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VOL. 68 NO. 5 MAY 2025

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RCM&E

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Welcome

Welcome to the May 2025 issue of RCM&E.

If something looks a bit different than usual with your copy of your favourite R/C magazine that's because it has changed to a new paper size of 205 x 290 millimetres. The types of papers used for both the cover stock and the inside pages have also changed. But don't worry, we are not alone in this, our sister modelling magazines Model Boats and Model Engineer Workshop having also adopted this new format.

'Why the change?', you may well ask. Well, simply put RCM&E and many other titles published by Mortons Media have now been taken over by Kelsey Media, one of the leading independently owned media businesses in the UK. This new format is one of Kelsey's preferred paper sizes and it will be used for several other titles, including the model magazines mentioned above, Best of British and a selection of angling publications.

By the time you read this the take-over will be complete and hopefully we will be able to manage our little piece of the transition with minimal disruption. In fact, I hope it goes as smoothly as it did when Mortons Media Group took over RCM&E from MyTime Media which, at least from my point of view, happened with a very light touch.

It will take a little while for everything to bed down so there will be a transitional period when you may see things like the Mortons logo still being used – probably when I've failed to spot them! So please bear with us while we fine tune things. But hopefully, apart from the paper size, any changes will be almost invisible to our readers over the coming few issues. Thank you in advance for your continued support and patience.

I have yet to be issued with a new email address so if you wish to contact me then please carry on using the Mortons one for the time being.

Now for a quick look at some of the main articles in this month's magazine. Barry Stevens starts the ball rolling by assembling the latest twin 40 mm EDF jet from XFly-Model, a working swing-wing F-14 Tomcat. In Retro Ramblings, Shaun Garrity previews the 13th Pontefract Single Channel & Retro Fly-in, as well as handing some page space to Peter Christy so that he can describe the Analogue Proportional radios of yesteryear. Martin Hardy has been busy in his workshop again, this time finishing off a classic SIG Spacewalker kit and converting it to electric power. Then it's over to Danny Fenton, who has also been busy building a new model, but this one's a lot smaller, being a Blackburn Monoplane which Danny will be flying at the Indoor Scale Nationals. Model Magic this month is dedicated to Kevin Powling's latest scale masterpiece which he built from the CARF P-51 Mustang kit. Fortunately, the full-size P-51 which Kevin chose to replicate now resides in the UK so he was able to take his model along to photograph alongside the real 'Jersey Jerk' before embarking on a flight in this famous fighter. Our free pull-out Pro-Plan this month is for Fundroid, a 51-inch wingspan fun fly model which Mike Bell has made from foamboard and Depron to reduce the cost of making a competitive fun fly machine. Our second review this month is from Frank Skilbeck who has been busy building a VP2600 electric glider using the kit and power set supplied by 4-Max Models. Then we return to Mike Freeman so that he can complete his article on building St8us, a one metre span EDF delta, featured as last issue's Pro-Plan. In Aerobatic Scene, Keith Jackson ventures out for his first aerobatic flying session this year, maidening his new Fantasista 70 pattern ship. Have you ever wondered how Express LRS (ELRS) radios work? If so, join Kevin Scott as he lifts the lid on this new breed of radio control systems. To finish everything off join me as I take my first steps into First Person View (FPV) flying with DJI's Neo palm size drone.

I hope you enjoy reading it all.

Happy Flying!

Kevin Crozier

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On the cover

Photo: Nigel Philpott

When Kevin Powling was deciding on his next project, he was drawn to the idea of building a model of a warbird based at Martlesham, close to his childhood home. Kevin already had a couple of Spitfires and had just spent the last two winters building two CARF P-47 Thunderbolts. But what he didn't have was a Mustang. After looking at many reference pictures he kept coming back to the 'Jersey Jerk' flown by Don Strait of 361 Fighter Squadron when stationed at Martlesham in 1944.

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SWITCH ON

Our latest round up of model flying news and miscellany

KELSEY MEDIA ACQUIRES MORTONS MEDIA

Kelsey Media, one of the leading independently owned media businesses in the UK, is pleased to announce the acquisition of the Mortons Media Group Limited and group of companies. The purchase includes RCM&E magazine and RCM&E's website, modelflying.co.uk. This strategic acquisition marks an exciting new era for Kelsey Media as it seeks to innovate and grow, enhancing its product portfolio, expanding its market presence, and creating significant growth opportunities.

Kelsey Media has invested significantly in growth over the last five years and now publishes over 80 brands in 15 markets across digital, print and events, creating value for our partners and serving our customers passions, interests and hobbies in the UK and overseas.

Based in Horncastle, Lincolnshire, Mortons Media is a leading specialist publishing company with strength in a number of magazine and book publishing sectors, including motorcycles, modelling, rail and gardening and also benefits from a profitable and dynamic events division.

"This is a significant step in our growth strategy as we look to build market share and skills in specific markets. I look forward to working with the talented Mortons team in the coming months to further develop our products and services", said Steve Wright, Executive Chairman of Kelsey Media.

Ian Fisher, Executive Chairman of Mortons Media said, "*In recognising both the opportunities and longer-term challenges presented by the markets we seek to serve, I am confident Kelsey will be a great home for our brands. With the greater scale afforded by the acquisition and the combined strengths of the respective businesses and staff, I look forward to seeing them continuing to flourish in the future.*"

The purchase was completed in late March and includes the publishing and events divisions, with Mortons printing and distribution operations being retained by the former owners as Mortons Print and Mailing Limited.

PONTE SINGLE CHANNEL & RETRO R/C FLY IN

RCM&E's Retro Ramblings correspondent, Shaun Garrity writes:

Hello again, fellow button-pushers. After what seems a lifetime we're back! We have a date for the 12th Single Channel & Retro R/C Fly-in at Pontefract Park, hosted by PANDAS, the Pontefract And District Aeromodellers Society. Our club website is **pandas.bmfa.org** where all the coming season's events are listed. This year›s meeting is on Saturday and Sunday, July 12th and 13th, 2025, so please keep those dates clear!

Since 2010 our small band of Single Channel & Retro enthusiasts has grown and grown and we now have a multitude of S/C and Retro modeller friends all over the world, all coordinated via our dedicated forum: **Mode-Zero.uk.**

For 2025 we're expecting to welcome lots of new faces, new models and lots of fascinating new gear too. Via the forum we've seen a variety of new S/C, Reeds and Propo conversions and more have taken up the Galloping Ghost and Pulse Proportional challenge. If you've never seen a Galloping Ghost set up, then you're in for a treat!

We have Saturday the 12th as an all-model type fun-flying day (IC permitted) whilst Sunday the 13th sees the actual S/C and Retro RC event. It's nothing too formal; we'll no doubt have the very popular and just-for-fun spot landing comp and a few prizes for anything special that catches our eye. Don't forget that modern propo sets are welcome to steer your chariots of choice

LANCASTER AND MORECAMBE MODEL AIRCRAFT CLUB

Lancaster and Morecambe Model Aircraft Club (LAMMAC) is a long established BMFA affiliated club situated a short distance from the village of Glasson, near Lancaster in Lancashire.

The club enjoys the use of a large open and unobstructed site a few minutes' drive away from the M6 motorway. Two runways, a pit area and parking area are fastidiously mowed and maintained by club members. LAMMAC also features an on-site solar powered charging system for members using electric models.

Beginners, or those simply curious to try model flying for the first time, and, of course, people returning to the hobby after a break, can be provided with trial lessons on a club trainer and tuition from BMFA qualified instructors. Tailored flexible support and tuition, as required, is inclusive and complimentary to LAMMAC membership. The club promotes the BMFA Achievement scheme.

The club has a very friendly and relaxed atmosphere. Safe enjoyment of our hobby is its primary goal. The site is open from 10 am to 9 pm, or sunset if sooner.

We currently have circa 43 members and are actively seeking more. We host barbecue days, fun flys and several other events throughout the year. The club welcomes fixed wing and rotary wing models, and its membership has

a wealth of experience with all forms of model flying including electric, IC, helicopters, 3D aerobatics and jets. We also have one of the country's top precision aerobatic pilots as a club member.

If you are looking to learn to fly R/C planes or could use our flying site, we would really like to hear from you. Membership is fairly inexpensive and a discount is available for new members holding BMFA Achievement A or B certificates.

We hope you enjoy the attached photos capturing the action and fun at LAMMAC. If you would like to know more, please contact Membership Secretary and Instructor, Mick Lomax on 07783940934 or Committee Member, Stuart Emery on 07921315524

SHROPSHIRE MODEL FLYING CLUB

Shropshire Model Flying Club is a long-established club with membership vacancies for 2025 for both new and experienced pilots.

The club operates on a previous WW2 airfield, four miles west of Shrewsbury and is easily accessible with a short drive from the A5 trunk road between Shrewsbury and Oswestry. There is ample car parking and a mown grass runway of one hundred by eighty metres adjoining the previous paved airfield perimeter track. This tarmac area can also be used for take-off and landing.

There is ample space to fly, land and park models, and with no additional height limitations outside of usual legislative requirements the club also has a BMFA Site Permit established for models between 7.5 to 25 kg to operate up to 1500 feet, which we will ask to be increased up to 2500 feet for soaring events.

Members operate the full range of fixed wing, helicopter and multirotor aircraft. While it is predominantly for radio control, other disciplines are allowed, including control line flying. The club has a strong thermal soaring following and operates regular aerotow events. It has a GPS event planned for 2025.

Flying is allowed during daylight hours and there are no limitations on model type and size, subject to IC powered models being properly silenced and in compliance with BMFA noise recommendations (82 dBA @ 7 m). Only turbine jets are not allowed at the landlord's request.

Most flying is done at weekends, with a consistent turnout mid-week for those lucky enough not to be working on good flying days! We also have access to examiners for A and B certificates.

Please contact us: Shropshire.model.flying.club.sec@gmail.com

BMFA Northwest Area Scale Day at the SMFC field at Montford Bridge. Photo by Daniel Gray.

A typical SMFC flying day gathering. Photo by Malcolm Elliot.

F-14 TOMCAT

Barry Stevens assembles the latest jet in the XFly-Model range of twin 40 mm EDFs

Words: **Barry Stevens**

Photos: **Barry Stevens, Kevin Crozier, Barry Atkinson, Rob Bennett**

Last year I was pleased to review XFly-Model F-18 Hornet which proved to be a great little jet to fly. Unfortunately, it suffered a bit of a setback when the editor borrowed it back to try flying it from grass at his local club, his initial flying report having been made with the wheels off and hand launched. Sad to say a momentary distraction during a low pass resulted in the Hornet's 'rapid unscheduled disassembly'. Kevin said, '*I rarely crash but when I do, I do it in style! Sorry, Barry.*'

In recompense, Kevin promised me first choice of the next EDF jet offered for review. I didn't have to wait long before CML Distribution, XFly-Model's UK distributor, sent over an F-14 swing-wing Tomcat for us to try.

OPEN THE BOX

As always from X-Fly the Tomcat comes in a well-presented box, with all the airframe parts well secured within a close-fitting polystyrene inner tray. The most eye-catching item is the large one-piece fuselage with its factory fitted twin fins. By comparison the two wing panels are quite small, slender affairs as a lot of the wing area is formed by the broad centre section moulded into the fuselage and which houses the swing-wing mechanisms of both the model and full-size aircraft. Other than that, the other main items are the two all-flying horizontal stabilisers and the magnetically attached nose cone complete with pitot tube. A set of main wheels, a steerable nosewheel, elevator pushrods and a selection of screws completes the deal.

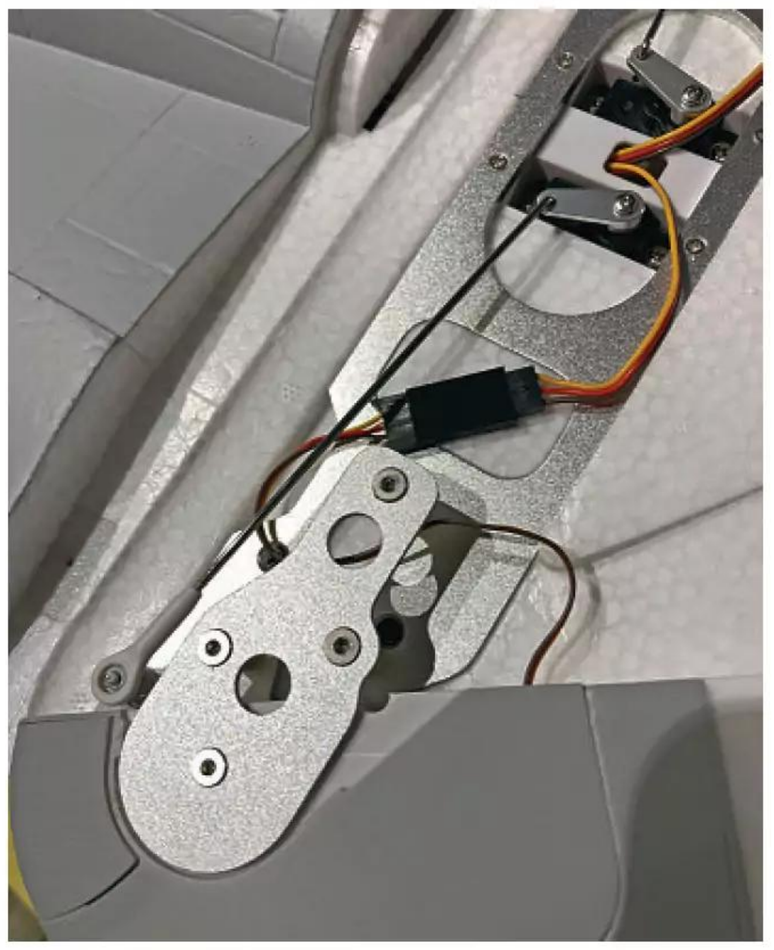
It all goes together very quickly, especially if you follow the very well-illustrated dual language manual. The front half is in English, with everything repeated in Chinese at the back.

SWING WING

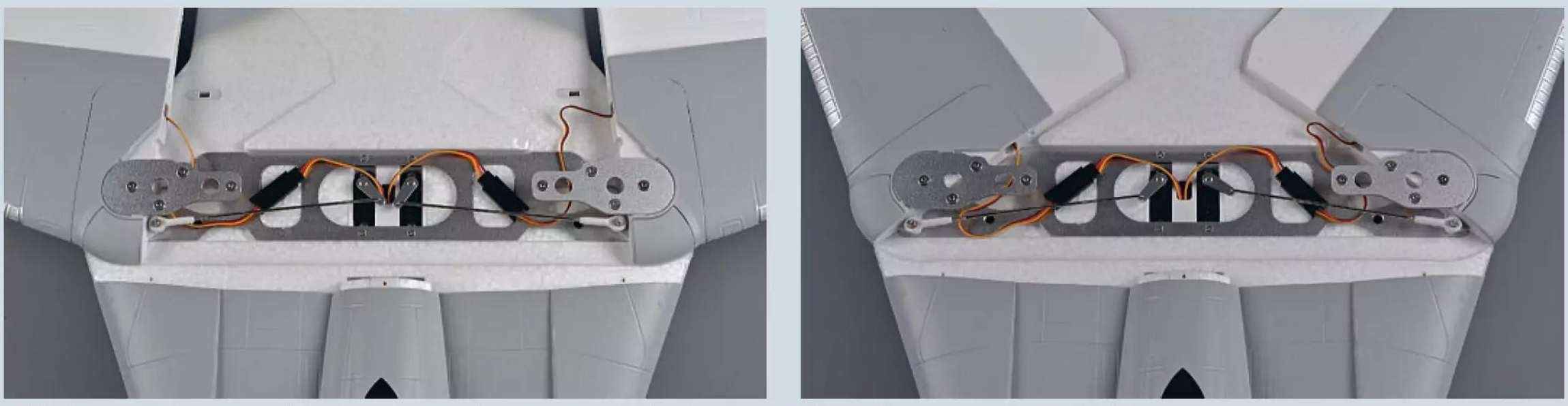
The first job is to fit the two wing panels and connect the swing-wing pushrods. An aluminium plate spans the centre section across the fuselage, acting as a main spar, with a sturdy metal wing pivot fitted at each end. A matching hole in each wing root fits over the pivots and a spacer plate, secured with four screws, is then fitted on top, sandwiching each wing in place. After checking for a smooth sweep of each wing the pre-fitted aileron

These images show the XFly-Model Tomcat with its wings swept and fully extended.

A broad metal plate acts as a main spar. Wing pivots are mounted at each end.



A spacer plate is screwed on top after fitting each wing over its pivot, sandwiching it in place.



With the pushrods connected up these pictures show the extended and swept positions of the wing sweep mechanism.

pushrods can be hooked up to linkage balls mounted at each wing root. The other ends of the pushrods are simple Z-bends inserted into metal servo arms fitted to a pair of 13 g servos mounted alongside each other in the centre of the fuselage.

The swing-wing mechanics are then covered up with a thin top cover secured with several small screws. However, you might want to wait before fitting the cover as you will need to see the pushrods when switching on the radio and setting up each sweep servo individually.

On my model the servo arms were set at slightly different angles due to the positions of the output splines, so a small degree of adjustment was required to ensure that both wings retracted to the same position on either side of the fuselage.

ALL FLYING TAIL

The two tailplane halves are fitted next. These simply push onto rotating shafts protruding from the sides of the jet efflux mouldings. Each shaft has a flat machined onto it to give the fixing screws a smooth surface to bite down onto, so it's important to make sure that the flats are lined up with the screw holes in each tail half.

A pair of short wire pushrods are supplied to connect each stabiliser to individual servos mounted on the undersides of the efflux mouldings, using ball-links at the elevator ends and Z-bends at the servo arms. A reference diagram in the manual shows how to line each stabiliser up with a panel line moulded into each side of the fuselage just forward of the stabiliser leading edges. This gives an initial neutral position for the elevators for the test flights.

The same process is used for the Hornet and with that model both sides were quickly trimmed to the neutral line by rotating the ball-links half a turn or two. On this model one side lined up very quickly, but the other side strayed slightly off the neutral line whatever I did with the ball-link. The mismatch is only very minor, but it was a bit frustrating to not be able to set the linkage up mechanically.

FINISHING TOUCHES

All that remains is to slot the main wheels in place, their short legs being simply clicked into place. The steerable nose leg locates through a hole in the underside of the fuselage and is locked in place by a steering arm grub-screwed onto it at the front of the receiver and battery bay. Finally, the nose cone is popped on at the front and the F-14 Tomcat is finished.

All in all, it's a very fast model to assemble, as we've come to expect with recent releases from this talented manufacturer of ARTF models.

A thin cover hides the moving parts.

Short pushrods with ball-links at one end and Z-bends at the other are used for both the elevator and aileron linkages.

Main wheels are a simple push fit into slots so can be easily removed if you want to try hand launches. If so, some strategically placed clear tape would help to protect the underside surfaces when belly landing. Note the ESC cooling slots and the EDF cheater holes.

View of the steerable nosewheel and the generous air intakes. It's the white areas that would benefit from clear tape protection if belly landing, especially under the intakes, as we found out when flying the F-18 without wheels.

Nose cone is attached with magnets to help stop the dummy pitot tube being damaged in transit. It's easy to forget though so we placed ours in a large plastic bag that hangs over the tail of the model when in storage.

SETTING UP

A smear of epoxy on the front and rear floors of the equipment bay, situated underneath the full-length removeable canopy, provided smooth areas for the self-adhesive hook & loop tape supplied to fix onto. I use the furry side of such tape on my LiPo packs and receivers, so it's the hook side that I leave permanently inside each aeroplane. XFly's tape is nice and wide so is especially useful for gripping onto heavy LiPo packs.

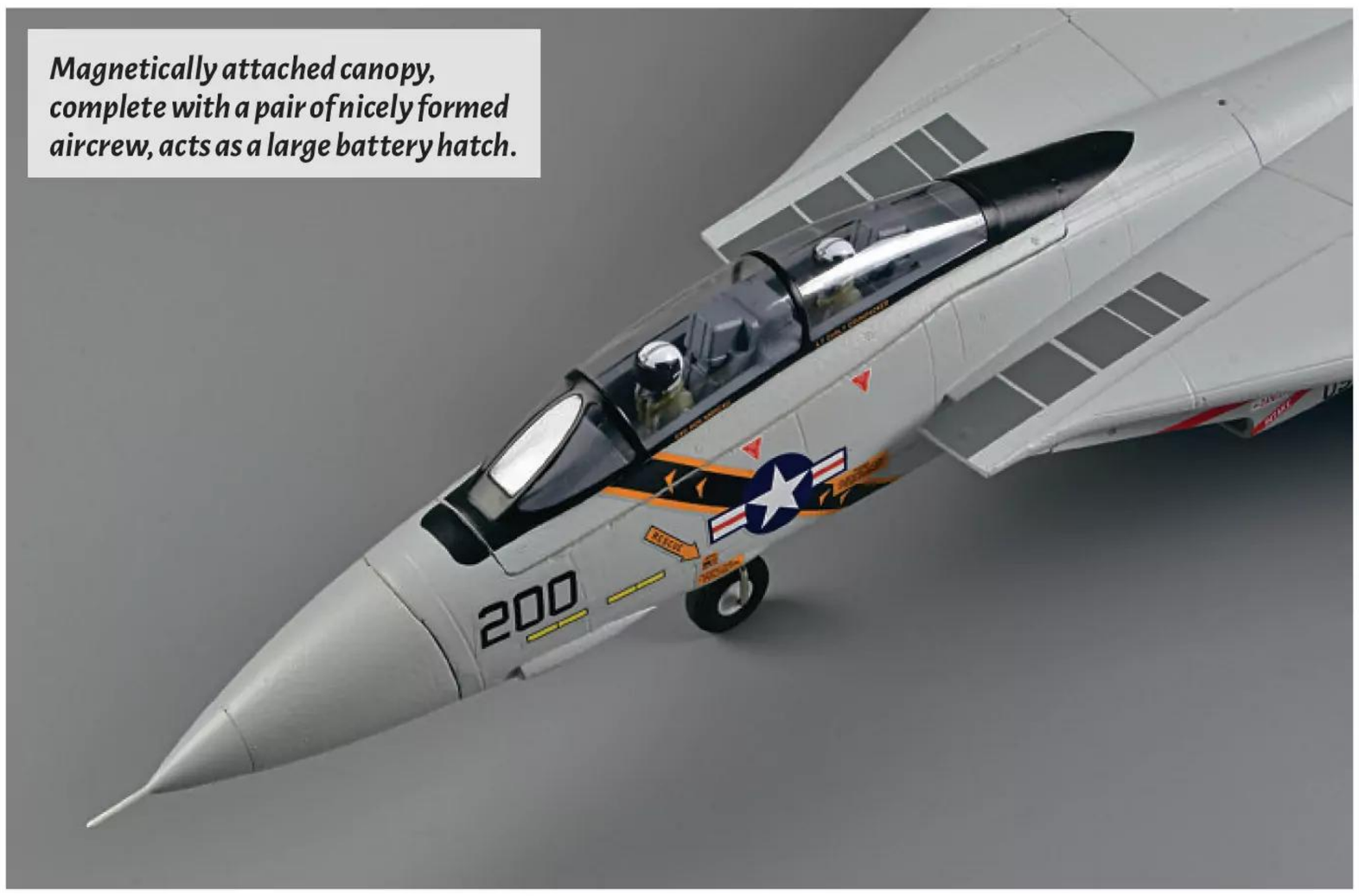
My Futaba receiver popped neatly into the smaller bay, just in front of the nose wheel servo, with the LiPo settled in the larger bay behind the servo. You'll need to fit a 4S LiPo to power the Tomcat. A 1300 to 2200 mAh pack is recommended and there's plenty of room to move it around to achieve the Centre of Gravity position indicated, just a mere 15 – 20 millimetres behind the point where the leading edge meets the edge of the swing-wing cover. I used the same Voltz 4S 2200 mAh pack from the Hornet to power this model as it had proven to be such a good match for the twin 40 mm fan units.

It was now time to check that the controls were moving in the correct directions and to set up the throws as per the manual. Since the Hornet instructions had provided good advice regarding control throws and a safe CG for the maiden flight, I felt happy to follow XFly's advice once again with this model.

With the ESCs calibrated to my transmitter's throttle range, as per the instructions at the back of the manual, and with failsafe checked, the model was put away, leaving a note in the cockpit to perform a range check before its first flight.

FIRST FLIGHTS ON HOLD

In recent years my flying field seems to require more and more time to recover from our now very wet winters. In truth it is only during summer that it can really be used for flying model jets with their relatively small wheels. So, as with the Hornet, it was time to pass the model back to Kevin so that he could wait for a weather window and test the Tomcat from a club that he has recently joined so that he could fly it from their ex-RAF tarmac runway...



Magnetically attached canopy, complete with a pair of nicely formed aircrew, acts as a large battery hatch.

F-14 Tomcat basks in the spring sunshine showing off its extended and swept planforms.

This model replicates the distinctive 'Jolly Roger' skull & crossbones livery of an F-14 of VF-84 Fighter Squadron based on board the USS Nimitz in the late 70s.

SPRING EQUINOX

After waiting several weeks for decent conditions in which to test fly the XFly-Model Tomcat, late March brought along a short spell of fine weather. Sadly, the wind direction was still not optimum for the tarmac strip that Barry mentioned above but a particularly good forecast for the Spring Equinox had me sending a call to arms to my flying buddies Barry and Rob at one of my other clubs, their jobs being photographer and EDF lobber respectively, to try hand launching the F-14 over grass. Rob had done a sterling job in getting all the previous XFly review jets away cleanly so I was hoping he could repeat the task with this model.

However, arriving at the patch I was very pleased to see that it had been closely mown and was in excellent condition, a marvel considering the soaking it had suffered in earlier weeks. Rob suggested that it might be safer to try a 'rise off ground', especially since the Tomcat has decent sized (55 mm) rear wheels, a sentiment that I fully agreed with. So, with the model facing into the stiff breeze and the wings fully extended, I smoothly applied full throttle. The little jet tracked straight and true, and after a couple of bumps she was airborne and climbing fast.

An easy circuit or two saw me input a few clicks of up elevator but there was no need for any aileron trim, dispelling any fears Barry may have had about possible taileron effects caused by that slightly off-centre elevator servo. It was time to settle her down for some camera passes

With its wings extended the F-14 is easy to fly and capable of all the usual EDF manoeuvres.

Surprisingly, despite higher rate settings, the Tomcat is less agile with its wings swept.

and by this time Rob had joined Barry with his own telephoto equipped DSLR, so I was looking forward to having a wealth of sunlit flying photos to choose from.

THE NEED FOR SPEED

Since a transmitter timer waits for no man I steadied the F-14 in a straight and level pass and flicked the flight mode switch. With my usual Tx set up this normally just increases the control throws, but the manual recommends combining the rate switch with the swept wing control. The wings tucked smartly away, giving the now arrow like jet an extra turn of speed, which I added to by pushing the throttle to its limit. With its wings extended the Tomcat is very easy to fly, offering a high degree of stability, but with its wings swept it becomes a little less stable, rocking slightly at lower speeds, so is best flown as fast as possible. It then becomes a veritable rocket ship and quickly covers a lot of ground, just like the real thing is designed to do in this configuration. Flying her is still a pleasure but you do need to keep your wits about you when flying with the wings raked back.

Although the Tx timer was still counting down to my usual test flight estimate of six minutes, I reasoned that all those high-speed passes would have taken their toll on the remaining capacity in the LiPo so on the next pass I flicked the rate switch to extend the wings and brought the Tomcat around for a smooth circuit and an easy landing.

DOUBLE THE FUN

You might be surprised to find that the Tomcat, with its wings swept and the higher rates commanded at that setting, would be more agile but in fact the opposite is true. With its wings extended this model is capable of all the usual jet style manoeuvres, looping and rolling with ease from mid to full throttle settings. But with its wings folded back it rolls far less quickly, although flying faster, to the extent that I chickened out when it became apparent that the F-14 would struggle to complete a roll on the suggested high-rate settings. Loops are also much more of a struggle, so be sure to give yourself plenty of room to pull out if the ground starts to approach really fast. I think that this must be because with its wings swept the ailerons are blanked to a certain degree and the horizontal stabilisers too by a lesser amount. In fact, the full-size F-14 doesn't even have ailerons, roll control being supplied via wing mounted spoilers and tailerons.

So, my advice would be to enjoy her easy handling characteristics and agile aerobatic performance with the wings extended and save the wing sweep as a neat looking party trick, followed by a fast pass or two, before reverting to 'wings out'.

Although the real thing could land with its wings swept in an emergency, the stall speed was greatly increased so don't even try going there with this model. But with the wings extended the Tomcat becomes a real pussy cat and is easy to land, allowing for reasonably slow, high alpha approaches, followed by smooth touchdowns.

If you're looking for a small semi-scale jet, then XFly-Model's rendition of the F-14 Tomcat should be high on your list. Buy one and I think you'll be impressed. ■

Best save swept wing mode for fast passes and wide sweeping turns.

DATAFILE

Model:	Twin 40 mm F-14 EDF 700 mm jet
Model type:	ARTF semi-scale fighter
Manufacturer:	XFly-Model
UK importer:	CML Distribution https://www.cmldistribution.co.uk
RRP:	£239.99
Wingspan:	970 mm (38.2"), fully extended
Length:	950 mm (37.4")
Wing loading:	115 g/dm²
Wing area:	10 dm²
Motor size:	1413-KV5500 x 2
ESC:	20A x 2
EDF Size:	40 mm EDF 12-Blade x 2
Servos:	9 g x 3, 13 g x 2
Functions (servos):	Ailerons, elevator, throttle, nose wheel steering, wing sweep
LiPo:	4S 1300 - 2200 mAh

Some fine spring weather and closely mown, smooth grass allowed the Tomcat to take off from the ground, helped along by a pair of large main wheels.

Landings are breeze with this nicely presented semi-scale twin EDF jet. Another excellent model from XFly-Model.

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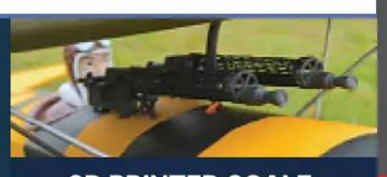

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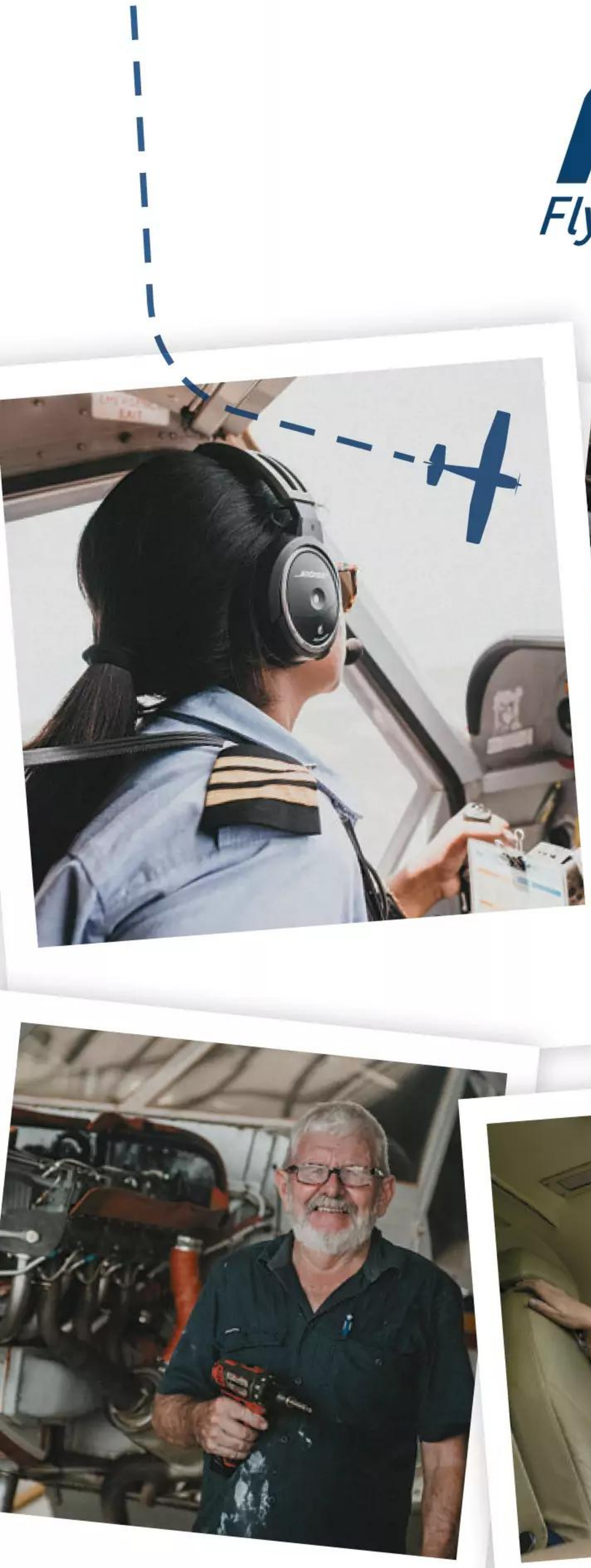

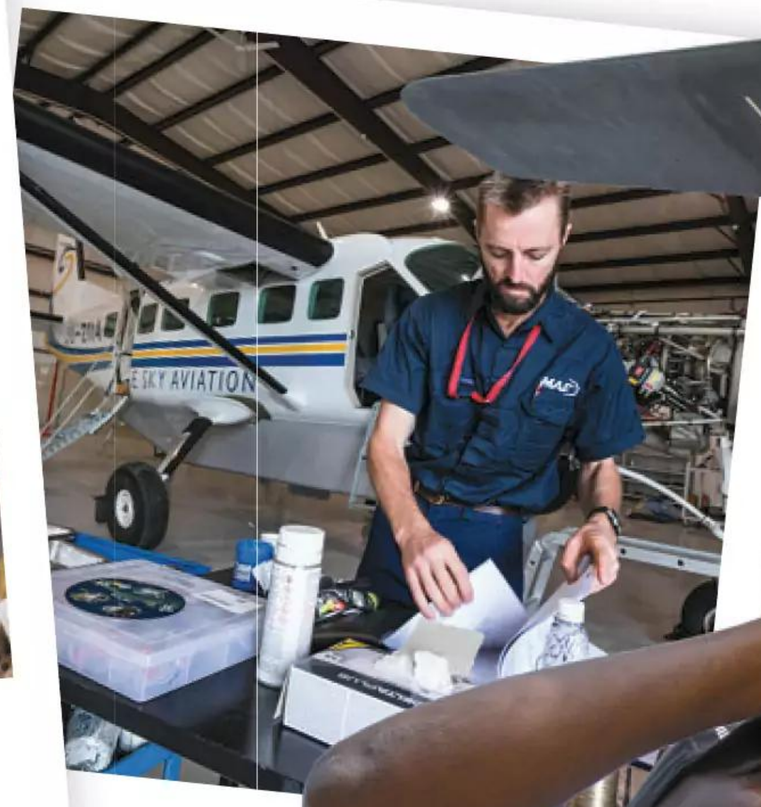

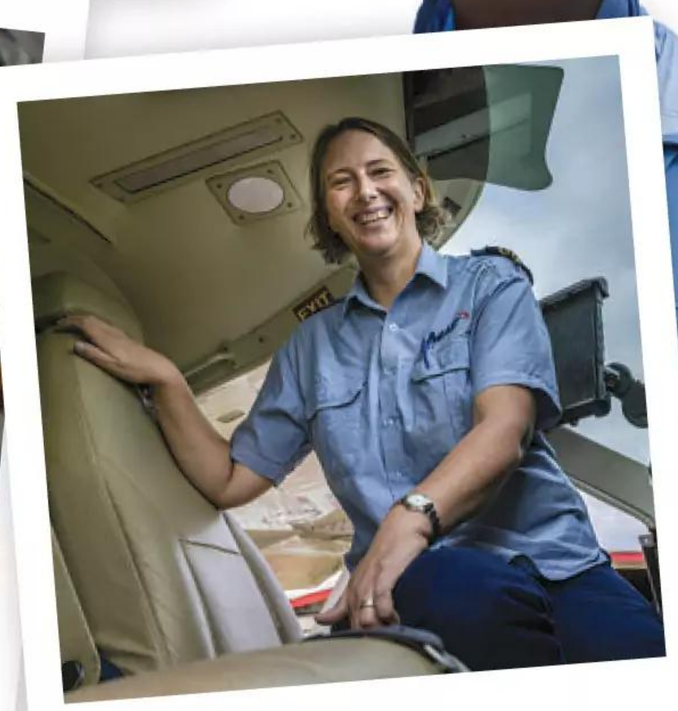

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The Pontefract Single Channel & Retro Fly-In is back again! Our 13th retro extravaganza is back on the 12th and 13th July.

DIGITAL, ANALOGUE & PONTE 13

This month **Shaun Garrity** harks back to early propo radio sets and looks forward to the annual Pontefract retro bash

Words and photos: **Shaun Garrity**

Last column's feature about reeds generated some interesting responses regarding old world radio gear. One interesting question was about early proportional sets know as Analogue Proportional. I've been meaning to cover this topic for a good while, but it's stayed in the to-do pile not done. However, I had recently been discussing this with my good pal Pete Christy; modellers of a certain age will remember Pete as an accomplished model helicopter pilot and designer of R/C gear, specifically a range of sets for World Engines, including a brilliant UHF version.

Another widget that was extremely popular was his Christy Mixer. Back in the day transmitters were very basic, many not even having servo reversing, so internal mixers were a pipe dream. Built into a receiver case his mixer allowed two channels to be combined in the airframe for V-tails, elevons etc. A far more elegant solution than the old school mechanical mixers used at the time.

Anyway, Pete told me he had recently scribbled a few notes (in Pete speak 'scribbled' is a detailed, well written, easily understood description) and would I like it for the column? So here it is and many thanks, Pete.

The Space Control was, I believe, the first commercial four channel propo set available to modellers. Unique in its day, but scarily expensive. Designed by Herschel Toomin in 1959-60.

Absolutely rammed full of valves (tubes) capacitors and resistors it was a very complex piece of hardware. Interestingly the Rx was all solid state.

DIGITAL - ANALOGUE

All the proportional sets on the market today are 'feedback' systems. In these, the receiver feeds a signal to the servo which is proportional to the stick position. In the servo, this is compared with an internally generated signal, which is proportional to the servo position. The servo then drives to make the two match.

All the first-generation proportional systems were truly analogue in operation. For example, the original Flight Link was based on the single channel Galloping Ghost principle. The mark/space ratio represented the rudder signal, the rate represented the elevator and full on or off drove the throttle servo. Obviously, you lost control of the rudder and elevator controls, which centralised, while the throttle was being operated. Not really very desirable. *(Very Heath Robinson but successfully flown by many modellers. Our very own Dave Boddington was a GG fan - Shaun)*.

Early American sets like Space Control and the British RCS Tetraplex managed to get this up to four fully proportional channels by switching between two alternating 'tones'. The frequency of these tones provided two further channels.

At the receiver all the signals were converted into a varying voltage, to be fed to the servo. The servo compared this to the voltage from the feedback pot and drove in a direction to make the two equal.

There were a number of problems with these systems. If the difference between the input and the output on the servo was small, the 'error' voltage might not be sufficient to make the servo move. It was extremely difficult to implement more than four channels and even four proved too much for some manufacturers. Kraft abandoned their analogue system after years of development without ever marketing a single set. Also, the update rate to the servos was very slow and sluggish due to the need have at least ten cycles of audio for the discriminators to act on, even at the highest rate of transmission and the minimum mark/space ratio.

In practice, they also suffered from trim drift with varying temperatures. On the plus side, the interference rejection was good.

The breakthrough came when Doug Spreng 'invented' the pulse tracking amplifier in the servo. I say 'invented' because similar systems had been in use for adjusting satellite dishes by the military and were meant to be secret. Spreng managed to make it practical for model applications.

The Spreng system replaced the varying voltage with a varying pulse width. This overcame nearly all the problems with analogue systems at the expense of being more prone to interference.

We were behind the curve in the UK but a few years later RCS brought out their Tetraplex four channel propo set. I've always wanted to own one of these but to date I've not had much success.

When released you could buy a car for what it cost!

Pete Christy's mixer was made under license by ACE in the USA. Hundreds were sold there, as in the UK. It started as an idea by Mick Wilshere of World Engines and a chat with Pete. An example of a mechanical mixer is shown on the right.

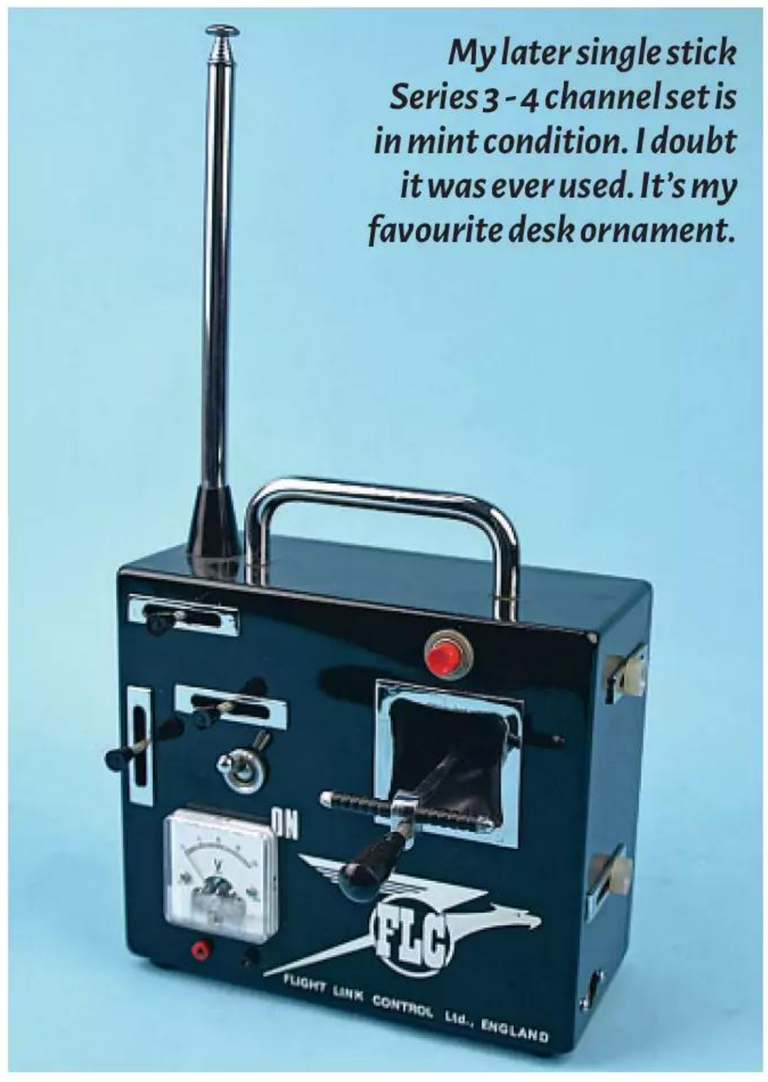
The beauty of it was that all the signals were either 'on' or 'off' (0 or 1), hence being regarded as 'digital'. In truth they were just a different form of analogue. Since no audio 'tones' were involved the data repetition rate could be much faster. The drive to the motor was always 'on' or 'off', with only the mark/space ratio varying for small errors. This meant that the servo developed full torque even on the smallest of errors. Also, because every channel operated in exactly the same way you only needed to design one circuit, which could be repeated for every channel.

True analogue systems disappeared quite rapidly after 'digital' came along. They couldn't compete on either performance or price.

Even today, most servos operate on the Spreng principle. There are no systems that are truly digital from end to end. So called 'digital' servos simply use speed controller technology to drive the servo motor at a higher frequency than the transmission rate of the original signal.

What has changed is how the signal is encoded. Following the switch from AM to FM on 27/35 MHz it became practical to transmit the data as a PCM code, where a binary number is used to represent the desired servo position. This also enabled

This UK Flight Link set was the first manufactured by Idris Frances. Two proportional channels with a progressive throttle on the buttons.



My later single stick Series 3 - 4 channel set is in mint condition. I doubt it was ever used. It's my favourite desk ornament.

Staveley also manufactured analogue sets. They were available with a choice of Kraft or Horizon Sticks and were very reliable but sadly came out too late as digital sets were becoming the norm. The Horizon sticks were also used in the series 3 Flight Link sets until Idris started manufacturing them. They were high quality units with thousands being sold into industries such as electric wheelchairs, machine controls etc.

This is the Avoncraft Cub my mate is trying to locate, along with the Wattage Turbo Hawk. I could fancy finding the U2 slope soarer kit also shown to build.

error checking to take place. The receiver now required a much more sophisticated decoder but also offered the opportunity to implement a 'fail-safe' if the data was corrupted.

The downside was that due to the narrow bandwidth available on 27/35 MHz, combined with the need for error checking before the signal could be passed to the servo, there was a noticeable lag between the signal being sent and the servo responding.

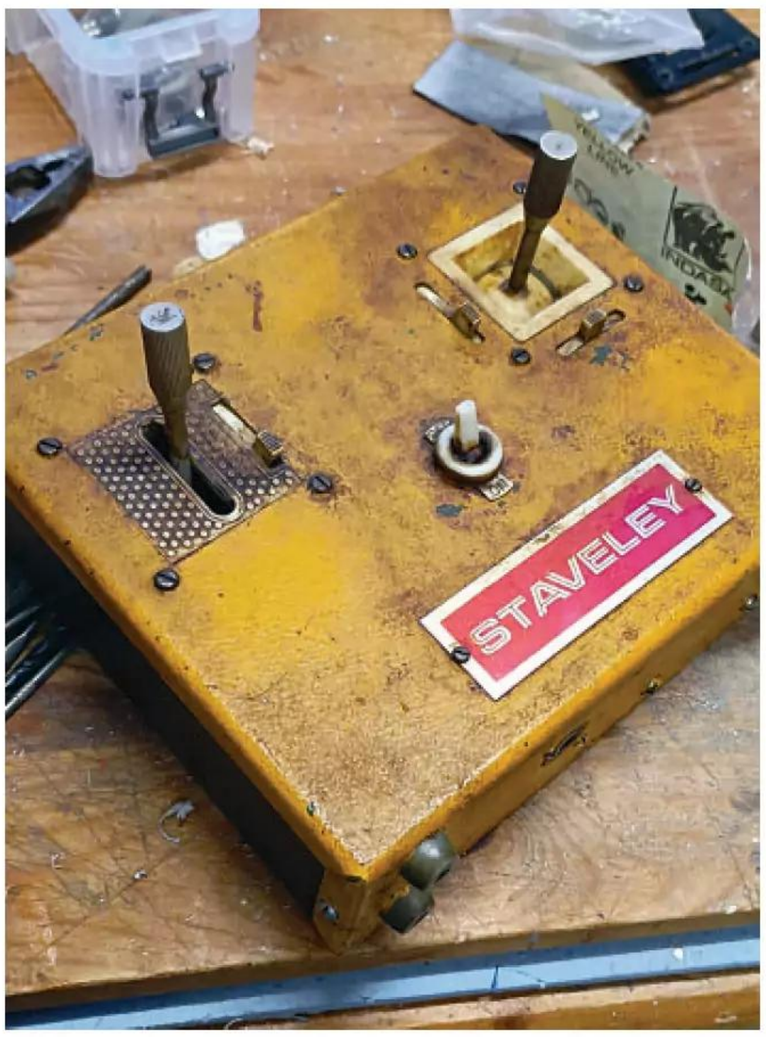
Various methods of 'creative accounting' managed to reduce, but never entirely eliminate this; at the end of the day the signal sent to the servo was good old Spreng pulse width.

The advent of 2.4 GHz solved the bandwidth problem. Most systems use between 200 KHz and 2 MHz of bandwidth and the response is once again almost instantaneous.

One or two companies have experimented with a truly digital signal to the servo but these have never been popular enough to usurp the Spreng system. This is largely because of 'vendor lock-in'. They will only work with their own servos and receivers, whereas the Spreng based servos can be swapped between manufacturers without problems.

Even those so-called fully digital systems still rely on an analogue feedback device - usually a pot - to provide the error signal. Until someone comes up with a micro-miniature optical encoder to replace the feedback pot (and stick pot) we will never have a fully digital system.

Thanks again, Pete. Some of the photos of early Analogue sets featured are from the collections of Stuart Mackay and Genichi Hirose (from Japan). Many thanks for these too, guys.



The two channel previously pictured arrived in this state - painted and abused. Due to its rarity I decided to refurbish it.

Surprisingly the original vinyl finish wasn't stuck on. It appeared to be sprayed on with the pattern stamped in and was almost impossible to remove back to the aluminium. I sanded it flat in preparation for the new covering, using a strong carpet spray adhesive to stick the new vinyl in place as the glue already on the sheet wasn't great. A heat gun teased it around the corners and helped get it wrinkle free.

HELP FOR A GOOD CAUSE

A friend of mine has been looking for a couple of old kits for a long while now. The reason being these were the last models he and his brother flew together before his brother sadly passed away at far too young an age. He would love to acquire the kits, build and get them back in the air as a tribute to his brother. The two kits he's looking for are the Avoncraft Cub glider and Wattage Turbo Hawk (EDF version). If anybody can help out, please get in touch with me and I'll pass your details on: aeroomodeller@gmail.com

BLINK & YOU'LL MISS IT

My love of deltas and canards is well documented. In fact, I've just managed to buy back an old Estes Astro Blaster kit I sold to a pal about 15 years ago. So, it was great to see the latest offering from Angelwing Designs' the Blink V2 Delta. It immediately reminded me of one of my all-time favourite deltas from days gone by, Pete Russell's 362, but at a much more convenient size to bung in the car. Traditionally built from balsa and ply, with some 3D printed parts for speed and accuracy, this model can be a pussycat or out of this world in performance terms. The power system specified is from a 3S 650 mAh pack to 2 x 850 mAh packs for an 8S set up. At 750 mm span and 500 g flying weight I can't begin to imagine what an experience it will be, but the name is 100% appropriate - Blink and you'll miss it! For more details visit their website at www.angelwingdesigns.co.uk

Angelwing Designs latest Blink delta. From tame to ballistic - you decide! Check out their website.

PONTEFRACT SINGLE CHANNEL & RETRO FLY-IN

It's back again! Our 13th retro extravaganza is back on the 12th and 13th July. The format is very similar to previous events, Saturday now being a general IC and Electric fly-in with Sunday for retro only aircraft, with free entry on both days. The cut-off date for designs on Sunday isn't hard and fast but the spirit of the day means anything newer than the early 1980s is not what the day is about. With regard to transmitters, single channel, propo, reeds, galloping ghost, 2.4G, 35 MHz and UHF is fine. But due to the proximity of the M62 motorway 27MHz isn't allowed and no free flight models can be accommodated. There are a couple of control line circles to get your inner ear spinning and balance tested. As always, we will run some light-hearted, just for fun competitions such as the ever-popular spot landing if you want to join in.

And don't forget there's the annual optional model theme if you want to get involved. This

Ponte 13 is back on June 12th - 13th. This is my Veron Tomtit in flight.

Bring your modelling goodies to sell.

I'm sure you recognise this avid modeller and collector of all things aeromodelling.

A Jasco Flamingo about to get skyward.

I love unorthodox models. The Rotor Duo was a free RCM&E plan a few years ago.

I remember Colin Baxter's Twinster well.

time it's the very quick and inexpensively built Grocker by Tore Paulson. Plans, article and build logs etc. are available on RCGroups: **https://www.rcgroups.com/forums/showthread.php?1314165-Grokker-3-Combat-aircraft-Drawings-and-pictures**

This truly is a scrap box special so a couple of days of leisurely shed time will see you with a completed airframe. Build it any size, any finish, scale up or down, IC or electric, maybe even use Depron instead of balsa, and we can have a mass launch, so get creative.

If you don't fancy flying your pride and joy, then bring it along to display so other modellers can appreciate your endeavours. We also have a 'Bring & Buy' area for unwanted modelling trinketry at no charge. No restrictions on items as long as they are modelling related.

To fly solo, you need a minimum BMFA 'A' or equivalent, plus all the relevant current CAA requirements and insurance. If you don't have an 'A' don't worry as we can make arrangements for you to fly under supervision. For models weighing over 7.5 kg you must have a BMFA 'B' or LMA proficiency and a spotter (we can assist here). No turbines on either day and all IC motors must be adequately silenced, so no changes there.

Free limited camping is available but please email me prior to the event to arrange things.

We are looking forward to seeing everyone again so mark it in your diaries now. For more details look at **www.singlechannel.co.uk** or **www.pandas.bmfa.org**

3D PRINTED ART

Over the years I've featured some brilliant creations by Ron Buckwell. Ron excels at thinking outside the box and has made many own designed transmitters that are finished to such a high standard they should qualify as art. Always up for a challenge he's also reimagined sets that never existed such as a Skyleader single channel and SKYLEADER reed transmitter. His latest example has been a Sanwa single channel set. The case is 3D printed in green filament similar to Sanwa's original colours and the badge laser etched from a blank aluminium business card. The analogue meter is recycled from an old Sanwa propo Tx.

If you fancy making one the STL file is available on the mode-zero forum **https://mode-zero.uk/viewtopic.php?t=1938**. All the help required to make a functioning set is available on the forum and it would be great to see a few of them at Ponte this year.

See you next time and as always please send you photos, missives etc. to **aeroomodeller@gmail.com** ■

Ron's re-imagined version of a non-existent Sanwa single channel set. It even has a faux Rx case for completeness.

Eric Clutton's Sharkface proved a popular theme model.

Ron's Skyleader single channel and reed sets that never were.

SPACEWALKER FLIES AGAIN

A quarter scale SIG Spacewalker 'loft find' is resurrected by **Martin Hardy**

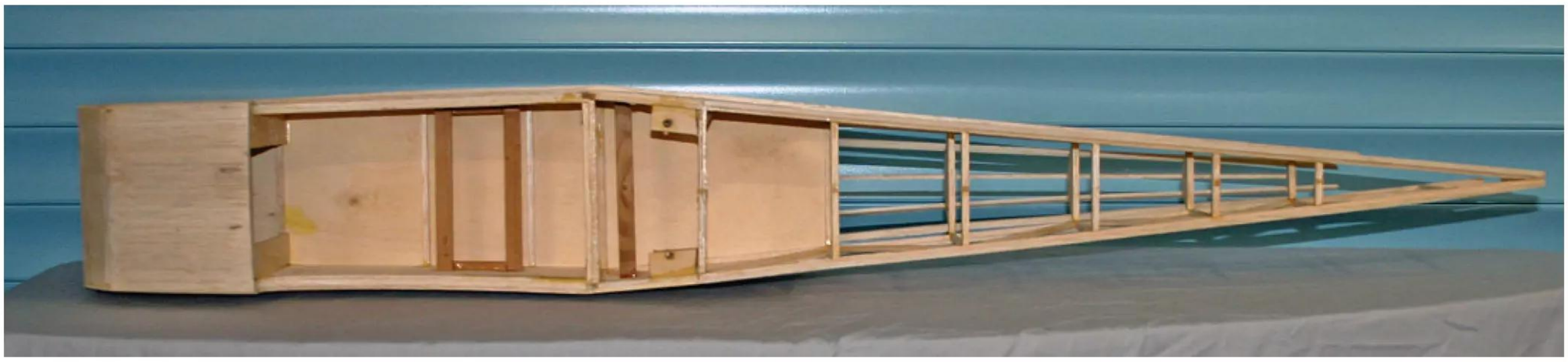
Words: **Martin Hardy** Photos: **Martin Hardy, Chris Montagu, Chris Williams**

A little while ago one of the (many) senior members of my club decided it was time for a de-clutter. He is a retired aircraft engineer, a long-time modeller and a very skilled builder, mostly of larger IC powered models. It may have been something to do with seeing the ease with which club members with an electric foamy or two in the car could head to the patch at short notice - no containers of fuel, electric starters or cleaning cloths required. The rot really set in when other dyed in the wool IC flyers stared appearing with really good-looking twin motor electric models, with all the bells and whistles. These not only flew very well but had good duration from relatively small batteries.

His 'For Sale' list duly appeared and was circulated, resulting in several happy new owners. One of the items was an IC powered, quarter scale SIG Spacewalker. The idea of putting in a bid was duly considered and prevaricated over for several days. As I only fly electric since my return to modelling it would need to be converted, something much easier to do during a build than by having to re-work a perfectly serviceable IC model.

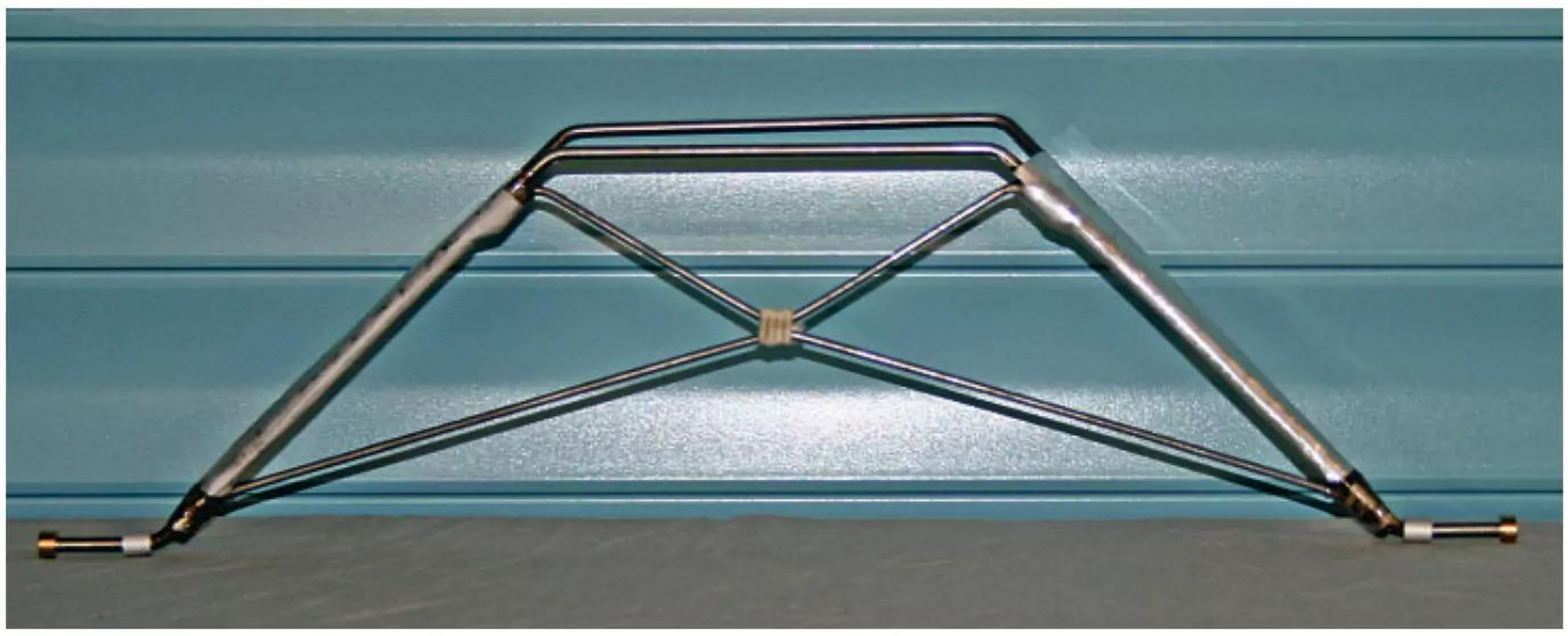
Chatting about it at the patch, as one seems to do more and more these days, it transpired that the Spacewalker in question was the second one

SIG Spacewalker in action.



Fuselage bottom view, as received.

The kit came with a selection of moulded plastic components - including some spares!



Undercarriage wire components assembled.

A good indication of the Skywalker's wingspan, as built.

he had built and was already sold. He had made a start on a third several years ago but had lost interest. It was thought to be somewhere in his loft, part built, possibly missing a few parts and was probably destined for the skip. I promptly volunteered to be the 'skip'!

This started a train of thought, *'How many other long-time modellers out there have a loft containing nearly forgotten IC models or even pristine un-started IC kits?'* Could some of these modellers now be flying electric, but have a yen for something more retro but with the convenience of electric? Could they even consider going back to the shed for a winter build project again, to convert one of their carefully stored IC models or kits to electric?

It is one thing to buy a ready-to-fly electric model, fit a battery and commit aviation. It is a different challenge to have to specify an electric power train, fit it to a model not designed for it and then make it all work successfully.

CONVERSION REQUIREMENTS

I decided to look into what would be involved converting the SIG Spacewalker to electric and to assess the chances of success. A bit of on-line 'research' turned up a downloadable SIG build manual for the model, together with a 2008 vintage build log on RC Groups with lots of useful photos.

It appeared that a 1.20 size glow engine was a fairly standard fit for the quarter-scale version, but what did that equate to in wiggly amps? A bit of digging around showed that a typical 1.20 size engine could be expected to produce around 1.2 HP. A quick conversion (1.2 x 745.7) gave approximately 900 watts.

Approaching from a different angle, the flying weight range for this model was between 11 to 13 pounds. I would expect to need at least 100 W/lb for a club aerobatic model, so this would indicate the need for around 1300 watts. Say 1500 watts for cash! A bit more 'research' turned up an Overlander Tornado Thumper 5605/08 motor rated at 1600 watts, with a maximum current draw of 80 amps. A suitable 6S battery producing 80 amps equates to around 1700 watts, so with careful prop selection to keep within limits this should do the business. As I had 3S 5000 mAh LiPos being used in other models, fitting two in series in the capacious nose of the Spacewalker should be easy.

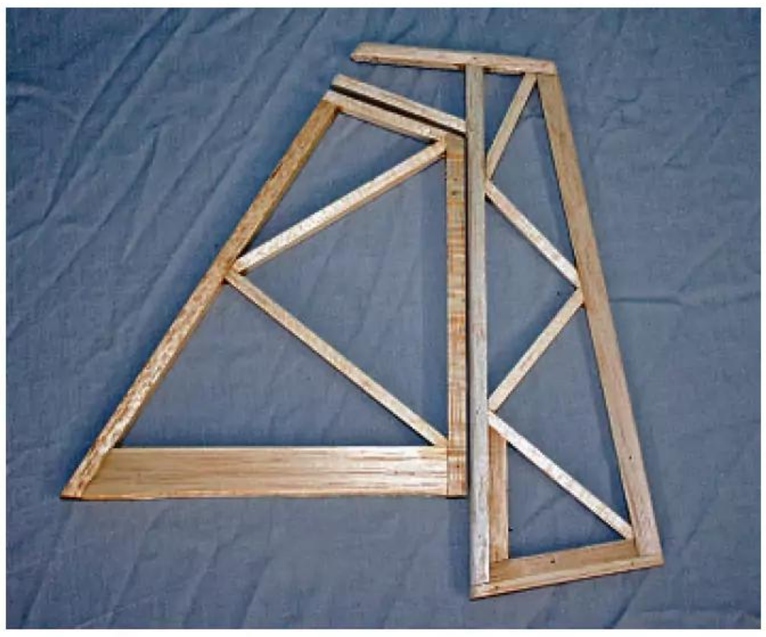
What about weight? A 1.20 engine is in the region of 900 to 1000 grams (2 lb. 3 oz.) with silencer fitted. A typical fuel load was given in the manual as 16 oz. This gives a 3 lb. 3 oz. load allowance for motor, ESC and batteries. For the electric conversion the motor weighs in at 382 grams (14 oz.), ESC at 76 grams (3 oz.) and two 3S 5500 mAh hard case batteries at 800 grams (28 oz.), giving a total of 2 lb. 13 oz. Allowing a bit for connectors and suitable size wiring the weight for the electric set up is very similar to the IC one. No real surprise there, it often seems to work out like that.

THE MODEL AS RECEIVED

A few weeks later a car duly turned up at the patch containing not a part-built kit but a nearly completely built kit. There was no covering to get in the way and most of the structural work had been done. The build was to a very high standard and was clearly not bothered by its time in the loft. A few bits were missing, including the original plan, but with a 90% completed structure did it really need a plan?

Did I want it? What do you think!

The starting point for the conversion is shown in the nearby photos. The Spacewalker is of traditional balsa construction, using

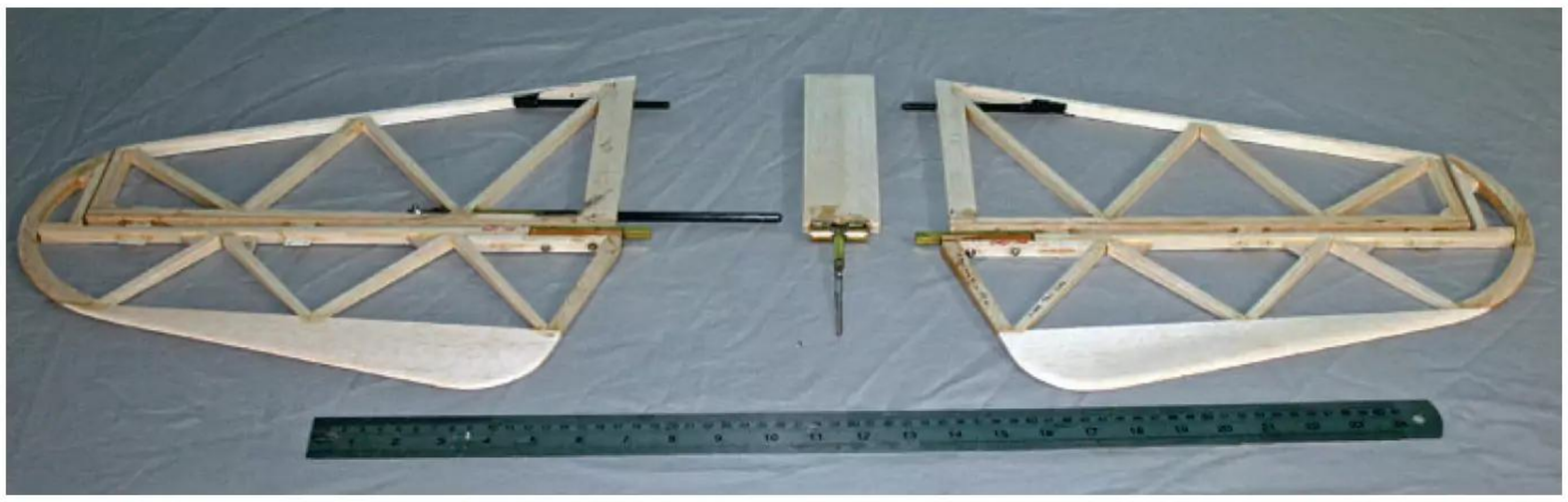


The original fin shape

an assortment of plastic mouldings for the cowling and shaped wire for the main undercarriage. There was a lot of building that I didn't have to do. The white tube in the wings is to carry the aileron servo wires from the receiver in the fuselage; the original kit even included paper to make the tube. A method for making it into a two-piece wing was shown in a separate build log on RC Groups.

The top and bottom Vs of the undercarriage are joined with white bungee cord to form a shock absorber for those less than perfect arrivals. Lithoplate was used instead of the fibreglass covered balsa side panels specified in the manual.

The original fin shape was not very 'Spacewalker' but maybe it was not completed?



Removable tailplane. Full details in Part 2.

Motor extension box attached to the existing firewall.

PRACTICALITIES & CHANGES

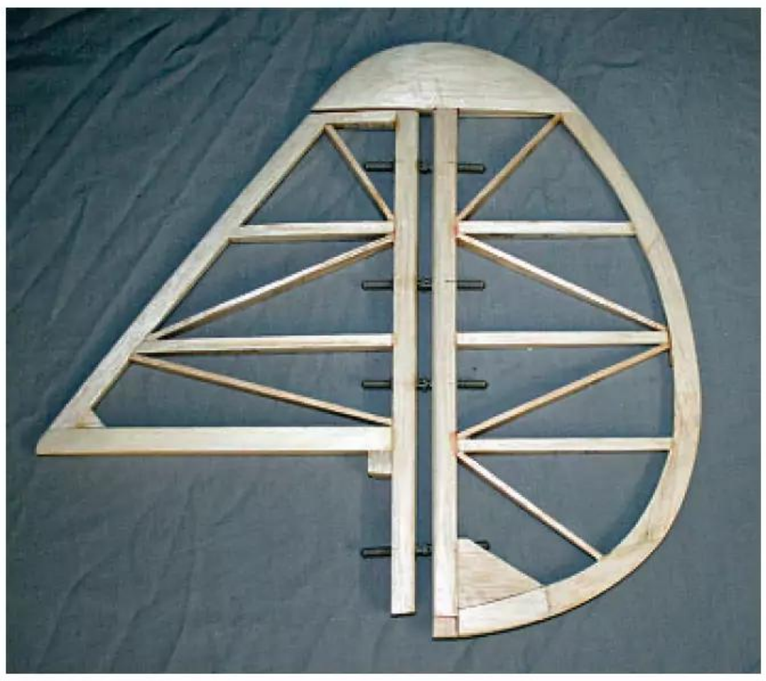
The first job upon getting home with my treasure was to look at the practicalities of housing and transporting the model.

The wing, although in one piece, fitted in my van with ease and could be stored on wall fixings in the garage equally easily. Fitting it to the fuselage used the time honoured 'two pegs and two screws into captive nuts' method. A change to the aileron to receiver connections, from loose servo leads as shown in the SIG manual to a 6-pin green Multiplex connector, giving easier connection on assembly, was the only change to be made. As I use one radio channel per aileron, to make adjustments easier, this also removed the possibility of connecting the ailerons to the wrong channel during assembly.

The fuselage would need a new motor mount, well forward of the existing firewall, plus flight battery stowage in the area designated for the fuel tank. As hoped, the large dimensions at the front of the fuselage made this a simple exercise.

The fin shape did not correspond with either the photos in the build log or the pictures of the full-size aircraft so a new fin would be required. A square-on photo of a fin shown in the build log was imported into a drawing package, drawn over and re-sized to make the plan for the new look version.

The tailplane was originally designed as a permanent fit on the fuselage. At something over 2 ft. 6 in. (80 cm.) wide this would be a nuisance for both storage and transport. A removable tailplane, with automatic control coupling and one-screw locking, was clearly required. The tailplane and elevator would also need reshaping to be more scale.



New look fin and rudder as per the plan.

MOTOR MOUNT

An extension box was required to interface the motor 'X' mount to the firewall. The box was made from 6 mm birch ply and secured using the existing IC engine captive nuts as well as glue. The length of the box was critical if the motor was to position the propeller the correct distance from the firewall. Without a plan this caused a small problem, until the downloaded instruction manual came up with a figure of 5 13/16 inches. Now I know why my old brain prefers metric!

The centreline of the original engine shaft, drawn onto the firewall by the previous owner, was extended to the front surface of the extension box and used to set the position of the motor 'X' mount.

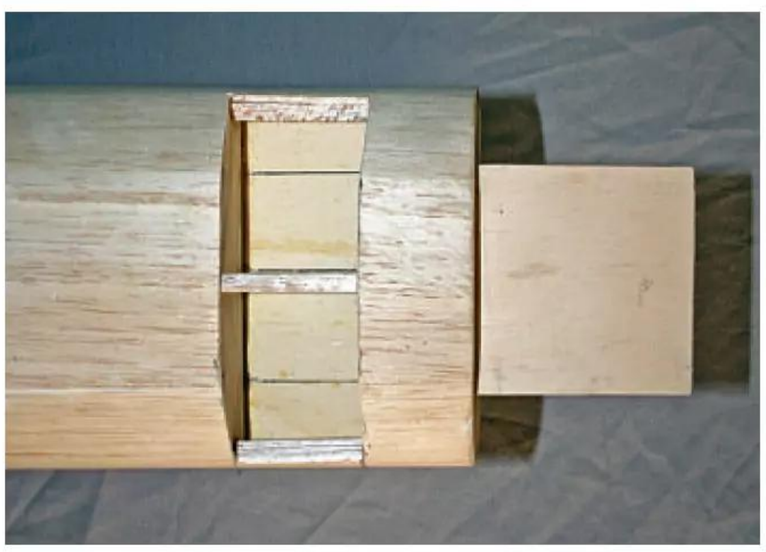
Holes for cooling air were made in the front surface to correspond with the motor cooling outlets. Circular holes in the side and bottom plates vent the air from the extension box towards outlets that will be cut in the cowling.

To further assist cooling a spinner with dynamic cooling holes, which pulls air through the front of the spinner, past the prop and into the motor, was added to the shopping list.

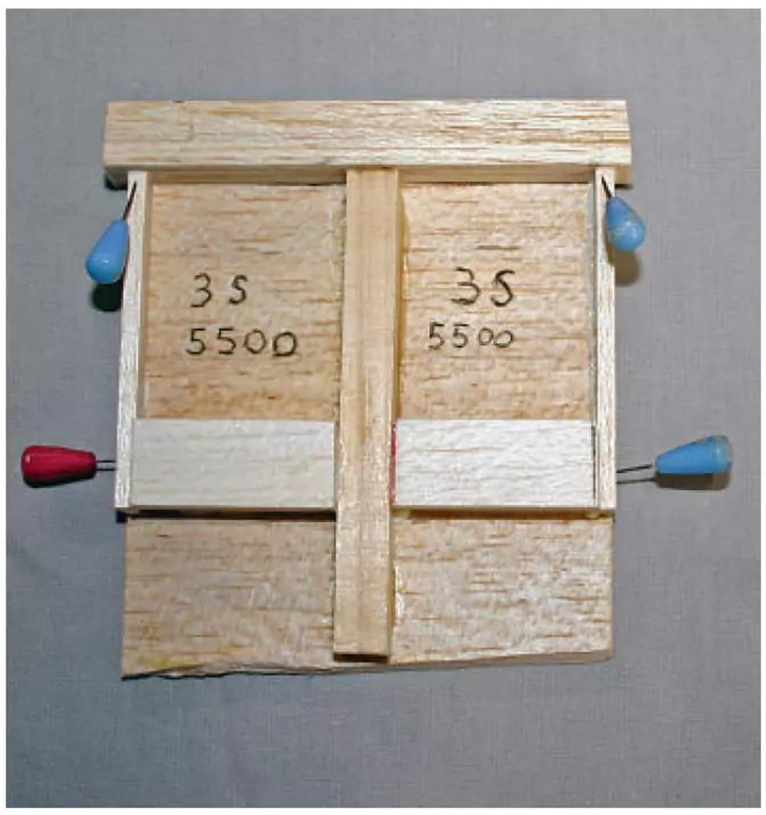
BATTERY BOX

The next job was to construct a secure housing for the two flight batteries. This needed to be in the area designated for the IC engine's fuel tank, as well as being as far forward as possible. Access for changing the batteries needed to be as easy as possible, together with space for the electrical connections.

An initial opening was made in the top deck, just behind the firewall. This revealed a ply floor running from the firewall to the rear cockpit, it obviously having structural implications for the whole front fuselage. Lines



Plan view of battery boxes.



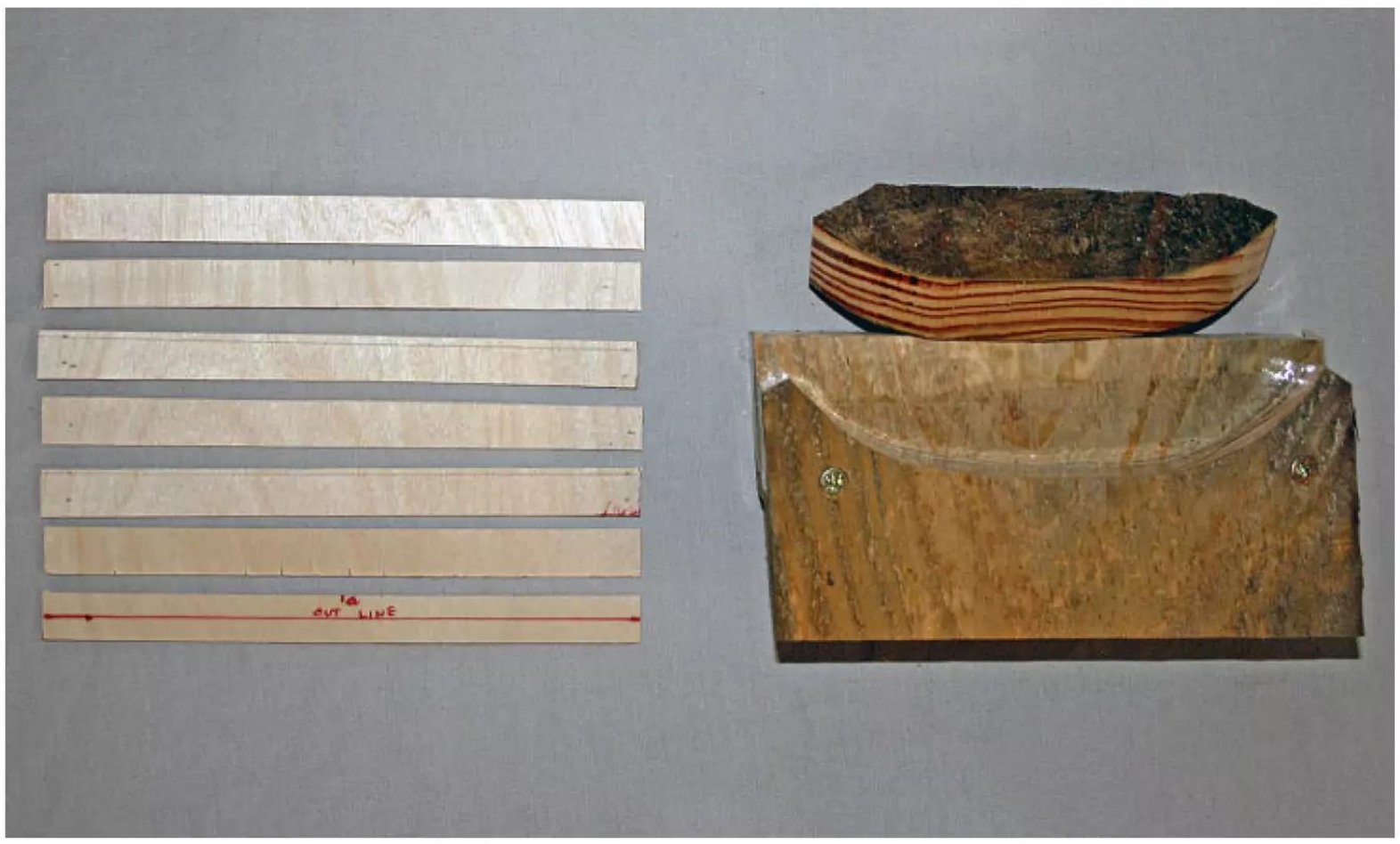
Battery box floor under construction.

Battery box layout for the dual 3S 5500 mAh hard case LiPo flight batteries.

showing the battery outlines were drawn onto the ply floor, ready for cutting. The opening was then extended forwards to the firewall to make space for the connectors.

The fuel tank support shelf, fitted below the ply floor, was easily removed to allow access to the bottom of the fuselage. The shelf was re-purposed as a battery box bottom support and fuselage reinforcement.

The flight batteries each connect to a black XT90 socket. Fitting a shorting plug to the yellow XT90 connector completes the series connection between the two LiPos and powers up the ESC. With the shorting plug removed the model is not powered up and is safe to handle. Heavy wires from the outer pins in each socket were routed through holes in the firewall ready for connection to the ESC.

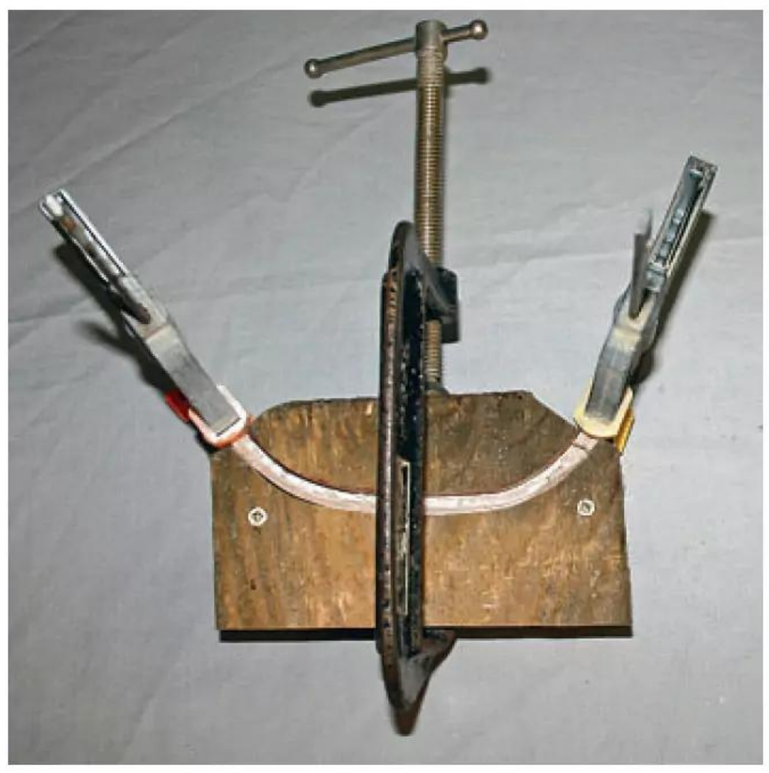


Wooden mould and ply strips ready for laminating the battery hatch frame ends.

BATTERY BOX HINGED COVER

The batteries would be secured by a hinged cover over the compartment. This would need to be robust enough for a lot of use and also to retain the flight batteries during negative 'G' manoeuvres. The cover comprises laminated ply end shapes, spruce longerons and hard balsa skinning. The laminated end shapes were made in a two-piece wooden mould cut to the curve of the fuselage and lined with Sellotape as a release agent. Seven 13 mm wide strips of 0.8 mm birch ply, cut across the grain, were used to build up the lamination. The ply strips were glued in a stack, placed in the mould, then compressed using a shaped block and a clamp. Ratchet clamps were used at each end to hold the laminations against the back of the mould. After at least 24 hours drying time the basic end shape was released. This was then cut along its length on a band saw to form two 6 mm wide lengths. The laminated ends were then joined to two lengths of spruce to form the hatch frame,

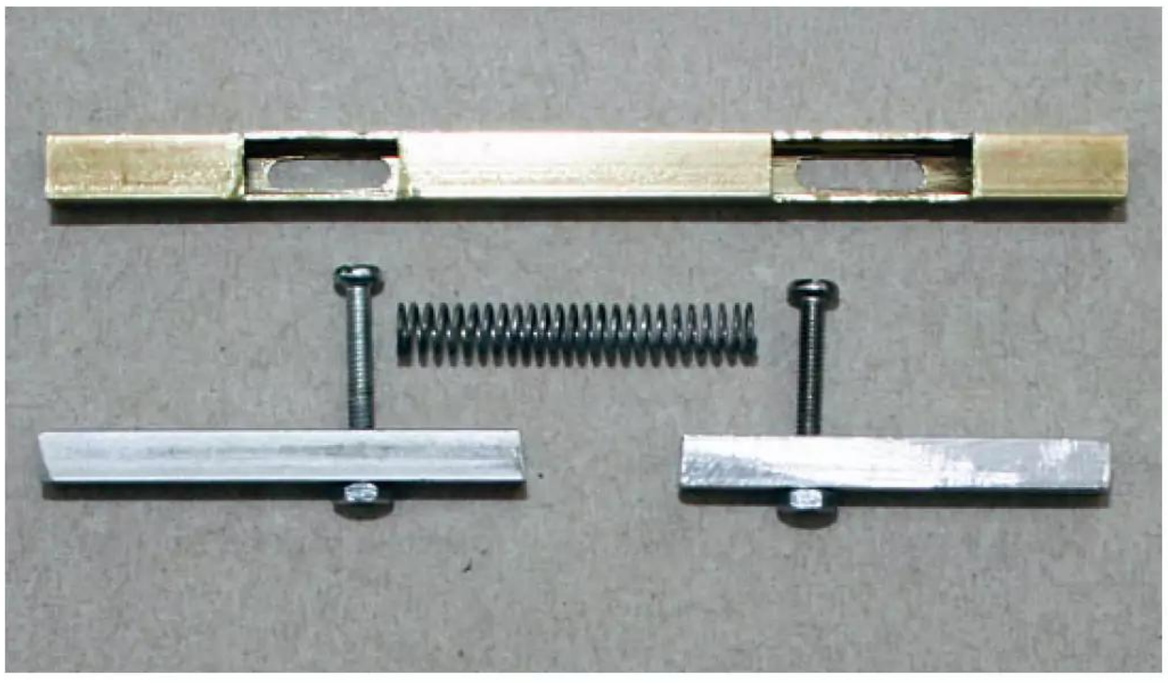
Two items of hardware were required to complete the frame. The first was a strong but light hinge. An internet search of dolls house suppliers for miniature piano hinges proved fruitless. So, a metal hinge, which just happened to be of the correct size and length, was liberated from an old glasses case and proved to be ideal.



Laminating in progress.

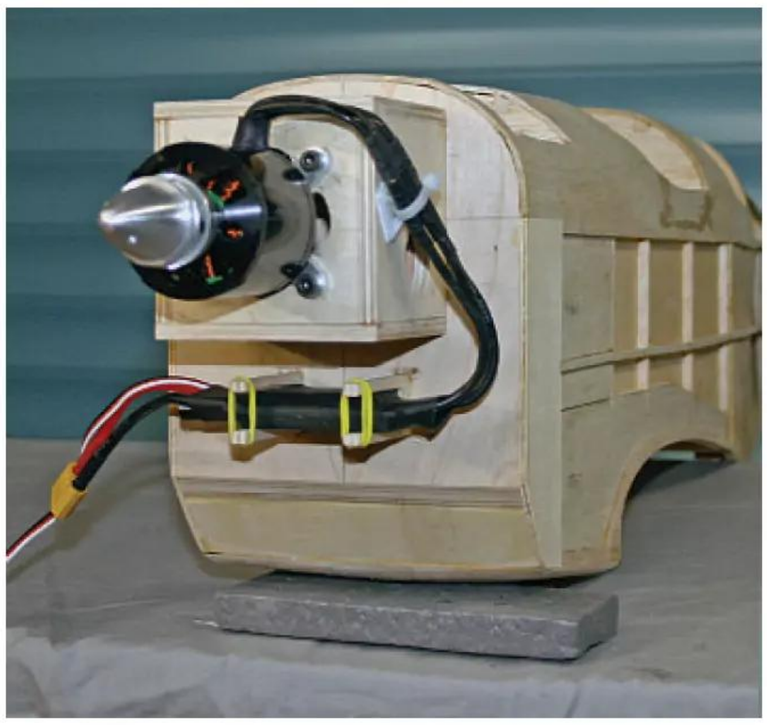
The second requirement was a secure locking mechanism, ideally shooting bolts from the front and rear of the frame into the fuselage structure. This was made up from two lengths of 4 mm square-section aluminium, a length of square brass tube, M2 screws with nuts and a compression spring. A 1.6 mm hole was bored through each aluminium bolt, then tapped M2 to take a screw. The nut was added to stiffen up the screw. The brass tube had two 2.5 mm slots cut into one face and a larger square opening made in the opposing face.

After the laminations were released from the mould they were incorporated into the battery hatch frame.



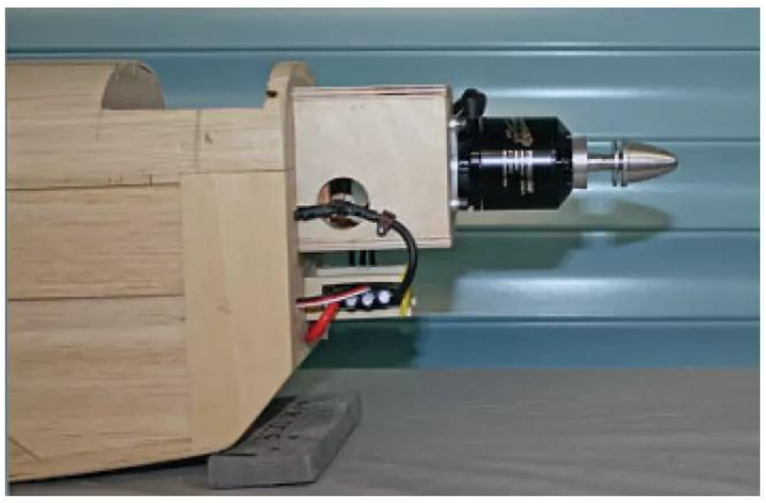
Battery hatch lock components.

A battery restraint was fitted to the hatch cover.



Front view of motor and speed controller installation. ESC mounting forks are a neat idea.

The spring was selected to fit within the square tube, to compress sufficiently to allow the bolts to be withdrawn towards the centre and to decompress to shoot the bolts outwards to lock the hatch. Pressing the screws together withdraws the bolts to release the hatch. A brass M3 screw was soldered to the centre of the lock and passed through the frame for added security. Inserts from square brass tube were inset into the fuselage to take the shoot bolts. The battery restraint was simply a piece of ply glued to the rear laminated end of the opening hatch and extending downwards



Side view of motor and ESC installation.

to the batteries. The hatch was skinned with balsa and slots were cut for the lock's M2 operating screws.

FITTING THE MOTOR & ESC

The next job was to fit and connect up the motor and ESC.

The ESC is mounted horizontally, supported by 6 mm ply fittings and secured in place by elastic bands. This allows for maximum cooling air flow over the speed controller's heatsinks. Motor wires are secured by a cable tie base and an associated cable tie on the side of the motor extension box.

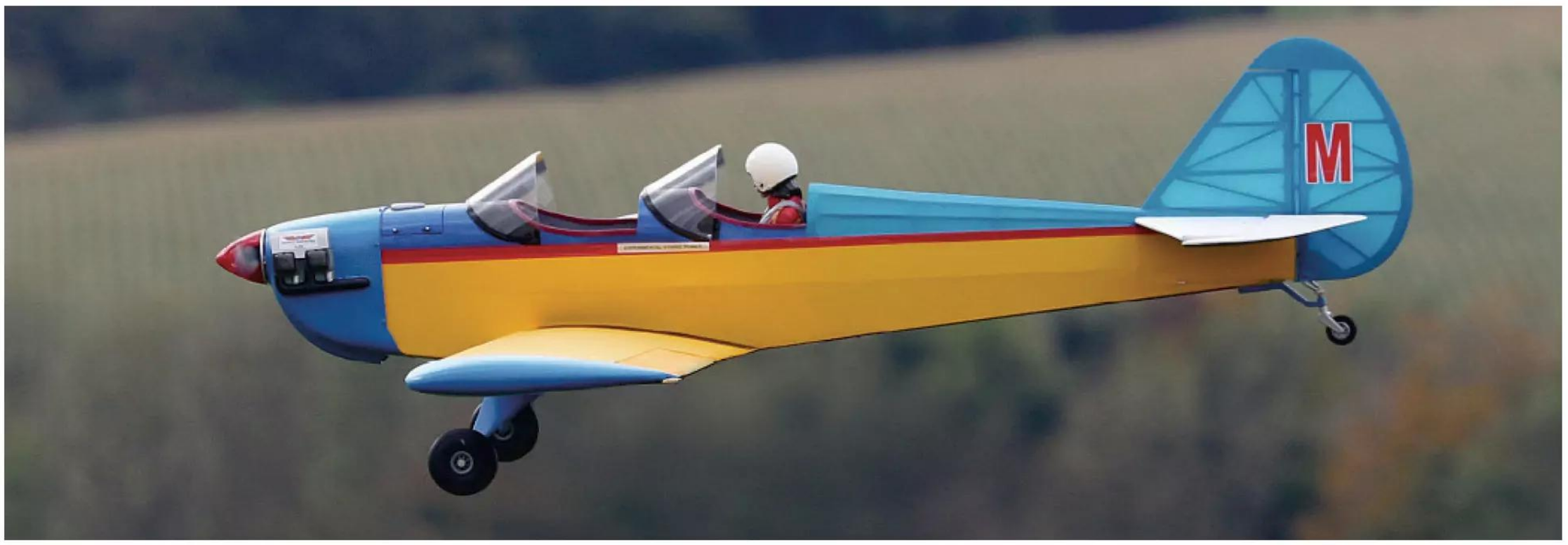
LiPo connections to the ESC are routed via holes in the firewall. Loose wires are secured using 'P' clips.

To be continued.

Next time, join Martin as he completes and covers the now electric powered SIG Skywalker before undertaking the maiden flights.

4max
The Electric Flight Specialists

Electric Setup For The SIG/Seagull SpaceWalker



Description	RRP
PO-5055-595 Brushless Motor	£61.00
60A Brushless ESC and Programming Box	£59.94
JXF 14" x 7" High Performance Wood Prop Only for use of 3S LiPo	£9.68
5A UBEC to power your receiver and Servos	£14.99
4S, 4500mAh LiPo Battery 60C Fitted with XT60 Connector	£70.00

Value Power Packs £24.99

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Package	Supplied Prop	Static Thrust @11.1V	Est. Speed
1000kv	10x6	515g/ 1.14lbs	35MPH
1200kv	9x5	635g/ 1.40lbs	42MPH
1400kv	8x6	810g/ 1.79lbs	55MPH
1800kv	7x3.5	490g/ 1.08lbs	52MPH
2200kv	6x3.5	470g/ 1.04lbs	59MPH

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BUILDING A BLACKBURN

Danny Fenton works up a Blackburn Monoplane to compete with at the Indoor Scale Nationals

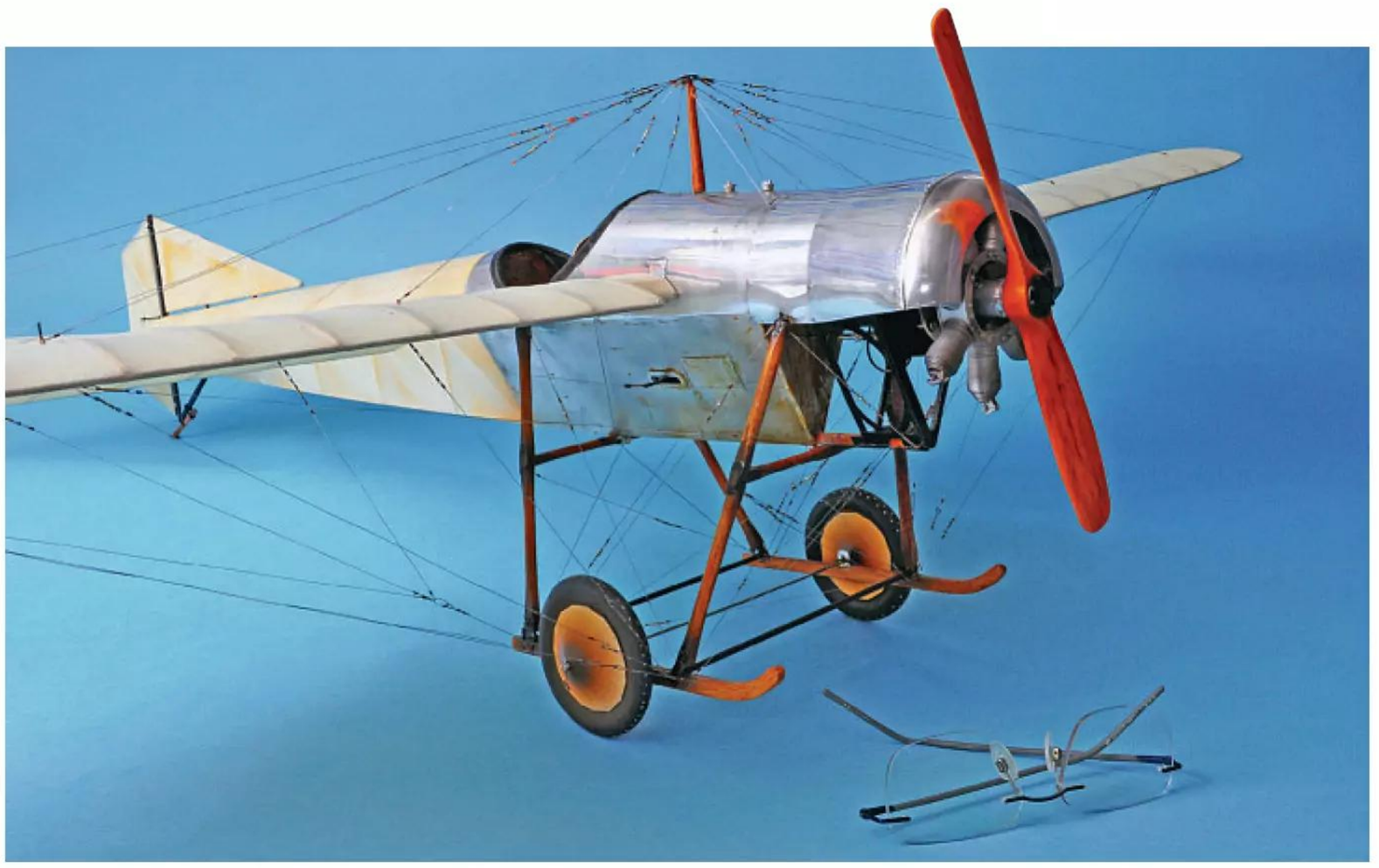
Words & Photos: **Danny Fenton**

Those of you loyal readers that have suffered my ramblings for more than a decade will remember my first foray into Indoor Scale with my own designed Piper Cub Pa-18 in 2017. Since then, the Cub has flown at subsequent competitions and has been great fun and well received.

Following that success, I spent a few years helping establish the Scale Indoor Nationals into an international gathering. The event now spans the entire weekend and attracts modellers from all over Europe, including some stunning builders: George Kandylakis from Greece, Antonin Alfery from the Czech Republic, Mats Johansson and Peter Evers from Sweden, also Hari and Caroline Simon from Germany (Caroline originates from Australia). Not to mention the home-grown modellers that fight it out for the trinkets. Having stepped away from organising the event I have more time and I am able to focus more on my own modelling again.

That first model was special as it was based on the Cub that dad and I flew around England in the mid 1970s. Dad would give me control while he filled in paperwork and I would fly us back to Sherburn-in-Elmet following the main train line to Selby. No radio, no navigation aids. Simpler times.

I was looking around for a 'new' subject for this year's Nationals and an aircraft that could be notoriously tricky to make, due to the all-alloy clad front, appealed to me. My good friend Andy Sephton was always telling me of his love for the aircraft and I have many pictures of Andy flying the 1912 Blackburn Monoplane at Old Warden. So, I had to have a go, especially as I had never built an Edwardian.



At around 1/9th scale the Blackburn Monoplane poses next to a pair of glasses to show its size.

My Scale Indoor Nationals winning Piper Cub Pa-18.

"Building without instructions is a lot of fun and easier than I expected"

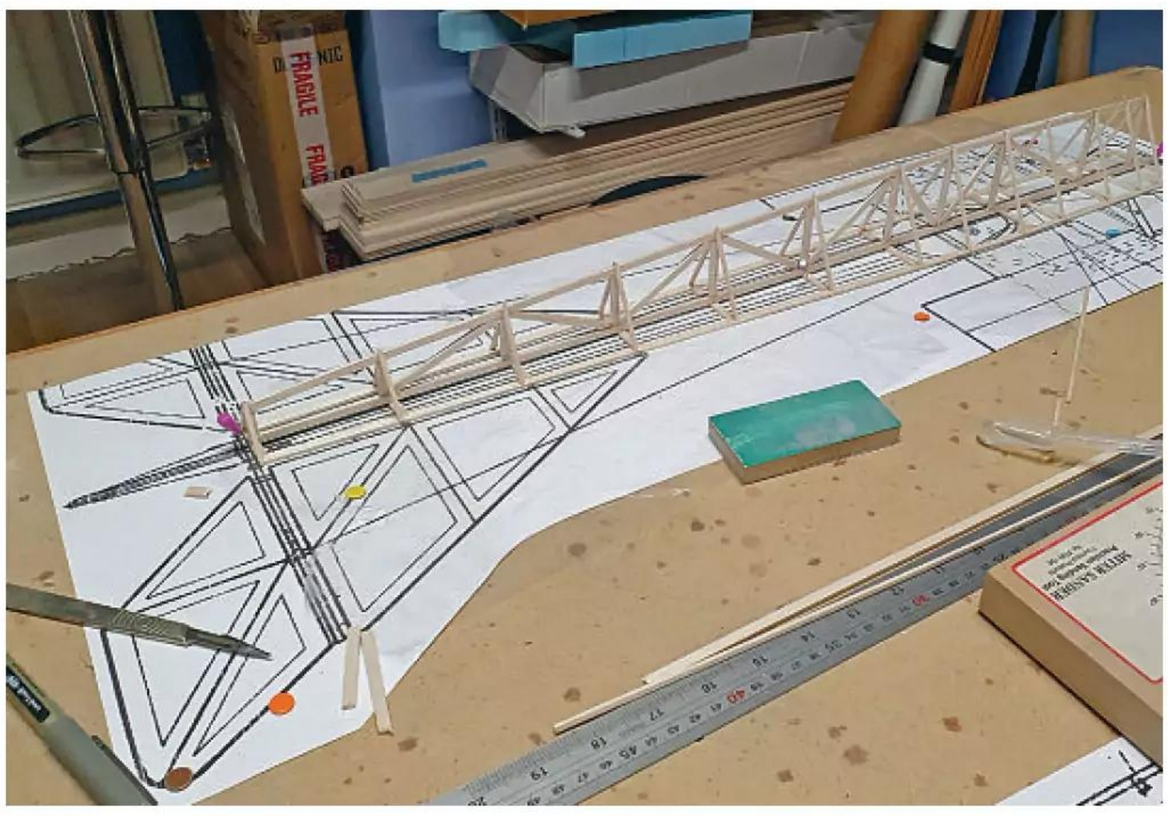
Lindsey Todd recently completed an article in RCM&E outlining the process when creating plans for a scale model. He used Computer Aided Design (CAD). This is also the way I would normally create a model.

However, speaking to several well-respected modellers about how they approach building a scale model, I was surprised they build in a different, simpler way. I thought it might be fun to try.

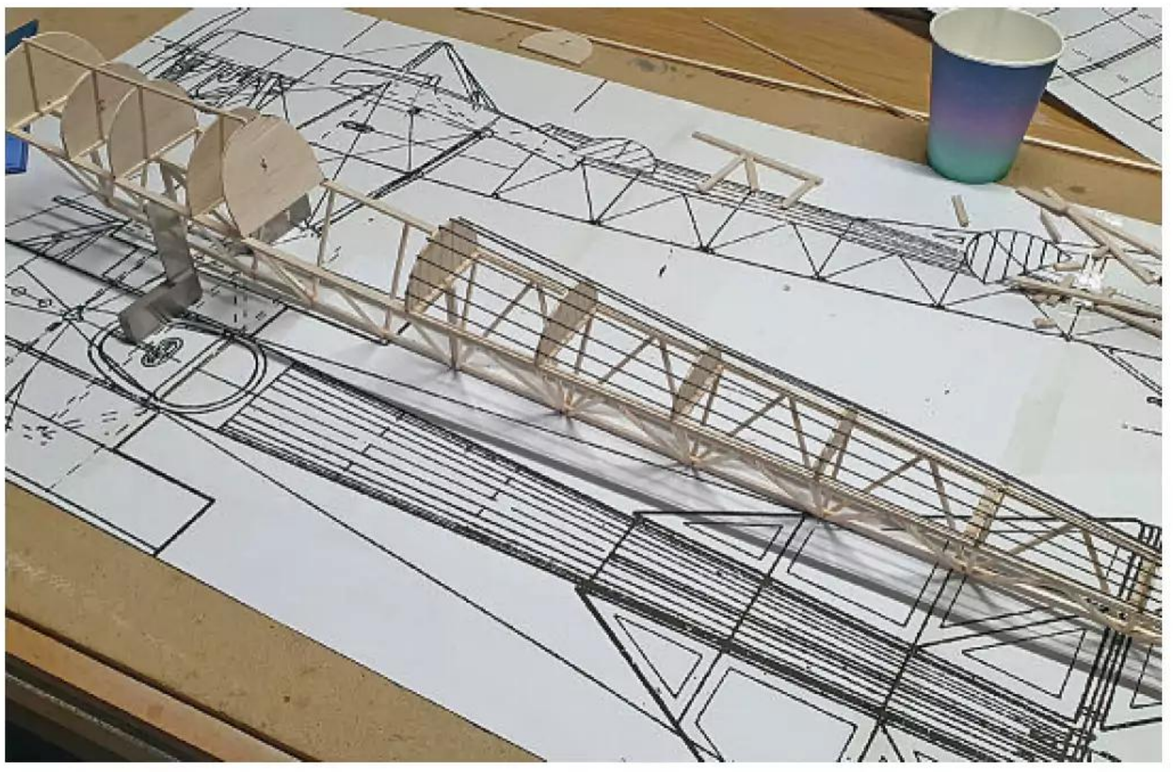
A GOOD THREE-VIEW

The key to a good and accurate model is the three-view drawing. I have often alluded to this before; if you follow a rubbish three-view, the model will never match any pictures. Although it may well match your three-view, it won't do well. Have you wondered why your model's panel lines don't align and markings don't fit, like they do in the pictures...

Thanks to Andy's love affair with the Blackburn, he had gathered quite a stash of data, pictures and drawings, including



Build over the three-view, ensuring you stay within the outline.



Still building over the three-view, now the right way up. I added stilts to keep it level.

> “One very neat thing with Esaki is you cannot see a join if you add a second layer over the top”

a nice looking three-view published in an Aeromodeller magazine from 1951.

So, what is this simpler way to build a model, I hear you ask? Well, basically we cut out the drawing phase and don't design a model. We simply build on top of the three-view.

I printed the three view drawings to the scale I wanted. This was done using some software called TilePrint. You load the drawing, select the scaling ruler and mark a known reference. In my case I chose the wingspan. I set the scale to give the reference line a length of 40” or 101 cm. TilePrint then allows you to print the drawing in sheets (A3 in my case). These are carefully aligned and taped together.

Building this way does require skills that you only acquire with experience. You need to understand how you can make a light but strong structure. With the Blackburn's triangular fuselage, you must figure out how to build it. A side view would be the normal approach but that won't work with the sloping sides. To solve this, I made a plan view 'crutch' that gets cut away once the fuselage is filled in later in the build.

Building without instructions is a lot of fun and easier than I expected. Sure, you must make decisions off the cuff but most of the time I am incapable of following a designer's plans anyway. We all have our own ways of doing things.

The bulkheads were simply created as sections of a circle, using the plan and side views to get the size right. You need to remember to undersize formers to allow for the outer skin. I am using litho plate so that allowance is slight.

MODERN MATERIALS

The wings were very straightforward. The full-size wing is made from wood, but I deviated in this area, opting for more modern materials. I used two carbon tubes as spars in the correct location. Ribs were cut from 1/16th balsa (1.6 mm) They are all the same, so I made ply templates and used the sandwich method, where you stack a load of balsa blanks together and sand the ribs to shape. It's a very quick and accurate method, especially if the wing is a straight chord and all the ribs are the same. The ribs were slid onto the spars and another carbon tube added to form the leading edge. The trailing edge was again made from carbon, this time a flat section of 1 mm x 6 mm.

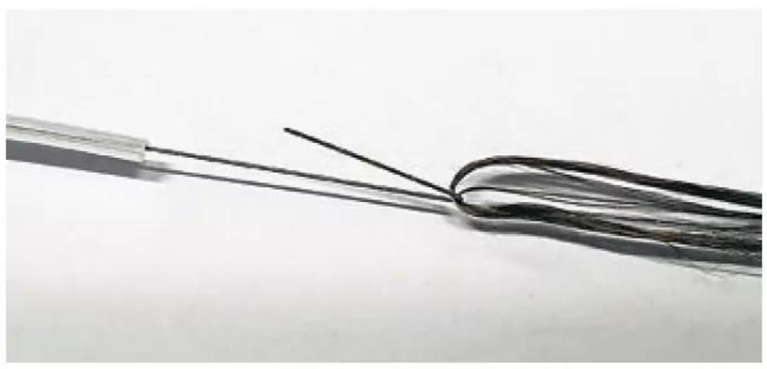
The wing tips were an opportunity to play with an idea I stole from a friend in the USA, Ben Andrus. Ben flew a stunning yellow Ag-Cat at the World Champs in Romania. He showed how he took some silicone fuel tubing and by threading resin impregnated carbon tows through the tubing he could shape it around formers whilst it cured to create whatever shape you wanted.

Me being me, I had to modify the process, of course! My method deviated mainly in scale. I found that the silicone tubing was available in a myriad of sizes, right down to 0.5 mm I.D. (Internal Diameter). I selected a tubing that gave me an I.D. of 1.5 mm. The process involves drawing resin impregnated carbon 'tows' through the tubing. These are then taped to the outside of a former, allowing for the size of the tubing. Once set the tubing is stripped away and you have a perfectly shaped, rigid carbon part.

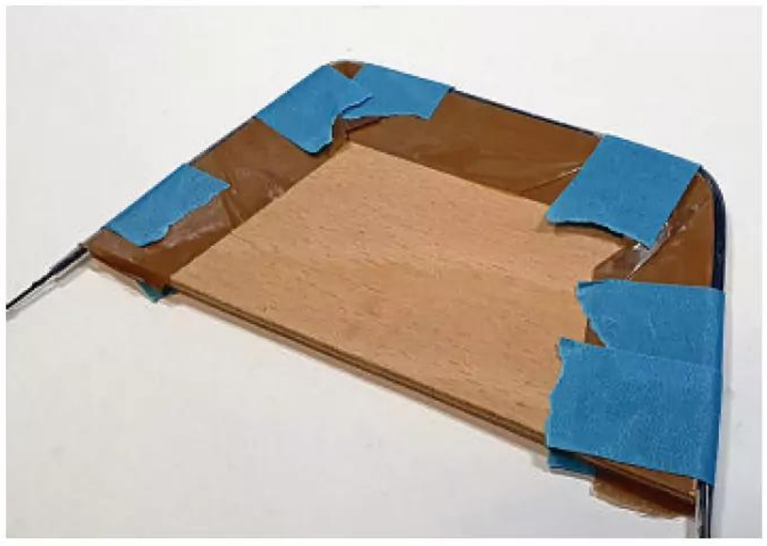
After the wing tips were formed in carbon it was a simple task to complete the framework of the wing. I left the spars overlong to locate in tubes in the fuselage.

Wing build follows the same idea. Just follow the outline.

It's not obvious but on the full-size some ribs are thicker. On mine I added some light 1/8” (3 mm) balsa blanks to the sandwich.

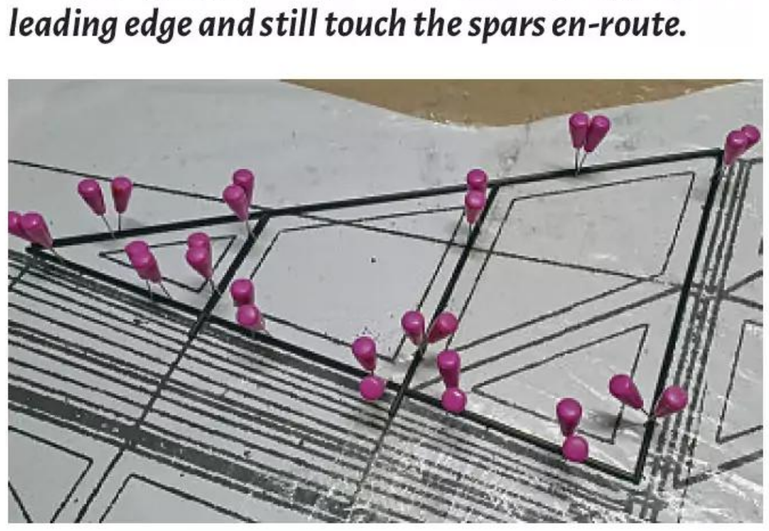


The number and weight of tows is critical. Too few and you get voids. Too many and the tows snap as you draw them through to fill the tube.

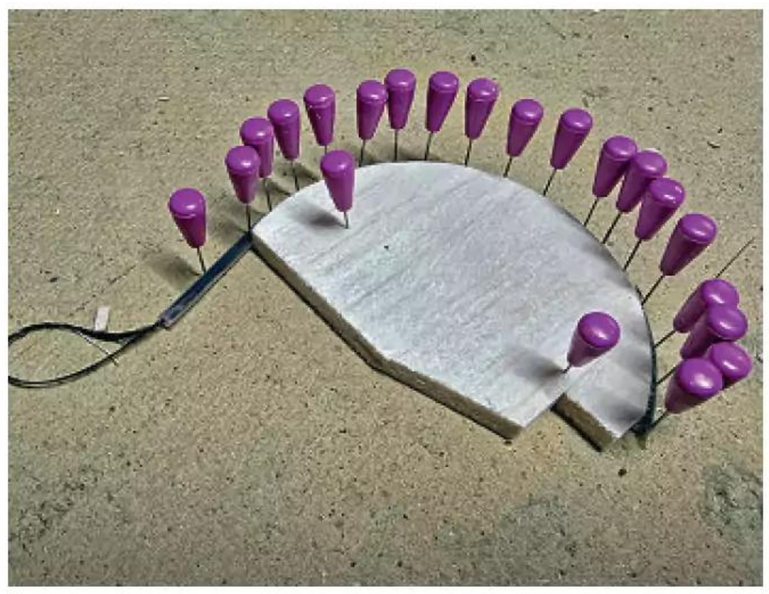


Here the tow filled tubing is taped around a former, in this case a rudder outline.

Completed wing structure. The tips had to be curved slightly to run from the trailing edge to the leading edge and still touch the spars en-route.



Fixed tail surfaces all have straight edges so are made from 1.5 mm carbon tube.



When I made a support former for the front of the cowl, I used pins rather than tape to align the tubing to the former.

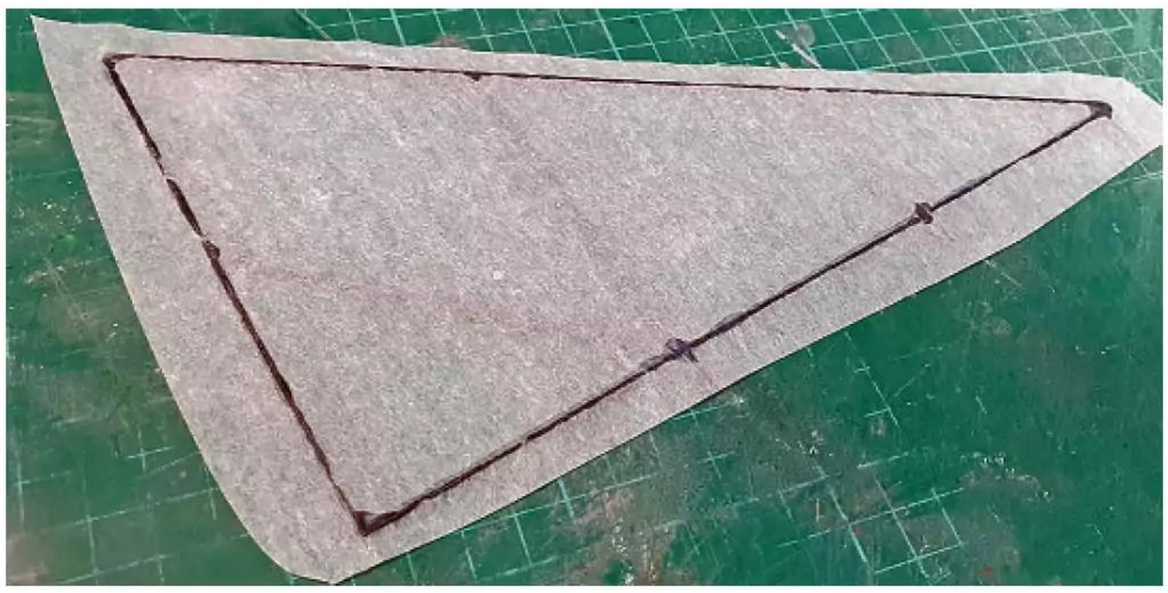
COVER UP

After the framework was sanded, I then carefully covered the structure in tissue. The underside is heavily under-cambered, so care has to be taken to ensure the tissue remains stuck down.

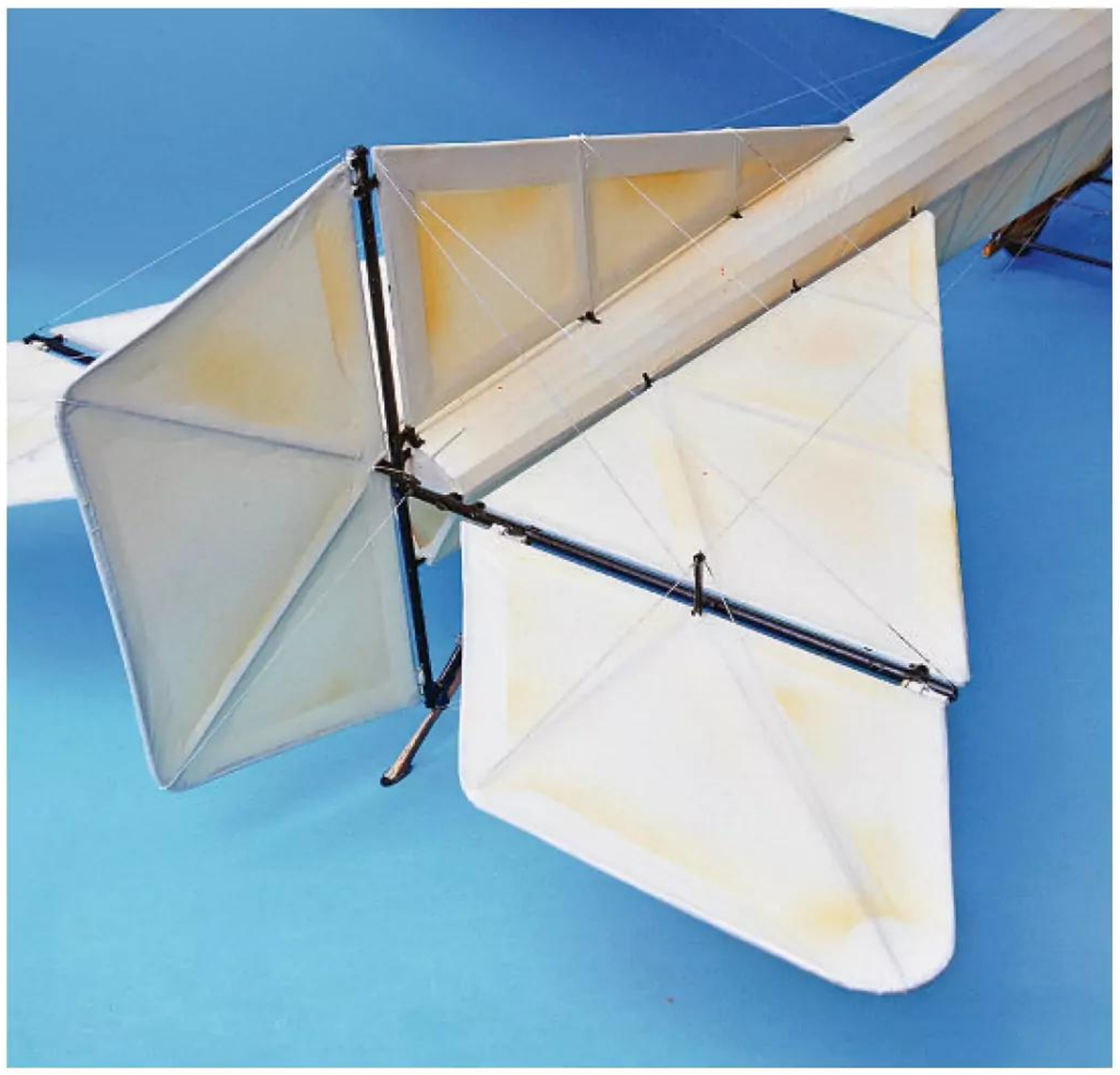
On my model the fixed tail surfaces were created from straight carbon tube using thick CA to make the joints. The moving parts are curved and created using the 'carbon tows in tubing' method.

The full-size Blackburn has a single thickness of fabric on the tail surfaces. This is quite clever; in fact, the Blackburn is full of very clever ideas. Anyway, on a conventional airframe the fabric is applied as a top and bottom, i.e. two layers. The Blackburn only uses one layer, but the framework has two layers, overlapping at the frame only. I was struggling to re-create this and, in the end, I used tissue on both sides but I then squashed the two layers together, sticking them with dope so they appear as just one layer. The edges are not defined well enough on my model, but I am still pleased with the outcome.

I covered the fuselage in Esaki tissue and what a joy that was to use, but it is different since applying the tissue by doping through



Covering is unique on the Blackburn. In this shot I doped tissue over the surface.



I struggled to re-create the covering overlaps around the tail framework until I used tissue on both sides and squashed the two layers together, sticking them with dope so they appear as one layer.

Andy sent me this picture and it shows how the fabric is wrapped around the frame, leaving just a single layer between the tubing. (Thanks for the picture, Andy.)

The wings were set to the correct dihedral and alloy tubes slid onto the spars were then glued to the fuselage bulkheads. The rigging is functional on this model.

doesn't work. You must dope the airframe with a couple of coats, then once dry apply the tissue by soaking thinners through to re-soften the dope beneath. It's easy once you get used to it. The wet strength of the Esaki was incredible.

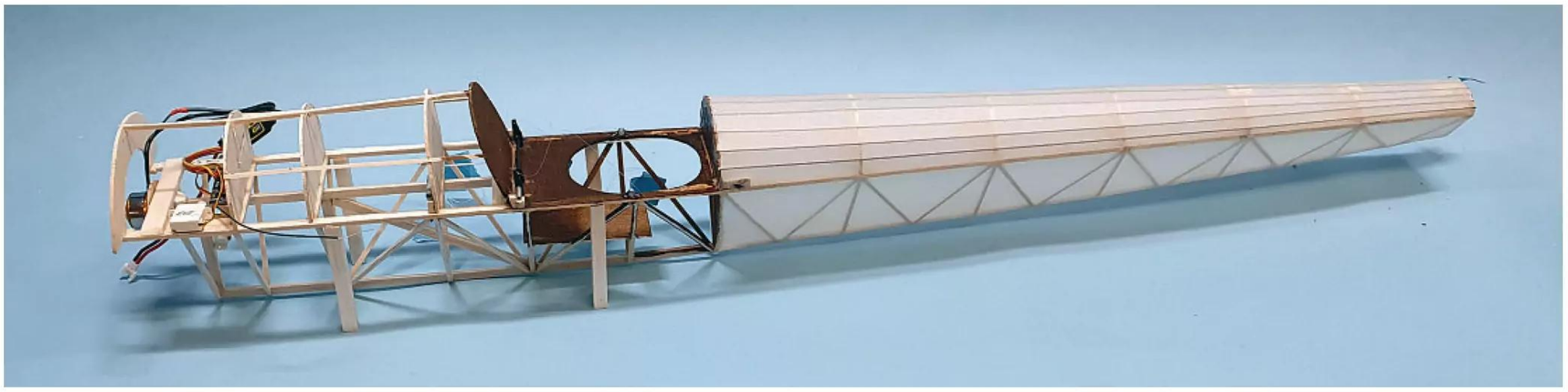
Unfortunately, Esaki is no longer available and Mike Woodhouse of Free Flight Supplies sent me some Asuka tissue to try. I will let you know, once I have had a play.

One very neat thing with the Esaki is you cannot see a join if you add a second layer over the top. Why would you want to do that, I hear you say? Well, I tried a cunning trick that I heard Richard Crossley, a tissuing 'maestro', uses - if he gets a wrinkle, he just cuts it out and applies a patch of tissue. So, when I got a wrinkle in the covering I did the same, cut it out and patched. I defy you to find it.

ON STILTS

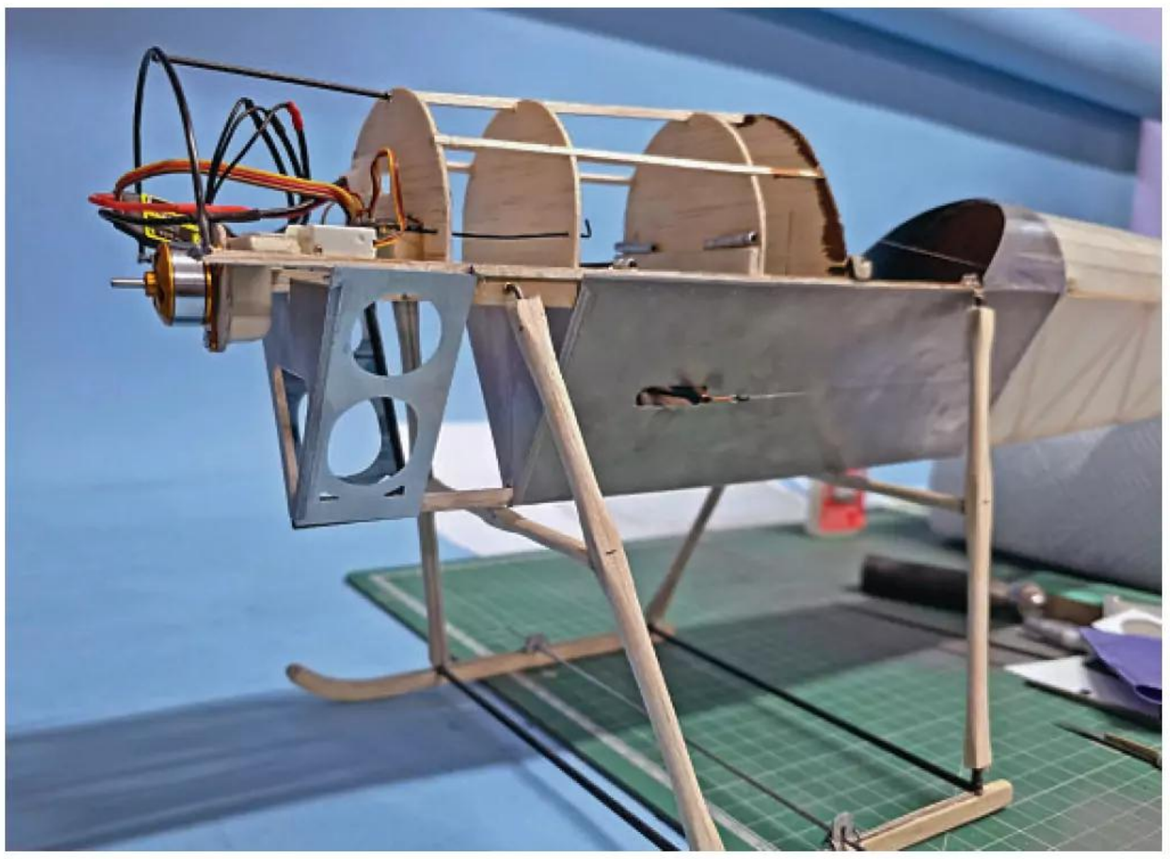
The undercarriage was next, a key component on this aircraft. It needs to be sturdy as it is where all the lifting loads are focussed and transferred to the airframe, as well as taking the shock of landings.

I used the profile view to create 'stilts' to hold the fuselage at the right height and attitude from the bench. The skids were formed from



Fuselage showing the 'stilts' which helped stabilise things while I worked on details.

The fuselage was stood at the right height on stilts and the undercarriage created in situ.



Here some litho plate has been added to the forward fuselage and the undercarriage legs have been clad in balsa and shaped.

laminated 1/16" balsa and pinned to the board. The carbon rod structure was created directly on the model using little bent sections of piano wire at the tops; these locate in alloy tubes. The carbon tubes and piano wire joiners were glued with small amounts of epoxy.

The bottom piano wire joiner went along the skids between the vertical legs. All this was clad in balsa and shaped. Additional parts were made of carbon rod and tube, all clad in balsa.

FUN WITH LITHO

The lithoplate work was fun. All the panels were first made in paper and then transferred to the metal. I scored the cut line with a scalpel and bent it gently without kinking until it snapped and separated. I polished the litho with Solvol Autosol, a metal polish, before shaping and cutting. I added rivet detail and various surface bits and bobs. It is very easy to get carried away and, boy, did I get carried away!

The internal control cable runs for the tail surfaces were fed through the fuselage guides and the panels added, sealing access to the internals. In fairness the panels were only attached with UHU Por so can be removed if the glue is softened with lighter fluid.

I painted the undercarriage parts with sanding sealer and sanded them smooth. The woodwork was then painted with a Humbrol cream coloured enamel and left to dry. The coaming was formed with some of that fine silicone tubing pushed over the edge of the litho. This was then covered with 0.2 mm Vector board, glued with Por. To complete the illusion the fake leather was stitched to the lithoplate.

Once the undercarriage woodwork was dry, I mixed three fast drying oil paints from the Winsor & Newton Griffin ALKYD range: Yellow Ochre, Burnt Sienna and Raw Umber. This made a sort of reddish brown and was streaked over the cream Humbrol with a dry brush to simulate wood grain.

The wheels were made from balsa. These were roughly shaped, stuck to bamboo skewers and spun in a drill to shape them. Paper circles were scored and folded to simulate the underlying spoke shapes underneath. I was really looking forward to attempting to make spoked wheels, but you wouldn't see any of the spokes as fabric covers are fitted to the inside and outside of the wheels. Carbon tube axles were glued to the centres and act as a bearing.

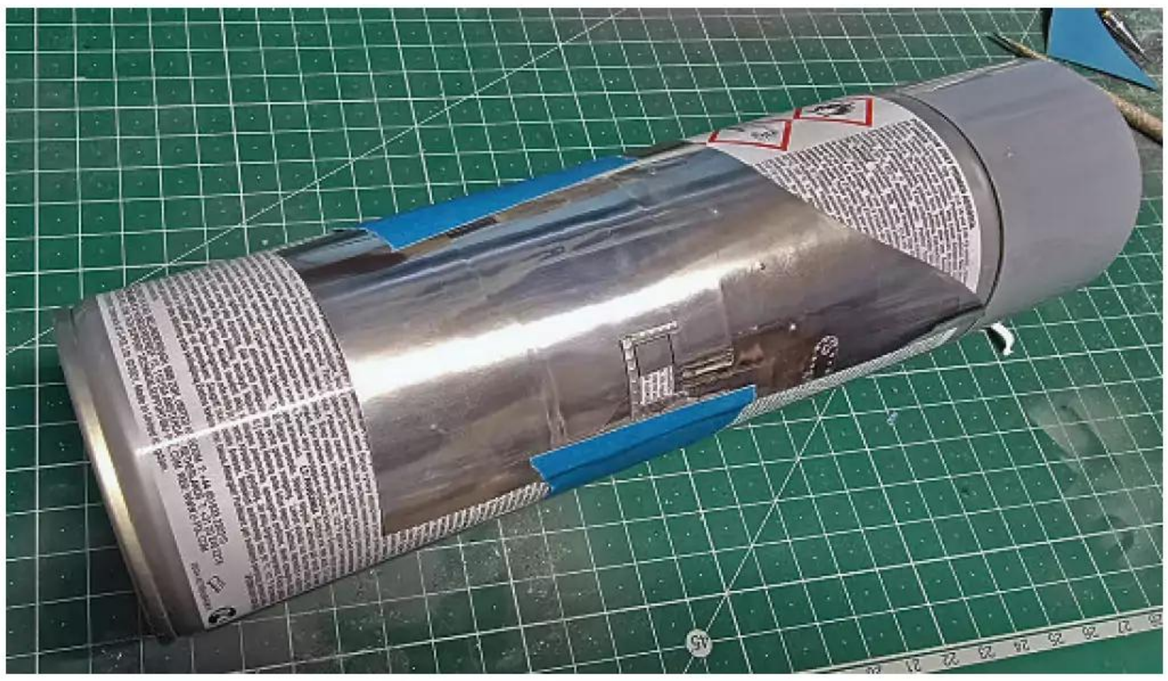
EMBRACING 3D

I am fortunate that I have friends that have embraced 3D technology. My friend, Mat printed a nice former inner and outer, which was excellent and allowed me to make the very difficult front cowl bowl. Amazingly, it was the first one I attempted, fully expecting to have a few tries. I broke through the litho in one area, stretching it too far, but as the part only requires a 180-degree section of the bowl it was usable. This made a great removable cover to access the radio, servos and fit the flight battery.

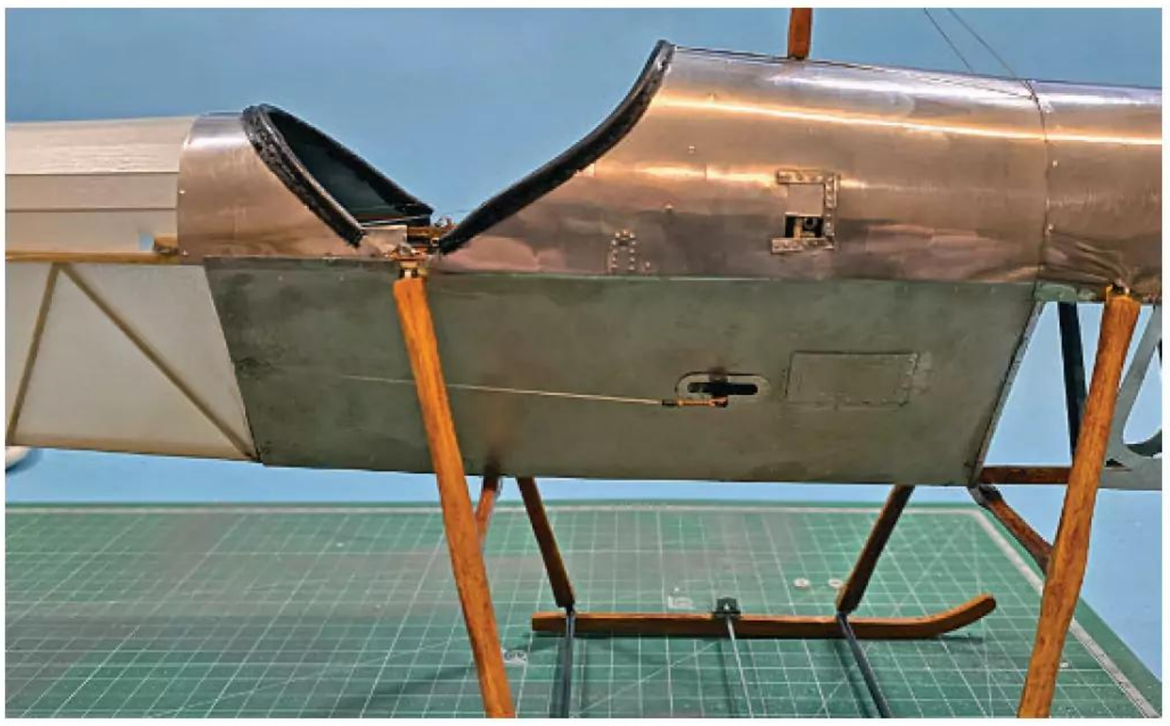
This model uses a FrSky 4 channel receiver with solder pads and no connectors, so all the wires must be soldered directly to the board, thus saving weight. This required a small tip on the soldering iron and a delicate touch, but it went okay and has worked well so far. The ESC is a separate 6A, max. 2S unit with a BEC to supply 5V power to the receiver. I am using a 1440 kV motor turning an 8 x 4 GWS slow fly prop. This set up draws 4.4A and produces 30 watts. The LiPo pack is a 2S 300 mAh.

To adapt the motor output to the propeller I turned a section of 15 mm 'T6' alloy to slip over the motor. I used two grub screws to attach it, then threaded the end to take a screw to retain the prop. A 4mm hex bolt fits the inside of a GWS prob perfectly. A big screw perhaps, but it is short and I needed some nose weight.

I wanted to make a dummy engine for the model but unfortunately time was against



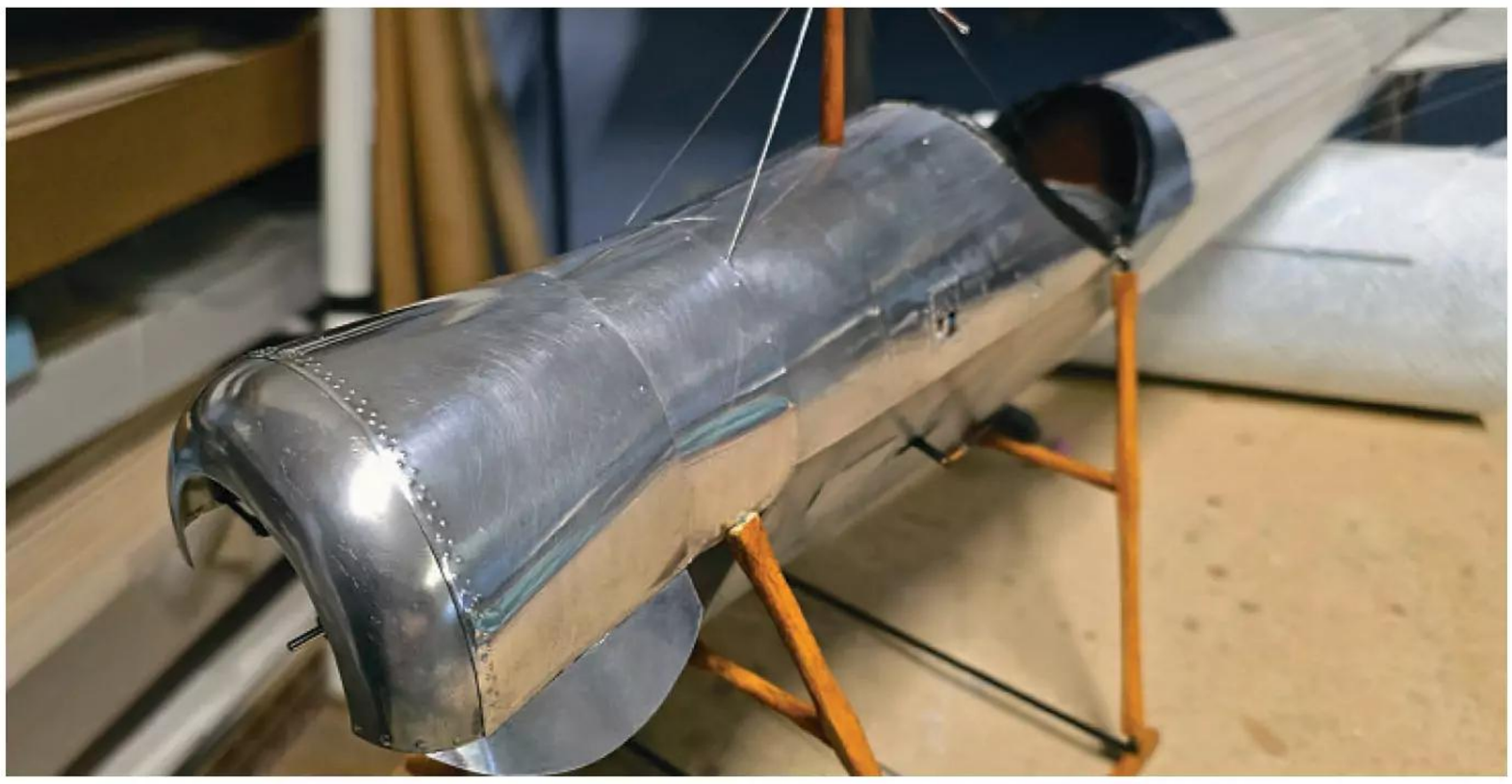
Lithoplate was rolled on layers of cardboard while pressed down with a smooth alloy bar to curl the metal. This shot shows how the already bent litho was held curved on a spray can while I added scale details.



I added the cockpit coaming and used oil paints to create the appearance of wood on the undercarriage.

Mat Dawson kindly 3D printed these formers for the front cowl.

Wheels are made of balsa. Fabric covers are from paper, scored to look like spokes.



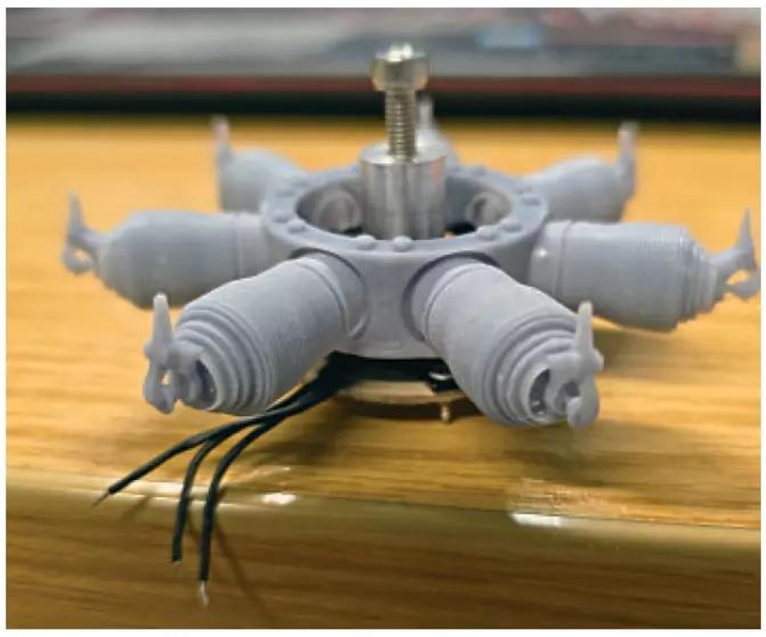
Fuselage cladding all done. The oil deflector plate under the front of the cowl is to keep the castor oil that is sprayed 'EVERYWHERE' when the engine is running from covering the airframe and pilot. Fortunately, mine is cleaner, as I am sure Wolverhampton University will be grateful for!

"To adapt the motor output to the propeller I turned a section of T6 alloy to slip over the motor"

me, so I downloaded a nine-cylinder Gnome 3D print file from the RCScaleBuilder.com website and a friend tweaked the drawing to reduce its cylinders to just seven. He also tweaked the front of the crankcase drawing to accommodate the depth of my motor and the diameter of the prop adaptor. Eric then resin printed the beasty at my model's scale, about 1/9th, and I spent a pleasant day

The motor weighs 20 grams. It's more than needed but nose weight was required. The prop adaptor was turned up on the lathe.

A static prop was carved from balsa - always a therapeutic process. Once painted and streaked with brown to simulate wood grain the prop was given a coat of clear orange acrylic. A metal plate with 14 B.A. nuts finishes the illusion.



'Strefford' Gnome mated to the 1440 kV motor.

Turnbuckles on the full size must be replicated. It wouldn't be right otherwise.

Some of the turnbuckles fitted to the Blackburn. Lines grouped as three are the 'warping' lines that lift and lower the rear spar, which sits in a cunning socket, to warp the wing and roll the aircraft.

assembling and fettling the thing. I found a combination of Tamiya silver and titanium silver worked well, with a dusting of that clear orange again to simulate the oil staining.

IN THE RIGGING

The turnbuckles were an exercise in patience and tried my dexterity to the maximum. For the rigging wires I used 0.25 mm Beadalon beading wire. This is a stainless-steel wire coated in nylon. The first spool was great and the wire was perfect. Unfortunately, later stock is not round but flattened. I emailed the manufacturer to ask if the round is still available. I fear it is not, so I had to complete the port wing with the flattened stock, which was all I could get.

On the full-size Blackburn there must be more than 100 turnbuckles. These adjustable fittings allow the riggers to alter the tension on every wire in the airframe, from control lines to lifting and landing wires, as well as wires to keep sections either aligned or just to impart additional strength. On my model I have made the turnbuckles from 1 mm brass tubing with an I.D. (inside diameter) of 0.5 mm, just enough to allow two pieces of the Beadalon thread. The loops on the ends of the tubing were created by cutting the eyelets from size 14 fishing hooks and inserting one eyelet in either end of the tubing. I made roughly 50 turnbuckles and this took two solid days, peering through a magnifying lamp whilst using tweezers. Did I say it was fiddly?

The rigging took another two days to do the starboard side but the port side I managed a little quicker. I just copied the first side and had worked out what I was doing. The main issue was applying too much tension to one wire, then all the other wires would go slack. I did have to remake several, but I got there in the end.

I hope you have enjoyed reading about the build as much as I enjoyed making the Blackburn.

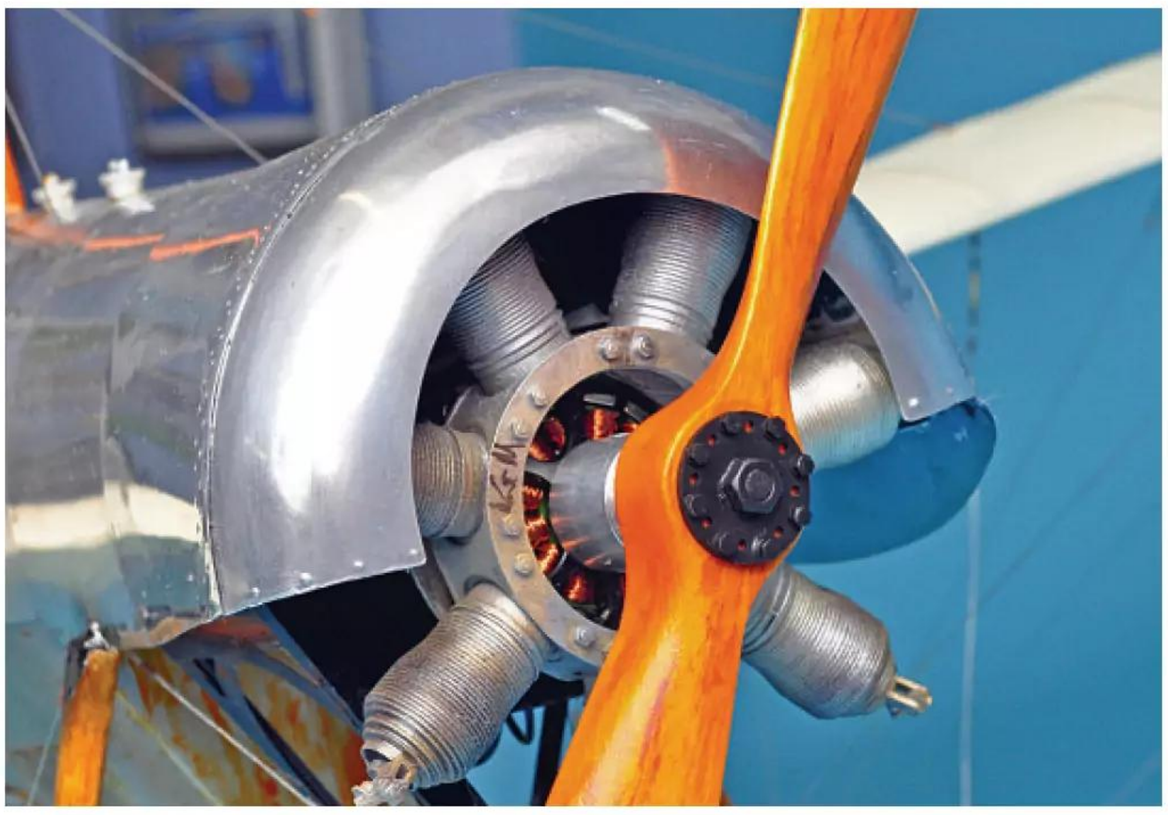
OFF TO THE NATS

By the time these words are published the results will be history. I am looking forward to competing with the model and hope this might encourage you to have a go at some indoor scale modelling. As they say, you don't have to be bonkers, but it does help...

I think that just about wraps it up from me for today.

As always if you want to drop me an e-mail, I can be reached at **cammnut@gmail.com** ■

I hope I haven't overdone the castor staining. I am sure the Shuttleworth lads and lasses clean it after every flight, but I quite like the used look.



She's not quite finished. I still need to fit the crankcase front cover.

There is a pilot, so don't worry. My Blackburn would not be complete without the inspiration behind this project sat in the cockpit. Thanks again, Andy!

I am looking forward to competing with the model at the Scale Indoor Nationals.

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All Write

Have your say in RCM&E's monthly chat room

Top letter

For his letter this month Stephen Lough wins a compact e455 multi chemistry AC input charger courtesy of Overlander Batteries: www.overlander.co.uk

COLD WAR CANCELLATION

I thought you would like to see my model of the TSR-2, the cancelled Cold War strike and reconnaissance aircraft. It's all built up from balsa and ply, then glass clothed and painted. The transfers were made by a friend. It's powered by a 105 mm EDF from a 12S LiPo, using a 3D printed thrust tube made by another friend. The model is awaiting its maiden flight.

Stephen Lough

HUNTING A HUNTER

I was sorry to read of the deaths of Peter Miller and Chris Golds. I have been reading Peter's articles for many years. What a knowledgeable guy.

I have enclosed two pics of a Hunter that I owned back in 2004. Powered by a ducted fan at the time, an OS 91 and Ramtec fan were the standard fit. I never had the courage to fly it and sold it to a lad in Yorkshire, who converted it to turbine power. I can't recall his name, but I think his home field was at Elvington.

You'll notice the name on the Hunter is C. C. Golds and I have a pal who was in the RAF with Chris at the time. He remembers this Hunter, or one very like it, being flown by Chris off his home base at the time, RAF Chivenor. *(Now RMB Chivenor - KC)*

Perhaps some of your readers may have some more info on the model's history. Also, whoever owns this lovely machine now, is it still flying?

Ken Rolph

SPRAYING FOAM

I just read the letter from Steve Hadland about using spray paint from aerosol cans. In my experience there are no detrimental effects on the EPO/EPP type foams. I have used acrylics and enamels on these many times. Start with a light coat, allow to dry and build up to full coats. Polystyrene foam is a different story. This needs a sealing coat of a water-based type before spraying or it will disappear before your eyes. Not conducive to a happy modeller!

Ian Swadling

kcrozier@mortons.co.uk

METRIC MIX UP

About 'Time's up for Imperial' on page 69 of the January issue. Well, actually the metric reference value for our models is grams per square decimeter (g/dm2), not grams per square centimeter [sic], nor kilos per square meter (this last value being for the full-size world). In the example given it reads 67 grams per square decimeter (67g/dm2), for a 30 dm2 wing surface, which is a reasonable value indeed. Sorry, Bob!
Bertrand Choupin

LIPO KILLER

With reference to the letter in the December RCM&E regarding destroying LiPo batteries, when a club colleague and I attended an event at Buckminster last July we came across the iSDT Q6 Nano Smart Charger. It can be powered by virtually any LiPo battery (i.e. no 240V AC required) and has a 'destroy' facility on it which works brilliantly. It is made by Shenzhen iSD Technology Ltd in China, but I wouldn't be without it now. I can't remember where we bought ours, but it was well worth the modest expense.
Denis Welchman

Chris (the author of the original letter) was after something that discharged a LiPo for disposal, i.e. completely flat. The LiPo discharge function will only discharge down to the LiPo minimum voltage, i.e. 3V per cell. If these are thrown away at this charge level there is still a risk of them catching fire.

Chris was concerned that the car bulb method wasn't controlled or safe. But if you discharged them on a charger's NiMH setting you can set the discharge current and cut off voltage, and you can monitor the process.
Frank Skilbeck

Thanks for your suggestions, Denis and Frank. Just a note of caution: please take great care if using a charger in a mode that it is not designed for. You do this at your own risk. And, as always, be sure to monitor the charger whilst in use, even more so if using it with the wrong chemistry type selected – **KC**

COPYING PLANS

I read with interest the letter regarding copying plans from RCM&E and, in particular, the response from Mortons Media Group.

I have been faced with the same problem as the letter writer when trying to build from awkwardly printed published plans. Luckily, I have worked in drawing offices with large format scanners and printers, so I have been able to copy the relevant parts of plans to enable the builds. I have also taken reduced scale plans, scanned them and enlarged to full size, then either traced or printed the scans to create new drawings for a build. At no time have I ever sold any of these plans to others.

A while back I noticed a seller on an internet auction site with a huge selection of plans for sale, including one of mine. I contacted the seller to point out that he was selling one of my plans without consent, but he ignored me. This leads me to wonder how many other plans this seller has sold without consent from the originator. Giving away plans is one thing but selling is quite another and seriously outwith the spirit of copying for personal use.
Eric Stephen

A PERFECT SPOT

As I have just acquired my latest copy of RCM&E (October issue), I have just read your editorial on clubs running with two or more strips to help combat cross wind situations.

My home club here in Australia is the Grafton Model Aircraft Club and we are located in northern New South Wales with thirty-eight members and one of the best grass strips that you will ever hope to fly off. The club has been continually active, in one form or another, from circa 1948, starting with control line and morphing into the club that we have today. Our founding member is still active with the club.

Our runway is orientated north / south (18 / 36) and over the twelve years that we have been at this location we have dabbled with - and then forgotten about - two cross strips. The first was at right angles, intersecting at the very southern end of our 150-metre runway. It was also 150 metres long and wider than our main strip, being 22 metres compared to the main at 18 metres. We fully maintained this runway for twelve months and never had one model either take off or land on it as the wind that it was put in for was not an issue. Our second attempt at a cross strip was on a 29 /11 alignment and crossed about halfway along our main runway. This was discontinued after a few months as pilots simply did not use it. Cost wise, it was not adding up as we mow all the year round. No 'off season' for us. Year round flying in the great Australian outdoors, where eighteen degrees at midday has us all rugged up like a polar expedition!

Our members thought it best to concentrate on making the main runway as good as we could make it. We were lucky enough to have access to a road roller for two weeks during the establishment of the main runway. Adding to this a significant sand base was laid under the topsoil for drainage and many metres of top-quality topsoil then went on top.

Our mowing crew, and there have been several over the years, are able to mow the grass to almost bowling green standard, with the couch grass forming a superb mat that allows us to take off and land even after the heaviest of rainfall. Only once have we had to close the field because of the weather and that was because the road leading to our field was flooded and our access track from the gate to the car park was a complete bog. There was nothing wrong with the runway - we just could not get to it.

Our entire area of runway, pits, taxiway and car park are fully protected by a dual strand electric fence to keep the bovine vandals off the surface and not leave their calling cards in the car park. The fence posts are located in aluminium sockets in the ground and the posts are simply removed and laid down before each flying session. It is a good idea to turn the power off first! After each flying session the fence is easily restored in less than ten minutes and the power turned back on.

We do not fly east of our runway to keep our neighbours happy, although they have never complained and actually enjoy watching our antics. But there is still nothing out there for four hundred metres. All of this and just eight kilometres from the town.

A perfect spot? We think so!
Daryl Woolfe

Thank you for sending details of your club's strip, Daryl. It does sound idyllic. From a quick search online, I see that it is facing more or less into the prevailing winds for around nine months of the year, which is a bit better than the mere one visit I had to the strip I mentioned when the runway was pointing directly into wind during 2024! The farmer did cut a slightly wider area of grass for cross-strip, into prevailing wind, landings, which was appreciated. But, as you experienced, it was interesting to see that many pilots chose not to use it and continued to land crosswind on the main runway - not always successfully! - **KC**

Ben's Pup looked simply gorgeous whilst waiting for a lull in the gusty wind before taking off.

PRETTY PUPPETEER

When building his Flair Puppeteer, Ben Smith decided to do something a little different. Mike Freeman tells all

words & photos: **Mike Freeman**

Both the Flair Fly-In days hosted by Banbury Model Flying Club in 2024 saw more Flair Puppeteers than any of the other models in Flair's extensive range. Hardly surprising, I suppose as this was Flair's most popular kit with some 15,000 being sold! The thing is they were all of a similar colour scheme with mainly camouflaged surfaces and the odd bit of colour trim. All, that is, except one.

Ben Smith from Bath had decided to do something a little different and brought his pretty white Puppeteer to the second Flair Fly-In. As Ben was assembling the model I could see lots of interesting details worthy of closer inspection.

BEN'S PUP

Ben has been flying R/C models for 35 years and regularly flies at the Bath Spa RC Society. He told me he had always fancied a Flair Puppeteer ever since he saw them advertised in the mid 90s. He eventually sourced this original Flair Mk.1 Pup kit and after a nostalgic build had it ready for its maiden flight in June '24. The Flair Fly-In was the model's first public outing and only its

Ben Smith proudly displays his Flair Puppeteer in the distinctive and very photogenic colour scheme of the full-size Australian RAAF Sopwith Pup with registration number D4170.

Side view of Ben's lovely Puppeteer.

There's a whole host of 3D printed goodies on Ben's Pup including the Vickers machine gun, ammo and sight which he designed himself. The pilot was sourced off the web but painted by Ben.

Ben 3D printed the pitot tube. Those interplane flying wires are 2 mm elastic cord finished in silver which are quickly and easily clipped into place making for a speedy assembly.

9-cylinder Le Rhone 9C dummy engine was 3D designed and printed by Ben, as was the prop hub/nut cover and locking ring. Stunning detail and look at how well the brushless motor blends in!

second time out for a flying session. Ben said it had been a delight to build and he'd enjoyed mixing modern techniques like 3D printing with the more traditional balsa/ply building methods that Flair models are renowned for.

The colour scheme Ben chose is based on a full size Sopwith Pup from the Australian RAAF with the registration D4170 and what a lovely job he's done too. Here are some details...

BEN'S BUILD

Ben built the basic airframe stock, as Flair intended, but then started to add his own detailing. The covering is 100% polyester dress lining which was stuck to the airframe structure with Mod Podge heat activated adhesive using a hot iron to tack and shrink the fabric. Acrylic clear varnish was then brushed on to fill/seal the weave, followed by satin white spray paint. Aluminium adhesive tape was applied behind the cowl and Tamiya paints were used for the roundels.

There's a whole host of 3D printed components on the model which give it a super authentic scale look, especially close up. The gorgeous 9-cylinder Le Rhone 9C dummy engine, which Ben designed himself, has to be the most impressive. I like the way Ben integrated the brushless motor into the design, making it look like part of the scale engine. Ben told me the dummy engine was the main reason for buying the Ender 3 Pro printer which he uses with PLA filament to such great effect.

Other 3D printed items, most of which Ben designed himself, include the pitot tube on the interplane strut, the Vickers machine gun, ammo and gunsight, as well as the tail surface bracing straps... and that's just the bits you can see! Inside the model there are more 3D components like the motor mount and bell-cranks. There's even a 3D printed bracket to mount the ESC under the motor and battery box to hold the battery in place just behind the bulkhead, all carefully designed to get the weight as far forward as possible as is often required with WW1 biplanes!

ELECTRICS & CONTROLS

Ben has used a Turnigy Aerodrive SK3 4250 350 kV brushless outrunner spinning an 18 x 8 wooden Airflow prop, making the prop 1:5 scale to match the rest of the model. An 80-amp ESC is supplied by a 4S 3300 mAh LiPo pack which gives an 8-to-10-minute flight time. Futaba 2.4GHz gear and Hitec servos provide the guidance and Ben has used a closed loop system on the rudder and elevators, with the wires exiting the fuselage and joining the surfaces faithful to the full size details.

FLYING

The second Flair Fly-In was only the Pup's second outing so Ben was rather reluctant to fly her on the day as the conditions were far from ideal. But he did fly a circuit for my camera and lovely she looked too! The bright white colour scheme popped nicely against the dull background. Lovely job! ■

Ben's pretty Puppeteer takes to the air for only the second time since he finished her. The blustery conditions weren't ideal so...

...Ben quickly brought her safely home.

JERSEY JERK

Kevin Powling relates the story behind little and large versions of a P-51D Mustang

Words: **Kevin Powling**

Photos: **Kevin Powling, Nigel Philpott, Ultimate Warbird Flights**

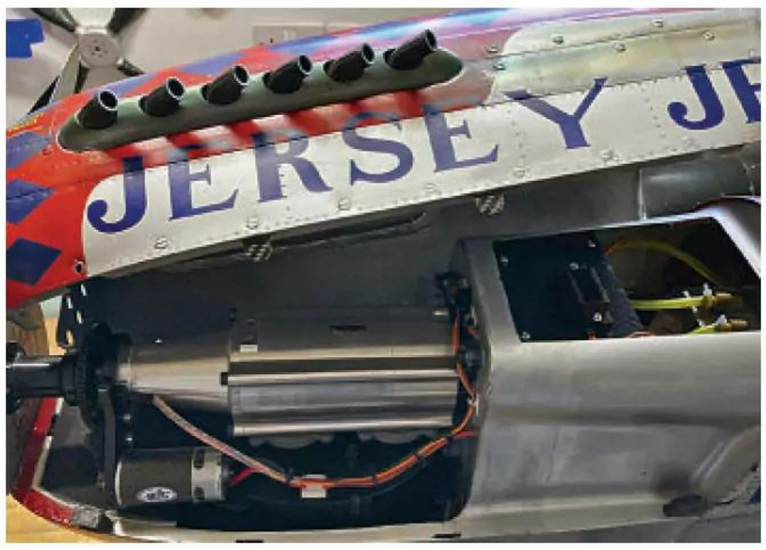
It was approaching the end of summer 2023 when my thoughts started to turn towards a project that would keep me busy throughout the oncoming winter. I had set a completion goal of six months and desired something that had roughly a 100-inch wingspan.

My main interest in R/C modelling lies with WWII aircraft. This stems from my childhood, having lived near to the north-east end of one of the runaways at Martlesham Heath in Suffolk. It is an area enriched with aviation history, having been a famous WWII station used by both the RAF and USAF. It later became an experimental airfield after the war, until the late sixties when it became a housing estate.

While I was deciding on my next project, I was drawn to the idea of building a model of an aircraft that had flown from Martlesham. I already had a couple of Spitfires and had just spent the last two winters building two CARF P-47 Thuderbolts. But what I didn't have was a Mustang, an aircraft that was used extensively at Martlesham. As I researched further the

The CARF Models P-51D sits majestically alongside Hastings Model Flying Club's neatly mown grass.

A Valach 120 inline twin powers this model, pictured with its Fiala starter motor alongside.



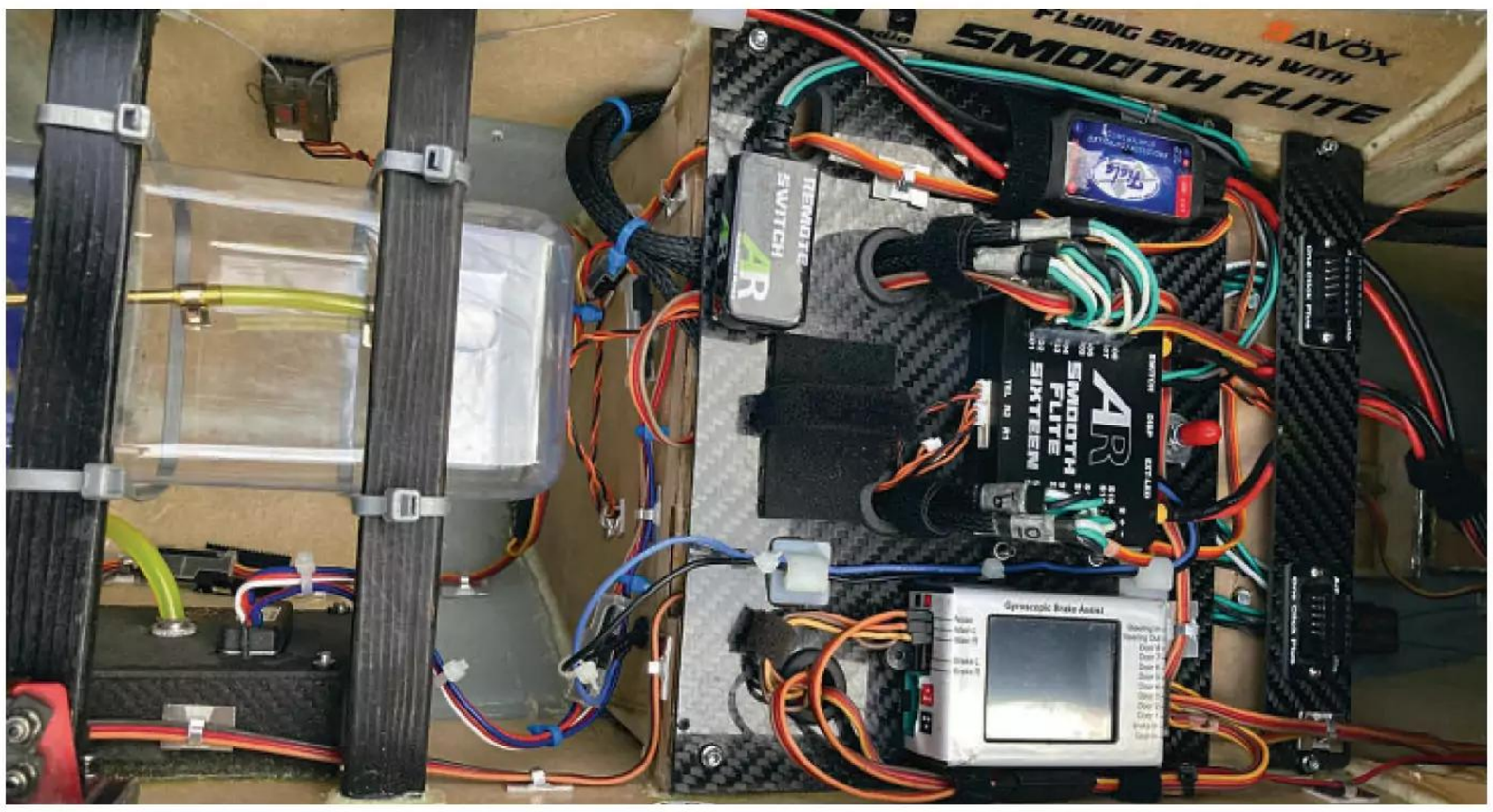
Under the hood! It's a very tight squeeze to accommodate the Valach 120 inline twin.

P-51D became the obvious choice. After looking at many reference pictures, I kept coming back to one that I was particularly keen on, the Jersey Jerk flown by Don Strait of 361 Fighter Squadron. This aeroplane had been stationed at Martlesham in 1944.

KIT SELECTION

Once I had decided on the model my next task was to select a kit or plans of which there were several available. However, my desire for a six-month project and something with a 100-inch wingspan led me to rule out the more traditional balsa airframes. I already had experience of CARF Models kits and I am a fan of their quality, so I began to consider their P-51 kit as it met the size criteria I was looking for. Conveniently, a friend from my local club had a complete set of Electron retracts for that very model, at a very reasonable price. This, of course, helped with my decision. The kit was ordered by late September; fortunately, CARF had one in stock in Germany and thanks to their UK Representative, Dave Wilshere, it arrived by mid-October, just in time for winter.

Upon arrival of the kit I noted that there would be a need for some alterations. The fuselage would need to accommodate the installation of the Valach 120 inline twin that I had selected. I am not a great fan of two stroke engines in a warbird, despite knowing they are usually very reliable and are a cheaper option.



Well organised interior depicting the Advanced Radio 'Smooth Flite' gyro equipment, remote start and fuel bottle. All easily accessible when the wings are removed.

Showing some of the additional detailing and weathering. The bubble canopy is significant in size.

> "...a sliding canopy and a detailed cockpit, complete with pilot, were added"

I have had a lot of previous success with Valach engines, as both of my P-47 Thunderbolts are powered by Valach 250s. The 120 I wanted to install has an auto starter and that, alongside the 3D printed ducting for the rear cylinder, was going to be a tight fit! I was also considering the possibility of adding a silencer, if possible, to take the edge off the engine note. After moving the firewall back to incorporate the engine I had just enough room to accommodate everything. Hopefully, this would mean that the use of lead weight up front would be redundant, avoiding potential balance issues.

There were several other adaptations I wished to make, one being how the wings would be attached. CARF designed them

Well placed decals and rub downs from Flight Line Graphics add to the realism, along with the detailed pilot wearing his Ray-Bans.

Detailed cockpit is helped by 3D printed dials that add to the realism.

to be fitted separately but I used a detachable air scoop which would enable me to assemble the wings before attaching them. In addition, a sliding canopy and a detailed cockpit, complete with pilot, were added.

For the past few years, I have been using Smooth Flite gyro systems and servos from Advanced Radio (https://eu.boomarc.com/en/). I have found their products to be both reliable and easy to set up, with the additional advantage that their HV digital servos are very quiet. The Smooth Flite system seems to be more common in Europe and the USA but is now becoming popular in the UK.

View of the Electron Retracts, showing the detailed linkages associated with the scale doors. You can just see the non-scale exhausts, but they are well hidden.

FIT & FINISH

To finish the build, I focused on enhancing the panel lines and rivets already part of the kit by adding a different aluminium tone to the ailerons and flaps. The time-consuming element of the build came in the form of the blue diamonds that feature against a red background on the cowl of the aircraft. These required individual masking before being sprayed which, though not a perfect finish, achieved a result I was happy with. The paint masks, decals and rub downs came from Flight Line Graphics. I purchased an extra spinner from CARF so as to be able to use either two blade or four blade propellers. Both spinners were painted with red and blue circles to replicate the full-size aircraft.

The suggested balance point resulted in the Mustang being nose heavy. I rectified this by placing the batteries for the receiver, retracts, ignition and starter at quite some distance behind the C of G position.

MUSTANG ON HOLD

It was now mid-April and the weather was still not flyable. At least, I did not feel comfortable test flying the P-51 until I had flown a few sessions with another model under my belt! However, I decided to run the engine to assess that it ran smoothly.

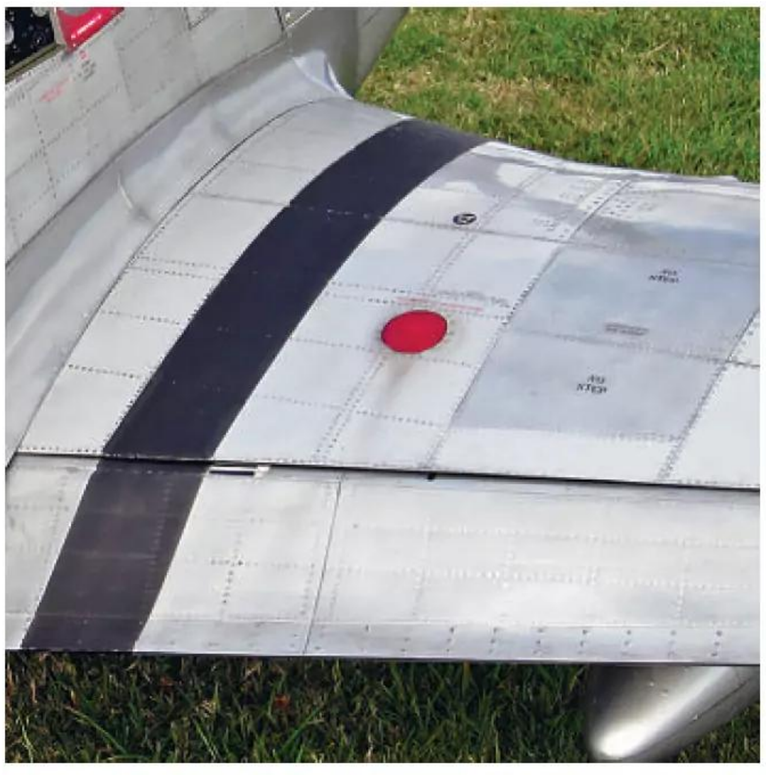
The first flick of the switch confirmed there were no problems as the Valach started with ease. Since I was satisfied with the result, I put her away for when the weather improved - or at least that is what I intended!

As I still had some time on my hands before the weather was likely to get better, I went in search of a relatively short-term project. I had seen a CARF Harvard airframe for sale and so I decided to buy it and install one of my Valach 250s. This was completed relatively quickly so I decided to fly the Harvard first and save the Mustang for more favourable weather. Which is what I did. In fact, I spent most of early to mid-summer flying the Harvard, along with my other models.

It was around this time that a friend of mine shared that there was now a full-size P-51 in the UK, which had come over from Australia and been repainted to replicate Jersey Jerk. I must admit, at first, I was slightly disappointed that there was going to be another Jersey Jerk in the country, even though it was four times the size of mine and cost considerably more! After doing some research, I discovered that the aircraft was leased to Ultimate Warbird Flights, who are based at Sywell in Northamptonshire. It was available for passenger flights, having had a rear seat with full dual controls and

Painting the cowling was a tricky job, with a lot of masking involved.

Masking the spinner for painting was no easy task!



CARF's P-51D kit comes with enhanced panel lines and raised rivets. It was just a case of applying some weathering to enhance the realism and depth.

Every effort has been made to portray the correct markings and paint scheme.

instruments fitted. It did not take me long to realise that there was an opportunity here for a flight and maybe to take some pictures of the model alongside!

LITTLE & LARGE

Ultimate Warbird Flights could not have been more accommodating. A flight was booked for late September and after showing them some pictures of my model they were very happy for me to take it along. This, conveniently, gave me another excuse not to fly it, since it needed to be presentable for its big day.

The next few weeks passed quickly and we were soon making our way to Sywell from the

"…there was now a full-size P-51 in the UK, which had come over from Australia and been repainted to replicate Jersey Jerk"

Air scoop doubles up as a container for the LiPo packs which supply power to the two receivers, ignition system, pump and undercarriage.

Drop tanks are an essential detail and are substantial items in terms of size. Very realistic and well modelled.

South Coast. As is typical the weather had been unsettled and there had even been localised flooding. The flight had been booked for 10.00 am but we had been asked to arrive at 8.00 am to give us plenty of time to assemble the model and take the pictures. We were met by the Ultimate Warbird Team, who arrived

CARF Models P-51D Mustang at 1:4.3 scale meets the full size.

I thank Gabriel Benson, Jersey Jerk's pilot, for a wonderful flight. This picture clearly shows the size of the propeller.

early to help us in any way they could. By then the weather had improved and made way for pretty much perfect flying conditions.

Jersey Jerk was towed out of the hangar just as we had finished assembling the model, which was already creating quite a lot of interest. I wheeled the model over to stand alongside the full-size. I must admit it was a slightly strange experience seeing them beside each other - a true 'little and large' pairing!

Plenty of photos were taken before it was time to park the model and have my flight briefing. This took around thirty minutes, which included a short film before meeting my pilot, Gabriel Benson, whose day job is as a pilot for The Air Ambulance Service. My flying suit was fitted, along with my helmet and parachute, all of which made it a tight squeeze when getting

Your author taking control of the full-size Mustang, taken by the Ultimate Warbird Flights 360° camera. The weather was much better as we travelled further north.

into the aircraft! The weather was ideal, with light scattered clouds at Sywell and clearer skies further north. It took around ten minutes to warm up the engine, which was a little longer than usual as it was the first flight of the day.

The first thing I noticed after taking off was how smooth and relatively quiet it was. As we flew north over Rutland Water it was time for me to take control. It felt great to be flying such an iconic aircraft. The controls were slightly heavier than I had imagined but the Mustang felt as though it was on rails! Before I knew it, it was time to hand the controls back to Gabriel for some aerobatics which included rolls and even some loops. The G forces were a bit more than I had anticipated! We headed back to Sywell for a low pass over the airfield before Gabriel brought her in for a perfect landing. We parked next to the Grace Spitfire, which is another one of their aircraft.

Finally, it was time for some more pictures before an early lunch as we continued to admire the aeroplanes flying above, this time with my feet on the ground. What a great experience! I can't recommend it enough.

A special thanks goes to Gabriel Benson, my pilot, and all the team at Ultimate Warbird

Picture credits:

Mustang cockpit in-flight photos were taken by the Ultimate Warbird Flights 360° camera. All Hastings Model Flying Club pictures were taken by Nigel Philpott. Other pictures were taken by the author.

Early on the weather was not on our side, being very overcast. There was doubt that the flight might happen.

Flights for making it such a great day - and for allowing me to photograph my model with the full-size aircraft.

I am still yet to fly the CARF Models Mustang. Hopefully it will happen sometime in 2025 - when the weather improves! ■

Jersey Jerk sits proudly on a sunny day in September 2024 at Hastings Model Flying Club. Maybe it will finally fly for the first time this coming summer?

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FUNDROID

Mike Bell introduces his Fun Fly model made from hybrid materials

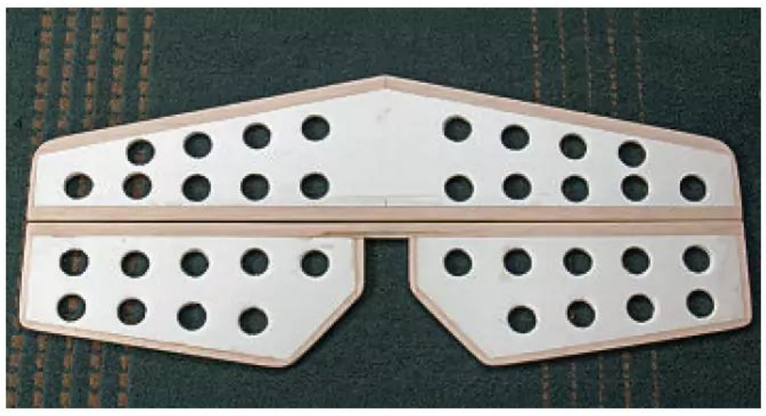
Words: **Mike Bell**

Fun Fly models have an enduring popularity mainly because they are, well, fun. With these machines pilots can release their inner hooligan and have loads of low-cost fun, but with the control movements turned down they can deliver a chilled out, lazy summer evening flight experience or even be used as an advanced trainer. I primarily designed Fundroid for use in fun fly competition but it's equally at home as a fun sports model.

Competition fun fly models are typically high wing monoplanes with minimalist structure, large wing area and thickish aerofoil sections. The materials used in their construction hasn't changed much over the years, i.e. mainly balsa with some ply for high stress areas. Unfortunately, this traditional solution is becoming an increasingly expensive option these days so it's time to look at some alternatives.

Competition flying involves quite a bit of manoeuvring close to the ground, passing through limbo gates and fast landings in a target square. All this means that the airframe is likely to take some knocks, and while a well-designed fun fly model is surprisingly robust and easy to repair the available kits

At last year's Fun Fly Nationals, Mike and his Fundroid took third place overall in Class 3 and a win in Class 3 Touch and Goes.



Tailplane and elevator assembly. Lightening holes are optional.

1/32" ply elevator joiner stiffeners are used top and bottom.

aren't cheap and I think some people might be put off risking their model in competition or competition practice, which is a shame. To address this, I decided to investigate whether I could significantly reduce the cost of building a competitive fun fly machine which would make pushing the flight envelope less of a financial risk.

For the last couple of years, I have been experimenting with designs making use of alternative materials with the primary aim of reducing cost whilst maintaining comparable durability and avoiding any weight penalty. I was inspired by seeing how a lot of people have been using foamboard and Depron in the manufacture of all kinds of models over the last few years (just look on the modelflying.co.uk forums). These materials are light and cheap, but could they be made to stand up to the rough and tumble of competition fun fly or enthusiastic sport flying?

A couple of prototypes were knocked up, the first having little in the way of wood or other reinforcement. While it stood up to all the normal in-flight stresses, it was no surprise that this one broke in all the expected places during hard landings etc. The next couple of attempts included various additions of wood, carbon strip and glass tape until failures stopped occurring. The last prototype survived two years of competition and practice and was still intact when I retired it.

The model presented here utilises all that learning and has proven to be just as strong as any wooden fun fly I have ever built with the same weight. Importantly, it was much cheaper to make. Fundroid's competition credentials were tested at last year's Fun Fly Nationals where I managed third place overall in Class 3 and a win in Class 3 Touch and Goes. No shortcomings regarding the performance of the model were evident so I consider that box ticked.

The foamboard used throughout was 5 mm thick and sourced from Hobbycraft. Other sources and variations are available, but I can't vouch for their properties. The Depron I used was all 3 mm thick and sourced from B&Q. No fancy skills are needed to work with these materials, though you will need to use glues compatible with them. I mostly used UHU Por in contact adhesive mode and I also found small amounts of Gorilla Foaming PU and Gorilla Clear useful in certain areas as described in the build notes below. I would avoid using Aliphatic or PVA as it can make the board card go soggy and it will take a long time to go off. The foam in the foamboard can withstand contact with medium cyano so long as it is zapped quickly, but it makes for hard, brittle joints which isn't ideal, so is probably best avoided.

> "The model presented here… has proven to be just as strong as any wooden fun fly I have ever built"

TAIL GROUP

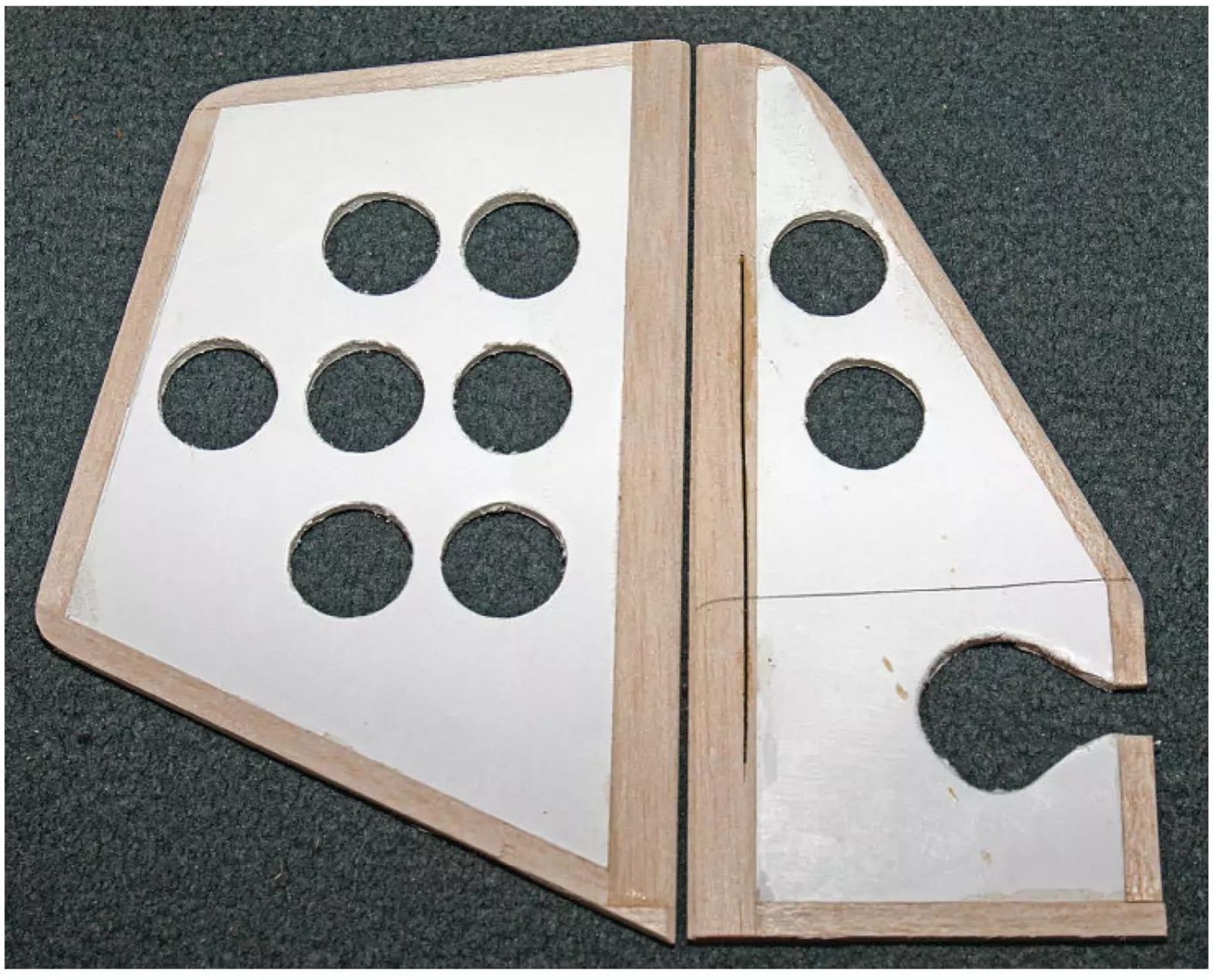
The tailplane, elevators, fin and rudder are nice, simple structures to start with and all have the same basic layout of a foamboard core outlined with soft balsa. Use the lightest you can find. I used 6.4 mm (1/4") sheet cut to 5 mm to match the thickness of the foamboard for the thinner outline parts. Where wider strips are specified, you will have to sand the excess thickness to the level of the foamboard, taking care not to sand into the board or the card facing will tear. Glue the balsa to the foamboard using UHU Por as a contact adhesive. You can wick a bit of cyano into the balsa-to-balsa parts of the joints if you like but zap it with kicker before it can migrate into the adjacent foam. Round off leading edges but leave all trailing edges full thickness. Hinge lines can be bevelled both sides if you want extreme control movements, but a single side bevel will usually be enough.

You will notice that the elevators use the front balsa strip to join the two halves together. On its own this is not stiff enough in twist so needs some reinforcement. Initially I tried inserting some carbon strip into the balsa which did improve things, but not enough for my liking. Matters were much improved by using the 1/32" ply joiners glued to the top and bottom between the elevators. Don't be tempted to use a wire joiner instead of the full span balsa strip as the wire will be inserted into the foam core of the foamboard and will quickly work loose.

The resulting tail parts are essentially solid sheet structures and while they are very light, I wondered if I could lose some weight by cutting holes through the foamboard. To do this I made a hole cutting tool using a piece of thin wall metal tube with the edge sharpened on a grinding wheel. The build pictures show how many holes I cut, which I thought were the most I could remove without starting to impact on strength and stiffness. Out of curiosity I weighed all the cut-out pieces and this came to a mere 9 grams (0.3 oz.) which was a pretty poor return for a fair bit of work. I probably wouldn't bother next time.

BOX FUSELAGE

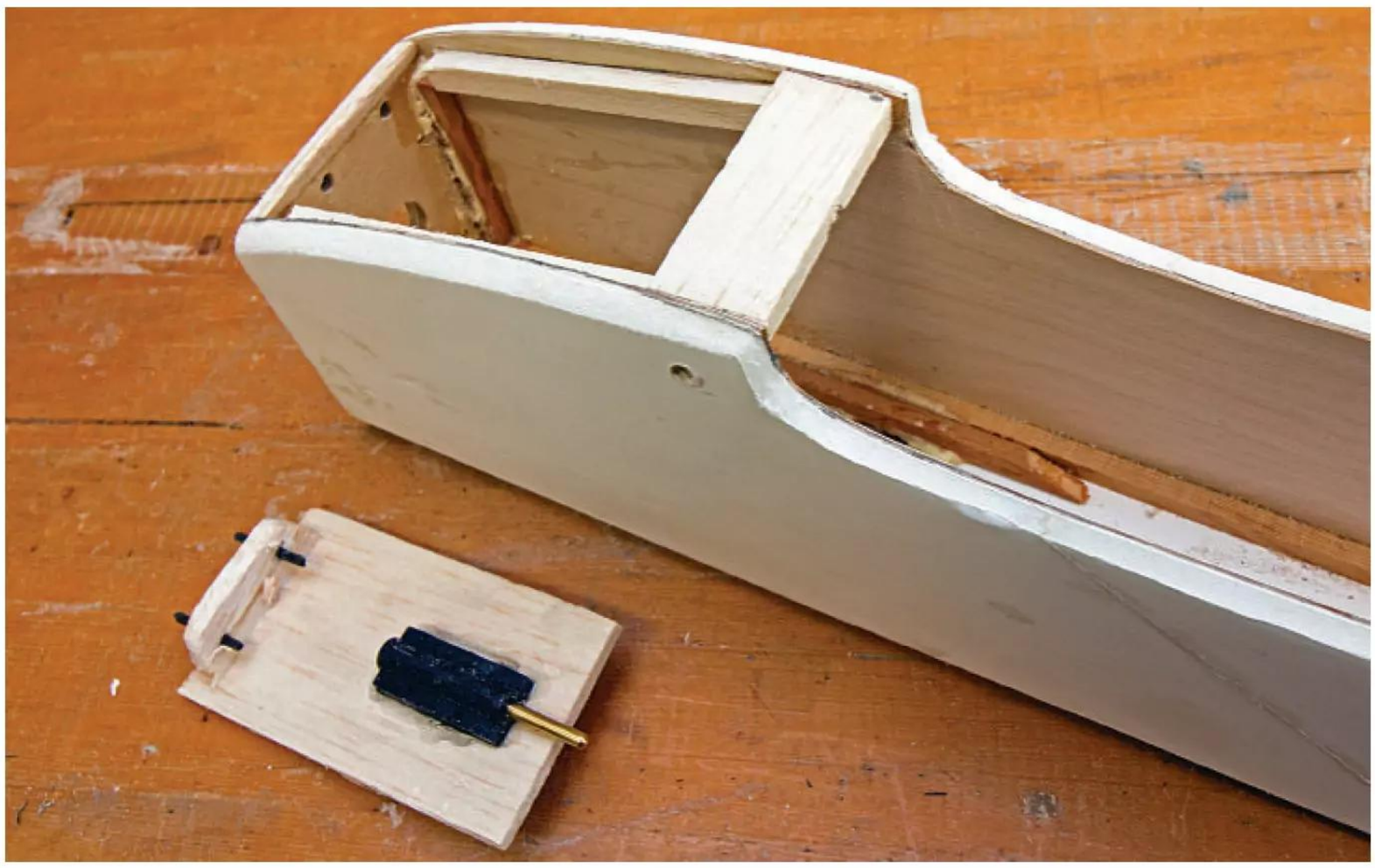
Moving on to the fuselage, this is a simple box structure where the lower surface is completely flat and defines the datum for wing and tail incidences (all zero degrees). In planform it



Fin and rudder assemblies. Note the carbon strip reinforcement in the fin stern post.

Fuselage side glued to the spruce longeron on the floor panel. Note the carbon strip let into the ply doubler.

After fitting the firewall, undercarriage mounts and spruce reinforcer strips.



Battery hatch detail.

has a straight taper from firewall to the rear, so no bending of the board sides is required.

Cut out the fuselage sides from foamboard, including the slot for the tailplane, and cut out the 1/32" ply doublers, noting the slot for the carbon strip stiffener. The sides are longer than the foamboard sheets so make a scarf joint at the front where it will be covered by the doublers. Using Por as a contact adhesive glue the doublers to the fuselage sides making very sure to have a LH and RH orientation. Now contact glue the carbon strip stiffeners in place. It's a good idea to drill the 6 mm holes for the wing dowels at this stage too.

Next, cut out the foamboard floor as a full-length rectangle with a centre line accurately marked on the inner face. Again, you will need a scarf joint to make up the length. Using the marked centre line as a guide mark out and cut the taper. This will provide an accurate base that can be used as a jig when gluing the sides on. Before the sides are attached, however, glue the 4.8 mm (3/16") square spruce lower longerons to the base 5 mm in from the base edges using Por. Leave the longerons 1/4" short at the front to leave space for the firewall.

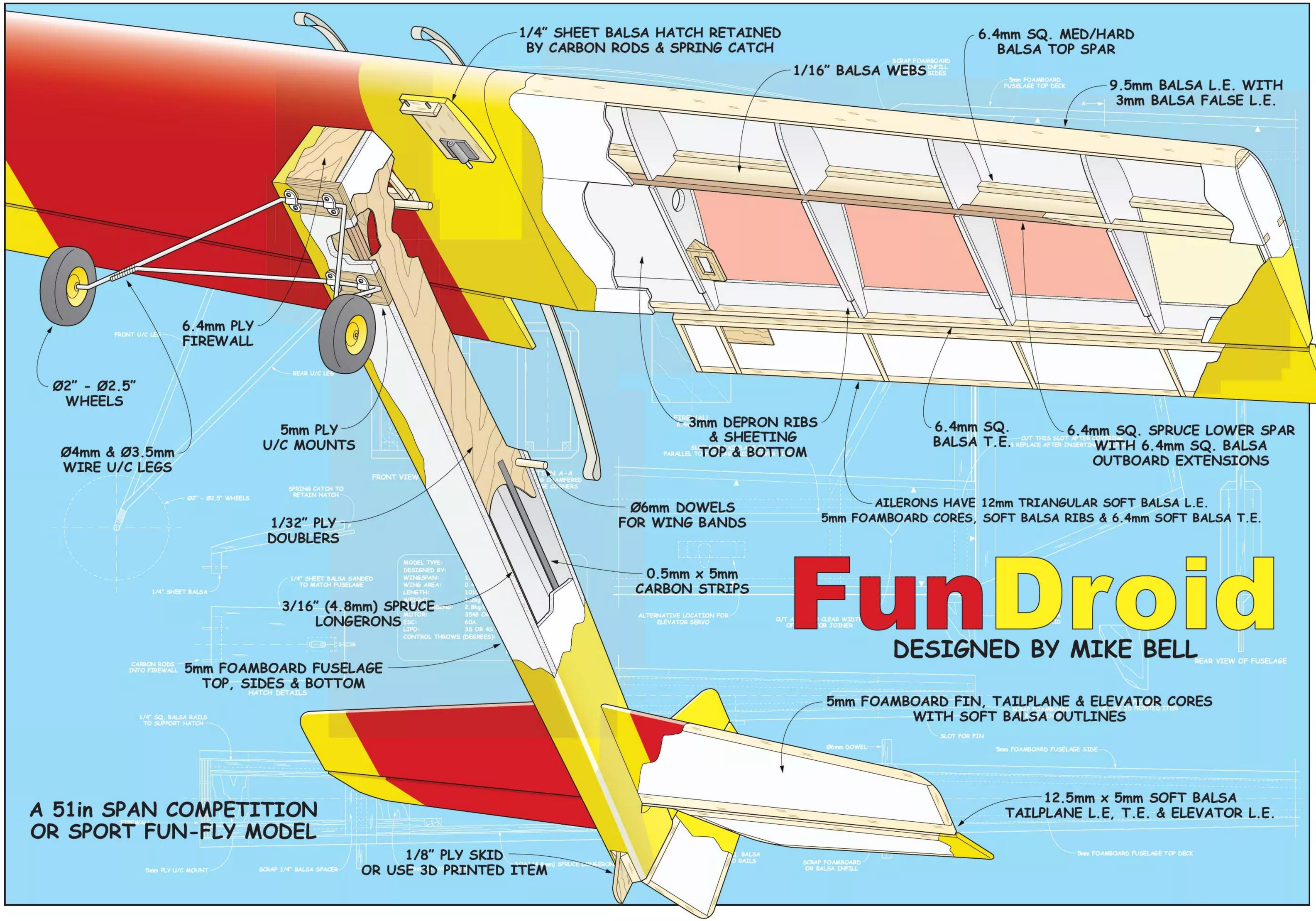
Smear the contact faces of the floor, longeron and fuselage sides with Por and before the glue dries fit the fuselage sides to the floor. In this state there should still be some wiggle time in the joint for lining up but it will still grab quite quickly. Make sure the sides are vertical before the glue fully sets. Alternatively, you could use Gorilla clear to give you more time to adjust things, then leave to set. But you will need clamp it all together whilst drying which isn't necessary with the Por method.

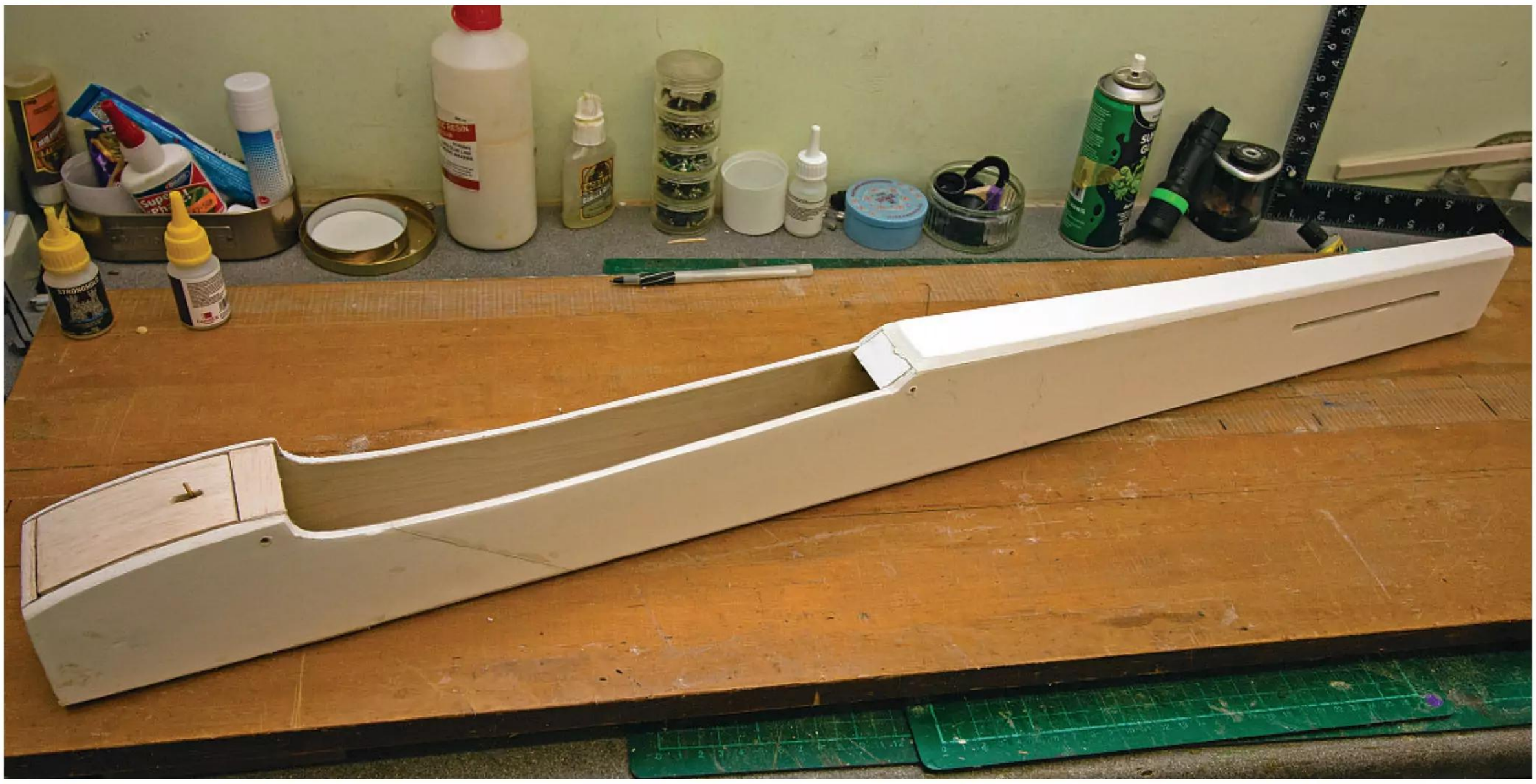
Cut the firewall and U/C mounting plates from 6.4 mm (1/4") ply (not lite-ply) noting that the U/C mounts will need to be sanded down to 5 mm thick to match the foamboard floor. Cut the floor to enable the ply mounts to sit snugly and cut lengths of 4.8 mm (3/16") square to bridge across the U/C mounts. Cut some more to make firewall support pieces for added strength in this critical area. Now you can glue all these in place using Gorilla Foaming PU or epoxy. I prefer the Gorilla glue for this as it expands to fill any gaps and whilst you do get glue extruding out of the joints it's easy to remove the excess once dry. Whatever glue you use make sure all is square and clamped in place until dry. Note that the firewall sits on top of the front U/C mount, giving a ply to ply joint in this location. No side or down thrust is built in.

Use some foamboard scraps to make up spacers located at the slope at the rear of the wing opening and another at the rear of the fuselage. These help to set the width between the fuselage sides prior to contact gluing the foamboard top deck in place.

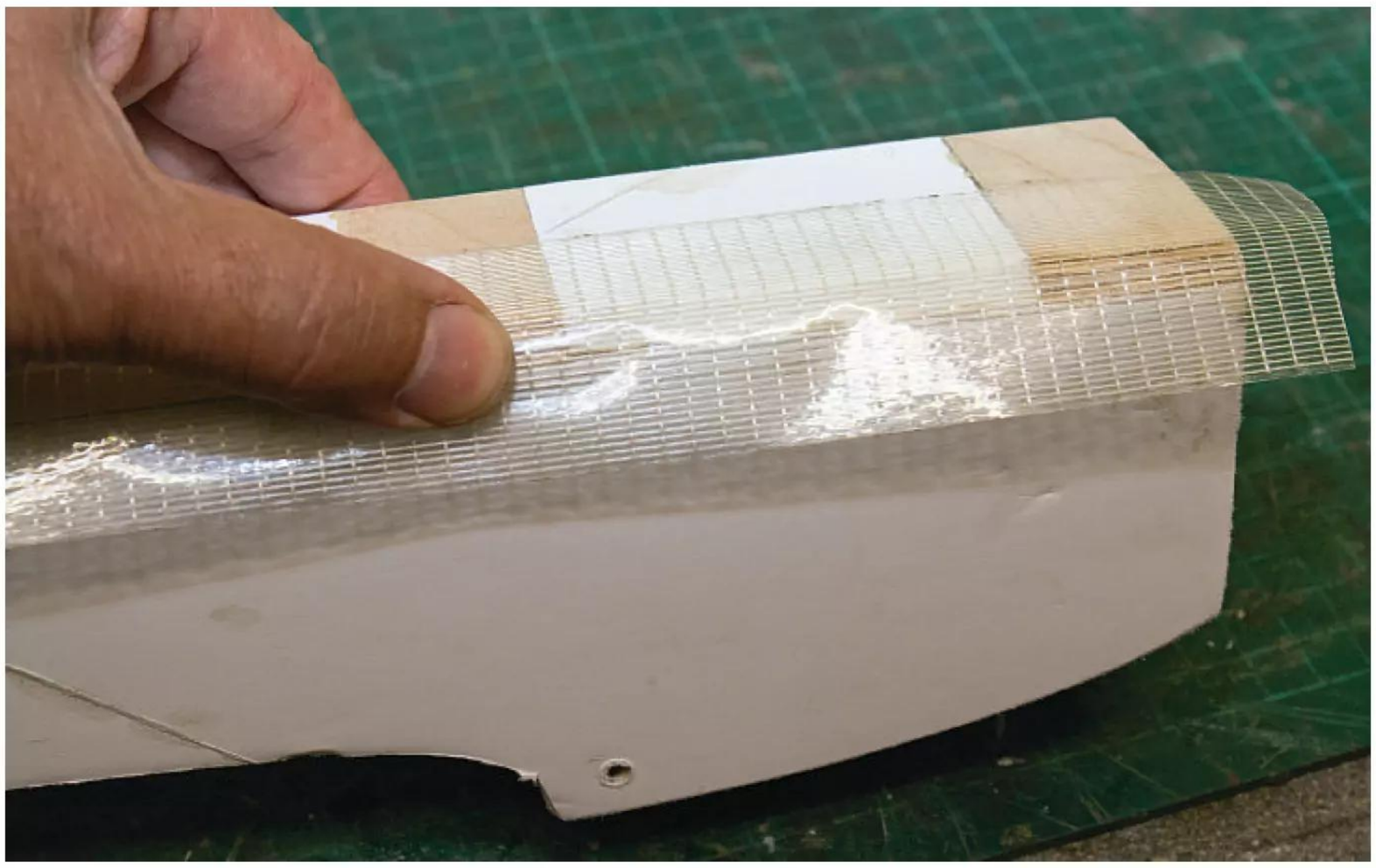
At the front end, I used a scrap balsa spacer at the front of the wing opening which also forms a rear mount for the battery hatch. I am not a fan of bottom hatches as I think they can be a weak point in what is a high stress area along the lower fuselage surface. Anyway, loading the battery from the front is a bit more convenient. The hatch assembly shown in the pictures is big enough to accept either 3S or 4S 2200 mAh batteries. Again, I used scrap 1/4" sheet balsa for the hatch top which is sanded to match the curved profile of the fuselage. The hatch is supported by scrap balsa rails and is secured at the front by carbon pins passing through the firewall and at the rear by a SLEC hatch latch. If you have a different preferred method by all means use it. Glue in a scrap bulkhead behind the battery location to stop it sliding into the receiver.

At this point the fuselage is structurally finished but is very square in section. Sanding curves into foamboard is not a very practical exercise so I simply cut a 45° chamfer in the top and bottom sheet (except at the front hatch where the top edge is just lightly


1/4" SHEET BALSA HATCH RETAINED BY CARBON RODS & SPRING CATCH
1/16" BALSA WEBS
6.4mm SQ. MED/HARD BALSA TOP SPAR
9.5mm BALSA L.E. WITH 3mm BALSA FALSE L.E.
6.4mm PLY FIREWALL
Ø2" - Ø2.5" WHEELS
Ø4mm & Ø3.5mm WIRE U/C LEGS
5mm PLY U/C MOUNTS
3mm DEPRON RIBS & SHEETING TOP & BOTTOM
6.4mm SQ. BALSA T.E.
6.4mm SQ. SPRUCE LOWER SPAR WITH 6.4mm SQ. BALSA OUTBOARD EXTENSIONS
1/32" PLY DOUBLERS
Ø6mm DOWELS FOR WING BANDS
AILERONS HAVE 12mm TRIANGULAR SOFT BALSA L.E.
5mm FOAMBOARD CORES, SOFT BALSA RIBS & 6.4mm SOFT BALSA T.E.
0.5mm x 5mm CARBON STRIPS
FunDroid
DESIGNED BY MIKE BELL
3/16" (4.8mm) SPRUCE LONGERONS
5mm FOAMBOARD FUSELAGE TOP, SIDES & BOTTOM
5mm FOAMBOARD FIN, TAILPLANE & ELEVATOR CORES WITH SOFT BALSA OUTLINES
12.5mm x 5mm SOFT BALSA TAILPLANE L.E, T.E. & ELEVATOR L.E.
A 51in SPAN COMPETITION OR SPORT FUN-FLY MODEL
1/8" PLY SKID OR USE 3D PRINTED ITEM



Fuselage assembly complete.



Tape reinforcement applied to the lower panel then smoothed over onto the fuselage side.

> "During my experiments one thing that made a big difference in terms of strength was the application of glass reinforced tape"

sanded). The chamfer can be cleaned up by sanding using a sharp Permagrit tool or fresh abrasive paper on a sanding block. This breaks the squareness up enough to improve the appearance. But don't get too fussy about how clean it is as we are going to cover the outer surface with tape, which will hide small imperfections.

During my prototype experiments one thing I tried that made a really big difference in terms of fuselage strength was the application of glass reinforced tape. You might think this would add a lot of weight but whilst I don't have a solid figure for exactly how much it added, the finished model was the same weight as my typical balsa built planes, so I am happy to accept any additional weight it might generate in exchange for the big increase in durability.

There are other types of tape that would probably work but I found that parcel tape, for example, generates so much static electricity as you peel it from the roll that it's very hard to stop it sticking to itself, making application very difficult and frustrating. Glass reinforced tape is a bit stiffer and easier to control, although it still needs care in application. I start by applying the tape edge along the centre line of the fuselage bottom, then flattening it to the sheet surface with my thumb, wrapping it around the chamfered corner and onto the fuselage side. It's probably best to do this in two or maybe three sections at a time to make it easier to control the tape. Do this for all the corners, then apply tape over any exposed foamboard on the fuselage sides. Finally, wrap tape over the firewall, extending over the fuselage sides for a few centimetres.

THICK WING

Wing construction begins by cutting a set of ribs from foamboard. Usually, my fun fly wings are parallel chord for simplicity but this time I decided to try a tapered wing, partly to see if this would increase the rotation speed of spins, but also just to make it look a bit different. I chickened out of using a more aggressive taper, but I think it's enough to make it look a bit nicer than the parallel chord versions. It's still very easy and quick to build.

My parallel chord prototype wing survived the whole of the development process but proved to be a bit bendy spanwise. Whilst it didn't actually break it was a bit off-putting to see the wing changing dihedral angle during tight loops! So, this version utilises a spruce lower spar and balsa shear webs rather than Depron webs to fix that trait. Unless you are anticipating doing violent outside loops there is no need to use spruce for the upper spar.

The ribs are tapered in both chord and thickness so to ensure they are properly aligned it is necessary to jack the outboard ends of the lower spar up by 3 mm. This is achieved by fixing the spar to the building board at the root rib location

and placing a 3 mm shim under the spar at the tips. I added a second 2 mm shim under the spar two thirds of the way along the spar for further support. The ribs were further supported at their trailing edges with 8 mm packing. With the ribs supported as described the leading and trailing edges should form a straight line from tip to tip.

Note that the wooden spars, leading edge components and trailing edge need to be scarf jointed to make up the full span. For the lower spruce spar, I made up the span by adding balsa extensions at each end. Most of the stress in the spar is concentrated towards the root with very little at the tips so outboard balsa extensions are quite adequate. For the upper balsa spar I made just one joint at one end and the same for the leading and trailing edge pieces.

Use Por or Gorilla clear to glue the ribs to the lower spar but note that you can't use the Por as a contact adhesive in this case since the rib slots have to slide over the spar. Also, you will need to cut a hole in each R2 rib before assembly to allow the servo wires to pass through. If you pin the ribs to the trailing edge spacer it will help keep the ribs aligned. Once the ribs are set you can contact glue the false leading edge and trailing edge in place. It's best to plane and sand the trailing edge top surface to match the aerofoil section prior to gluing.

While the wing is still pinned to the board the upper spar can be glued in place. Due to the rib depth taper the upper spar has a more pronounced bend compared to the lower spar so make sure that there is no tendency for the tension to lift the wing tips off the board. Make sure the assembly is allowed to fully dry before moving to the next step.

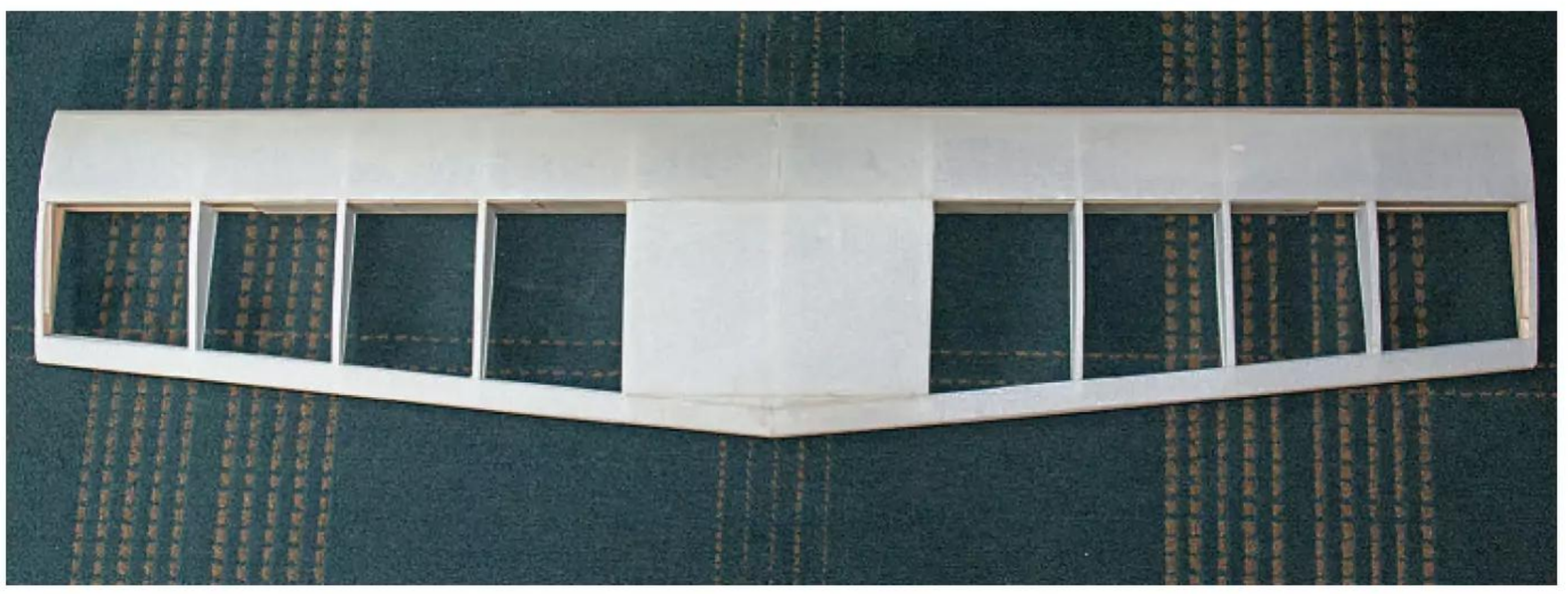
For the shear webs I used conventional 1.6 mm (1/16") vertical grain balsa sheet which doesn't need to be any harder than soft grade to do the job. You don't need to extend this reinforcement full span; I stopped mine one and a half bays short. So long as you fit the webs to at least the inner three bays that will be fine.

All the sheeting and cap strips are 3 mm thick Depron instead of the usual 1/16" balsa. This alone represents a major cost saving and while you may imagine that Depron isn't very strong, I have found it to be at least as good as balsa and maybe even better in terms of resisting handling damage once covered. I found it to be quicker to apply too as the larger Depron sheets can cover larger area without joins. You will need spanwise joins but since this sheet doesn't contribute much to spanwise strength, I simply made the joins at the wing centre line.

The trailing edge sheet is contact glued to the ribs and trailing edge, with the wing still pinned to the board to resist any distortion. After sanding the top edge of the false leading edge flush with the ribs the leading edge sheet can be contact glued in place. The method I used was to apply a generous bead of Por to the ribs, false leading edge and spar, then place the Depron in position along the spar while rolling it over the ribs to the leading edge. This transfers glue to the proper location on the Depron. The sheet is then lifted until the glue has gone tacky before carefully placing it back on the wing along the spar. Once located on the spar the sheet can be rolled over the ribs

Spruce to balsa spar scarfjoint.

Lower spar and trailing edge packing to ensure rib alignment.



Depron sheeting and balsa leading edge in place.

Finished aerofoil at the wing tip. LE has been laminated to achieve the required thickness.

The slightly tapered wing makes Fundroid look a bit nicer than the parallel chord versions.

Quarter inch square tip rib reinforcement top and bottom.

to the leading edge. I found it easier to do this operation starting from the middle of the sheet and working progressively outwards towards the root and tip.

The top sheeting is completed by applying a panel of Depron over the centre section which, if you are careful, can be done in one piece. The flexible nature of the Depron allows the panel to mould over the slightly raised contours of the wing surface in this location.

With all the upper sheeting in place, unpin the wing from the board and sheet the underside in a similar manner. Keep checking to make sure no warps are creeping in. Cap strips are 5 mm wide to match the thickness of the ribs and are again contact glued to all the ribs. The tip ribs need to be reinforced to prevent shrinkage of the covering pulling them in. Some scrap balsa glued to the inside surface of the tip ribs, top and bottom, will do the job.

Cut back and sand any Depron over hanging the leading and trailing edges before attaching the front leading edge strip, which is planed and sanded to the final profile once the glue is dry. Note that the leading edge is quite thick so make up the thickness with laminations of whatever soft grades you have available.

To be continued in the June 2025 issue of RCM&E.

Scan this QR code, or visit the link shown, for construction shots and views of Fundroid: https://youtu.be/IJtPERvKMyM

DATAFILE

Name:	Fundroid
Model type:	Competition or sport Fun Fly
Designed by:	Mike Bell
Wingspan:	1300 mm. (51 in.)
Wing area:	0.43 sq.m. (4.6 sq.ft.)
Length:	1010 mm. (43.5 in.)
Weight:	1.2 kg. (2.63 lbs.) (inc. 3S 2200 LiPo)
Wing loading:	2.8 kg./sq.m. (9.1oz./sq.ft.)
Motor:	3548 or similar outrunner
ESC:	60A
LiPo:	3S or 4S 2200 mAh
Control throws (degrees):	Ailerons: +/- 30° Elevator: +/- 30° Rudder: Max. possible

4max
The Electric Flight Specialists

Electric Setup For The Fundroid by Mike Bell

Description	RRP
PO-3547-800 Brushless Motor	£35.99
50A Brushless ESC and Programming Box	£57.94
4pcs of 4M-183HVDMG-044 High Voltage Mini, Metal Geared, Digital Servos. 18.3g, 4.4Kg pull	£59.96
3S, 2200mAh LiPo Battery 60C Fitted with XT60 Connector	£24.00
4S, 2200mAh LiPo Battery 60C Fitted with XT60 Connector	£33.50
JXF 14" x 7" High Performance Wood Prop Only for use of 3S LiPo	£9.68
JXF 13" x 5" High Performance Wood Prop Only for use of 4S LiPo	£9.68

Ultra Light Weight Spinners With Dynamic Cooling Slots

Diameter	Part Number	Weight	Price
51mm	4M-51SPIN-COOL-*	19g	£8.79
57mm	4M-57SPIN-COOL-*	22g	£9.89
63mm	4M-63SPIN-COOL-*	25g	£10.89
70mm	4M-70SPIN-COOL-*	36g	£13.19
75mm	4M-75SPIN-COOL-*	43g	£15.39
83mm	4M-83SPIN-COOL-*	48g	£17.04

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Tel: 01256 782 512 — **www.4-Max.co.uk** — Sales@4-Max.co.uk

VP2600

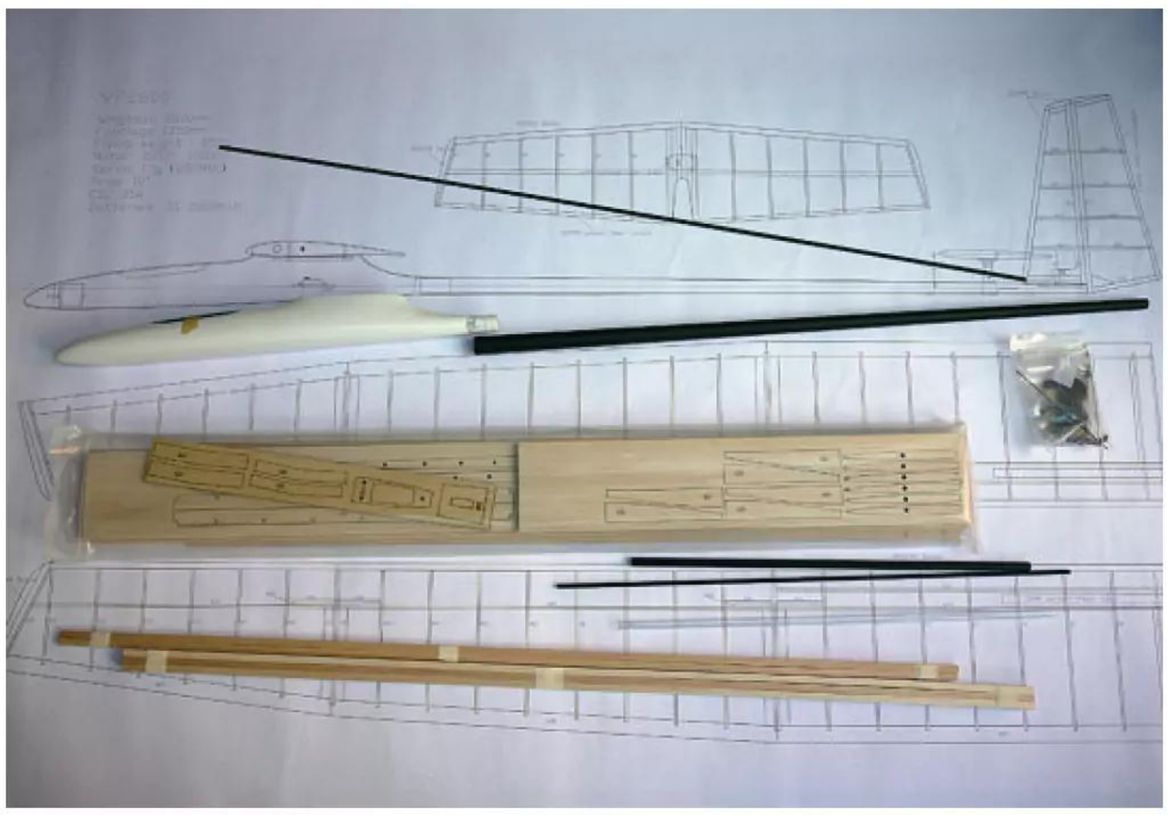
Frank Skilbeck adds a 102-inch span thermal soarer to his glider fleet

Words: **Frank Skilbeck**
Photos: **Frank Skilbeck, Kevin Crozier, Barry Atkinson**

Many readers will be aware of 4-Max for their extensive range of electric flight goodies and technical support, making them the go to shop for many electric fliers. In addition, they have branched out to offer the Value Planes range of built-up kits.

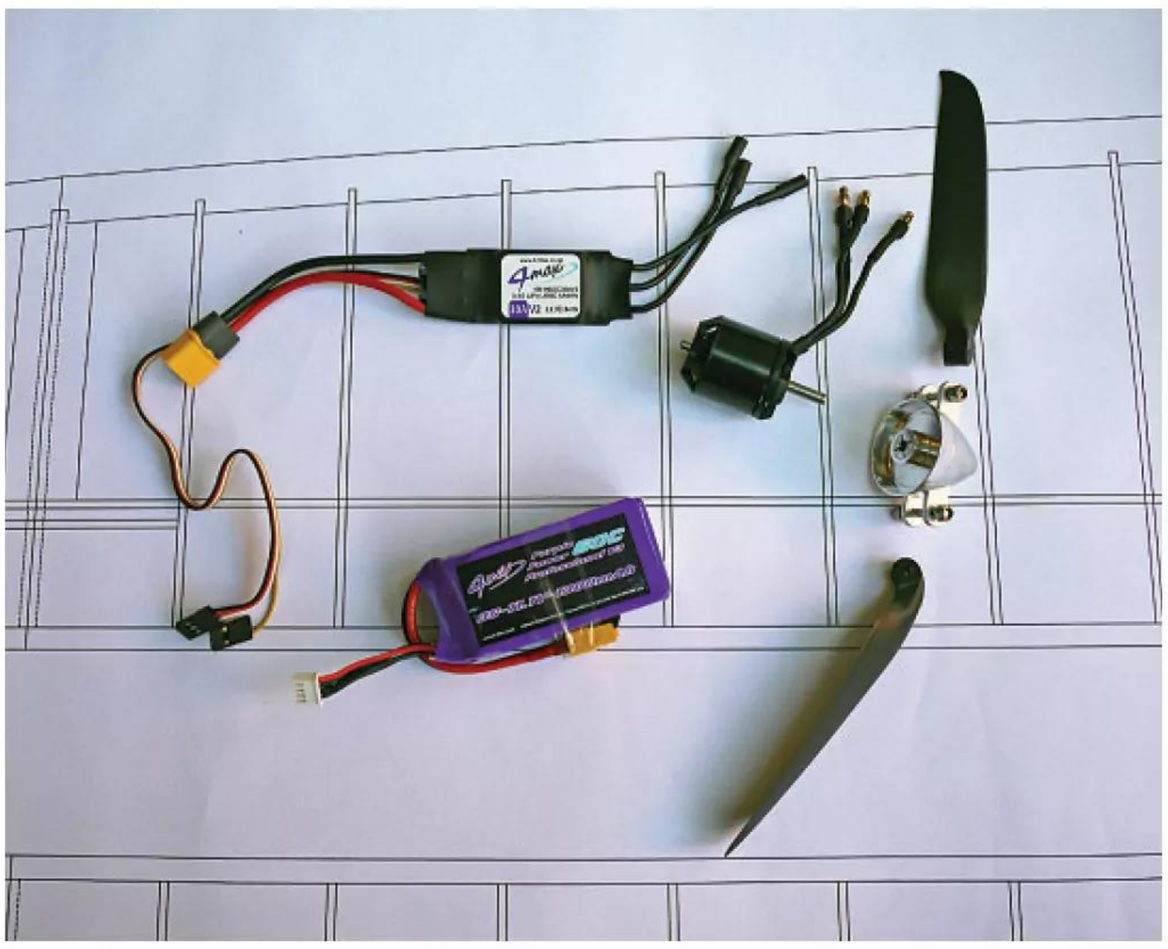
Initially offering scale models and vintage style gliders, Value Planes have now launched a modern rudder/elevator glider with a composite fuselage and built-up wings, tailplane and elevator, in both kit and ARTF versions. The model is 2600 mm (102") wingspan, weighing 850 g (just under 2 lbs) and features a fuselage made up of a glass fibre front section and carbon fibre tail boom, with an all-moving tailplane.

Your reviewer lends some scale to the model's size. An O-ring awaits fitting over those long blades to keep the prop folded in flight.

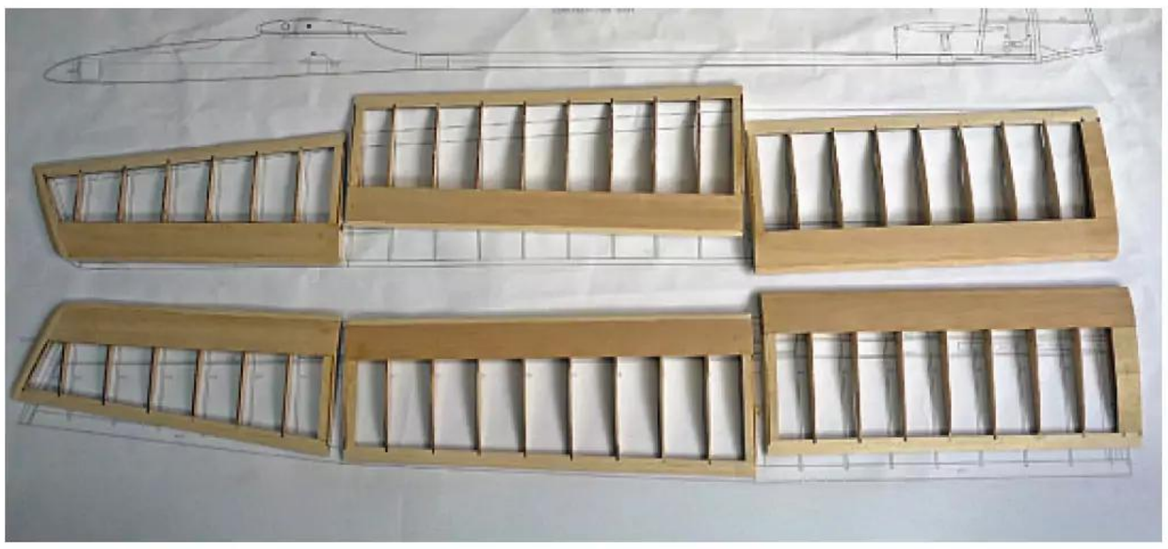


Kit parts laid over full size plan. No complaints with the overall quality.

Wing panels being built over the plan, assisted by the assembly manual with its step-by-step colour photos.



The PO-2834-910 motor, 10 x 6 folding prop and 1300 mAh 3S LiPo supplied by 4-Max were perfect for this model.



Completed wing panels ready for joining.

4-Max provided us the kit version complete with motor, ESC, servos, folding prop and two rolls of their heat shrink polyester covering film.

KIT CONTENTS

The kit came in a sturdy, plain cardboard box which provided ample protection during shipping for all the components. In addition, a full-size plan and photo construction manual were provided.

First inspection revealed good quality wood with crisp laser cutting, making extracting all the parts very easy. The kit we received was from the initial batch and was missing a couple of ply ribs but a quick email to 4-Max had the missing items arrive the next day and a reply explaining that the factory had picked this up and all subsequent kits would include the missing parts. Balsa parts make up the wings, all moving elevator and rudder assemblies, the elevator and rudder having a carbon fibre strip trailing edge for lightness and strength. The fuselage consists of two parts, the front section which houses the motor, battery, ESC and receiver made from glass fibre and a carbon fibre boom, plus a pivot assembly for the all-moving elevator, again all high quality.

WINGS FIRST

Each wing panel is made of three sections and these can be built over the supplied plan. The main spars are from balsa and are slotted to accept the wing ribs, as is the trailing edge. The laser cutting was precise and the parts all clearly labelled, so it all went together easily. The inner wing panels have a dual spar, one either side of the wing joiner tube. Construction is conventional, the front section being a traditional D box construction. Aft of the wing spar the ribs are cut such that capping strips are not required. Ribs nearest the centre joint are from ply and the rear centre section is filled in with balsa and sheeted top and bottom. The in-fill pieces are cut to shape but were slightly oversize so needed sanding down before sheeting.

The manual shows construction in a series of step-by-step photos with simple instructions. As an experienced builder I found this fine but if this is your first build, I'd recommend studying the photos and making sure you are happy before applying any glue.

The wing sections are joined together with ply braces and this requires a slot cutting out of the relevant ribs. A bit of sanding was required to get a comfortable fit. Before I joined the panels, I shaped the leading and trailing edges using a razor plane to remove the bulk of material, followed by careful sanding to get the final shape, taking care not to inadvertently sand away the wing ribs. Similarly, I shaped the wing tips. Before gluing in the ply joiners, I also sanded the adjoining wing ribs to get a consistent fit and measured the dihedral of each panel on both wings to make sure they were the same, noting that the plan doesn't give any dihedral measurements.

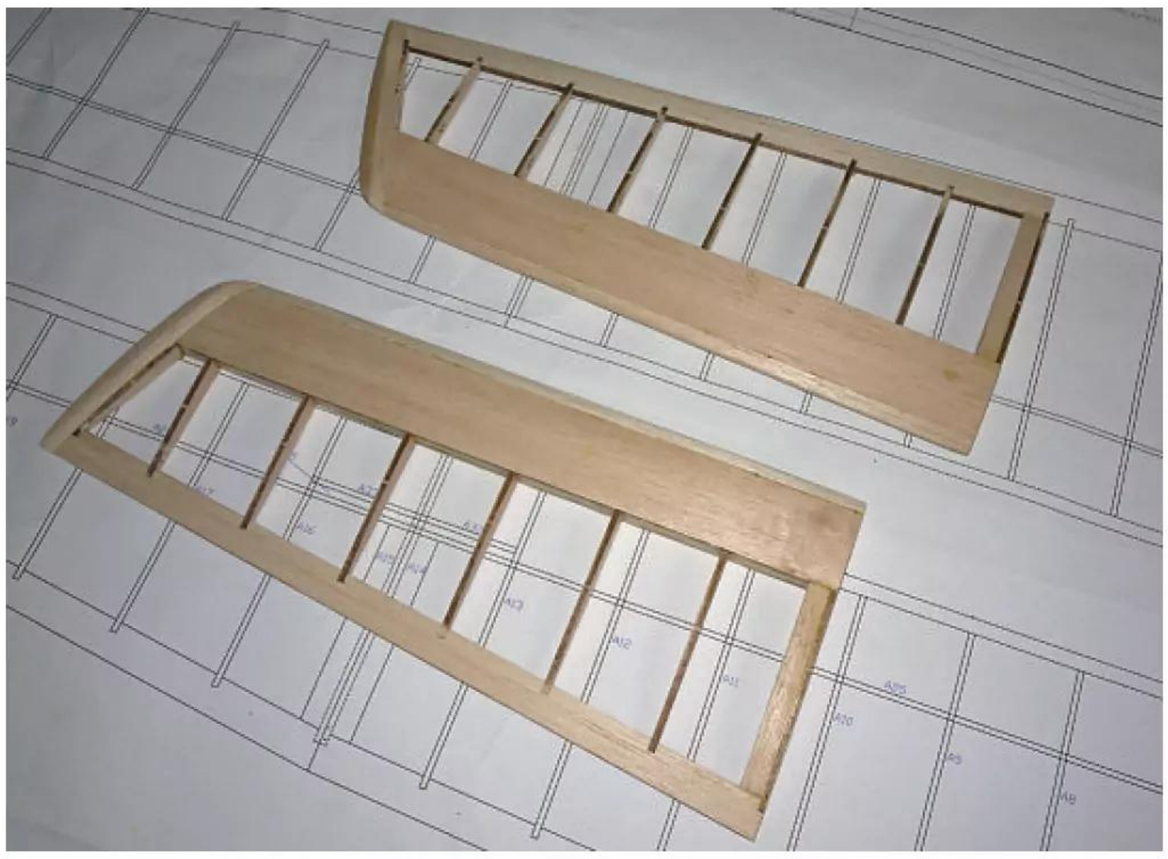
At this point it's the user's choice to either cover the wing panels before joining or post assembly. I went with the latter option, joining the panels with slow setting epoxy and clamping the ribs together whilst weighing down one section and packing up the other to obtain a consistent dihedral on the polyhedral wings. It sounds harder than it is but care at this point will ensure you get matching wing panels without any unwanted twists.

When happy with the wings I covered them using the translucent film supplied by 4-Max. Once I'd got the backing off this was easy to use and shrunk down well.

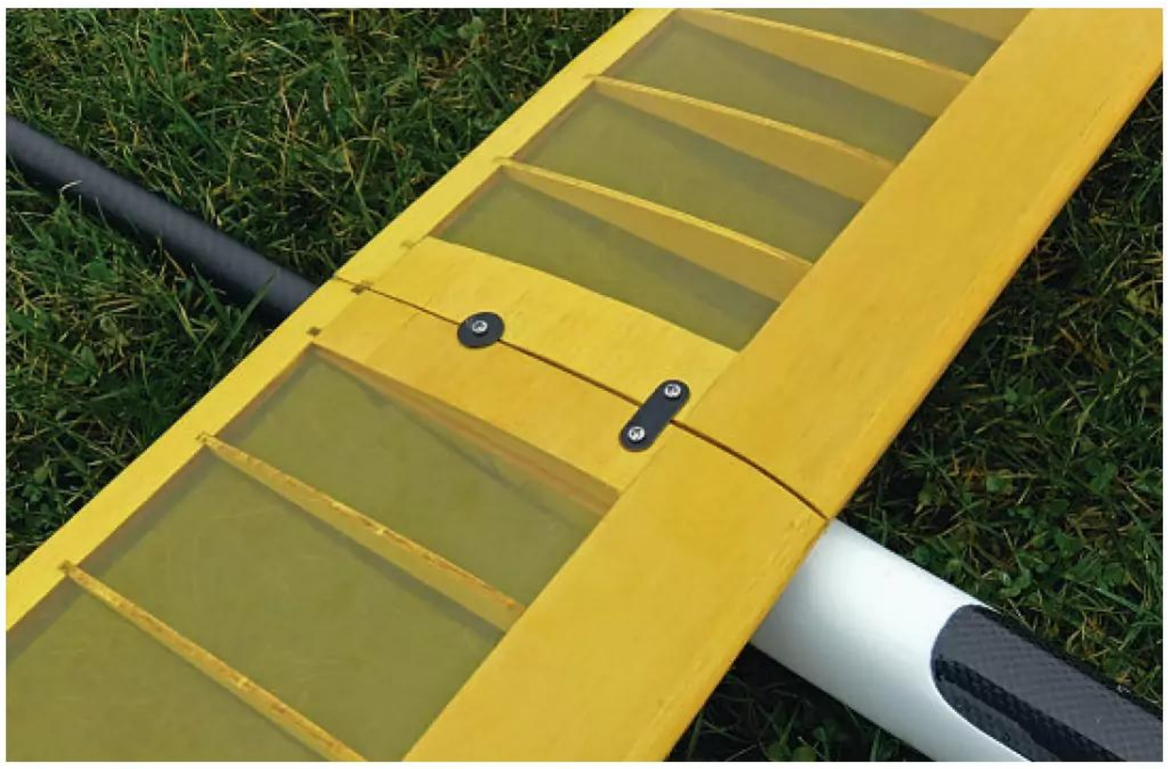
Last item on the wings is to drill the mounting holes and for this VP supply a template which is used to drill the holes in both the wings and fuselage. The wing is held on with three machine screws; the front two have a composite joiner washer whilst the rear screw uses a large washer to keep the wing in place.

TAIL SURFACES

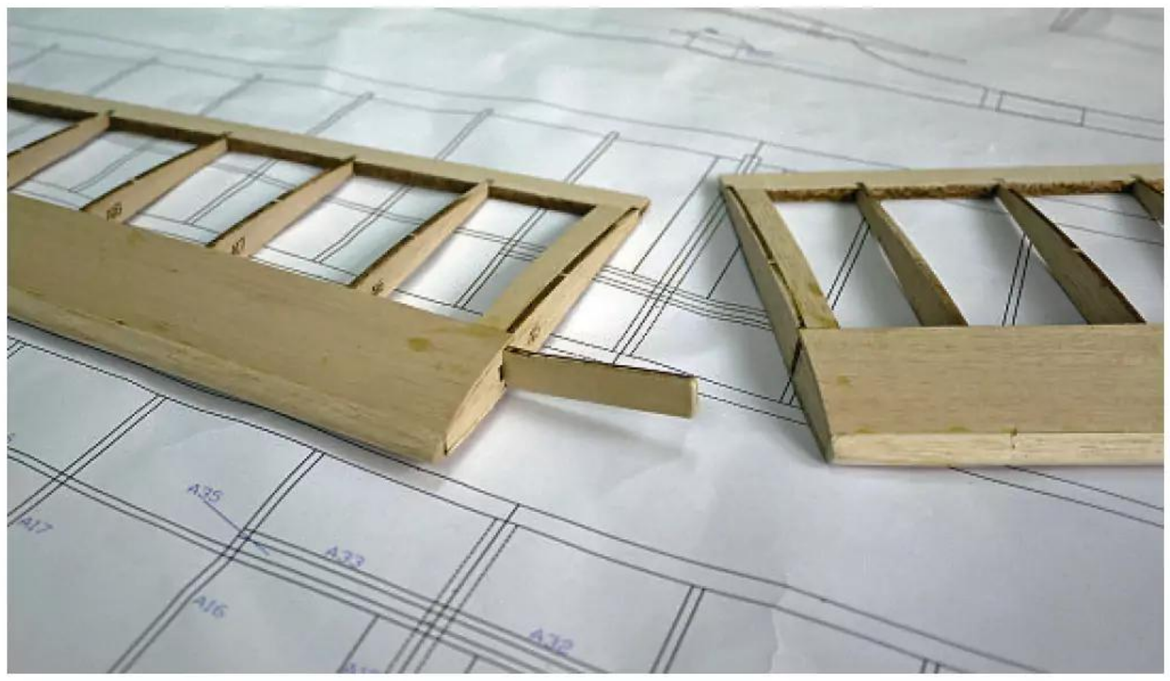
VP2600 employs an all-moving horizontal elevator on a composite pivot assembly. The elevator is built onto a carbon tube main spar with the ribs slid into place. 3 mm thick centre ribs are glued together to make a block to attach the pivot assembly to and then the carbon strip trailing edges are slid into slots in the ribs. This makes for quick



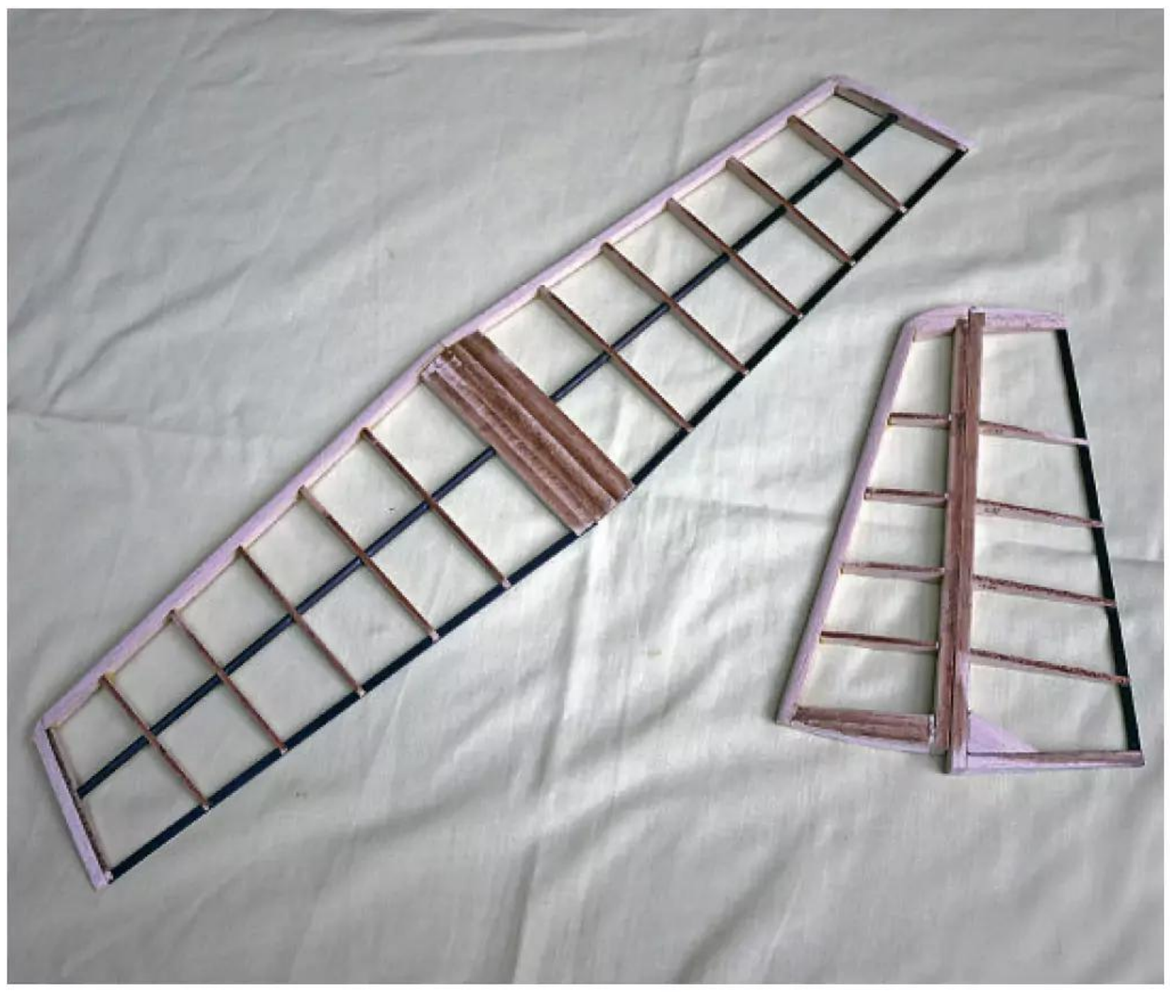
Wing tip panels almost ready for joining to the middle panel.



Wing is held in place with three machine screws threaded into captive nuts in the fuselage.

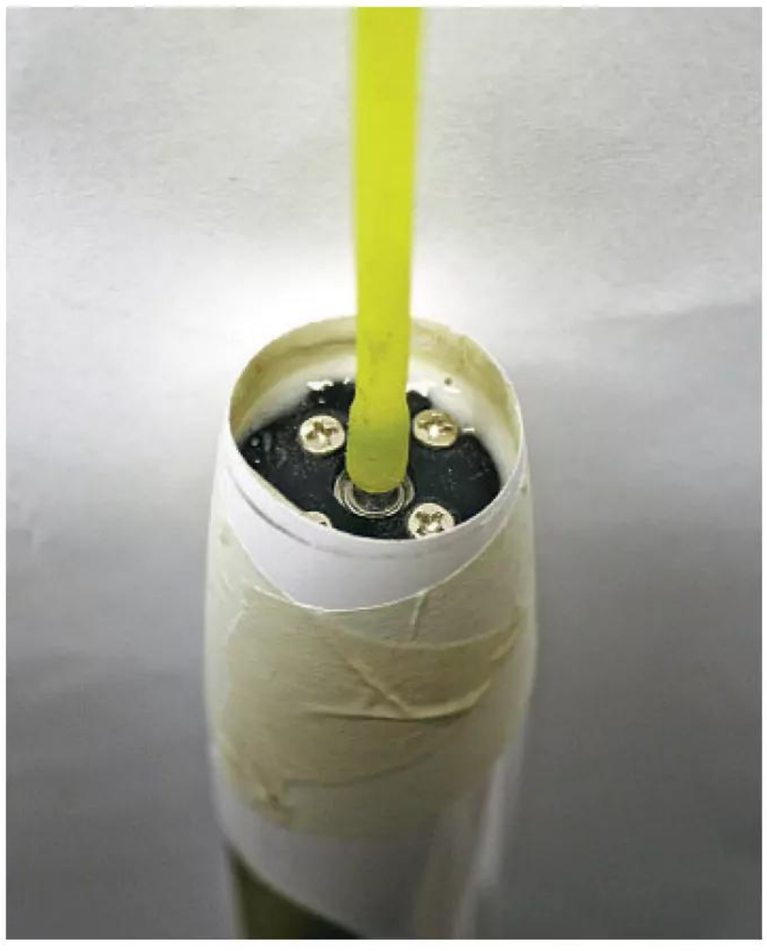


Some light sanding was required to get the wing joiner to slot in smoothly.



Elevator and rudder assemblies almost ready for covering.

Slim elevator servo is de-lugged and glued into the vertical stabiliser. Make sure it is centred and the servo arm attached before gluing it in.



Motor support plate was glued in with epoxy mixed with micro balloons, then using a piece of fuel tubing to pull the assembly through. The same tubing was used to hang the fuselage front section vertically while the epoxy set.

construction, but it must be done over the plan for accuracy.

The instructions say to glue the carbon tube and strip in position but don't say what with. I used thin cyano, wicked into the joints. The leading edge balsa was glued with PVA, which I also used for all other wood to wood joints. Once complete the back of the central ribs were cut out to clear the vertical stabiliser.

The vertical stabiliser is a conventional structure built of balsa and thin ply. The elevator servo is built in and glued in position after removing the mounting lugs. A narrow servo is required and 4-Max provided an E-Max ES3301 slim 10.6 g servo which was 9.17 mm wide. Anything more than 10 mm wide would be too thick so the ES3301 was a good fit. Make sure you've fitted the servo arm and centred it before gluing it in!

The rudder uses a balsa leading edge with balsa ribs and a carbon strip trailing edge, like the elevator. When completed the leading and trailing edges were sanded to shape. The vertical stabiliser is glued to the boom, so it needs to be sanded to fit using a piece of sandpaper wrapped around the fuselage boom.

MEASURE FIVE TIMES, CUT ONCE

Now for the job I wasn't looking forward to - cutting the nose off the front of the fuselage to accept the motor. I offered up the spinner to determine where the cut should be, came back a couple of millimetres and, with masking tape wrapped around the fuselage, I cut carefully with a cutting disc on my Dremel. I then sanded back the fuselage to get the spinner fully

The boom was glued to the fuselage front section with a smear of epoxy, using the stand provided for support.

Two slots in the rear of the boom for the closed loop rudder are fixed horizontality using a section of carbon strip to aid alignment.

Short and direct elevator linkage. The tail pivot pin was found to be sliding out just before the first flight so was fixed using a drop or two of cyano.

Closed loop uses glass reinforced cables, using a drop of cyano to secure the knots. Lightweight but not easy to tension with fat fingers!

aligned, leaving only a slight gap. It's not a job to be rushed but was much less fraught than I was fearing. I mounted the motor onto the motor plate and, using fuel tubing, pulled it into the fuselage, carefully positioning the motor to get it centred, the motor plate being fixed in place with 30-minute epoxy and micro ballons to give some working time. I used the fuel tubing to hang the assembly vertical while the epoxy set.

Next up was fitting the wing retaining captive nuts. The template used to drill alignment holes in the wing is used here too, the captive nuts being secured with a smear of epoxy. At the same time the rudder servo mounting plate can be epoxied in place, which saves mixing up two lots of epoxy.

The tail boom can then be glued to the front section. For this VP supply a ply stand to support the model. There are two slots in the rear of the boom for the closed loop rudder control so these need to be aligned horizontality with the main wing; the instructions show using a section of carbon strip to aid alignment. Then the elevator is screwed and glued to the all-moving pivot assembly.

After building up the assembly I screwed the elevator in place on the pivot assembly while I offered this up to the boom and, with the main wings fitted, I carefully aligned the elevator and wing in the horizontal plane before gluing the pivot with a smear of epoxy to the boom.

The vertical stabiliser is shaped and glued directly onto the tail boom and, again, it needs careful alignment. I used epoxy, with masking tape holding it in place while the glue set.

HOOKING UP

The elevator linkage is a short pushrod from the servo in the vertical stabiliser to the all-moving pivot so it's easy to set up, the most difficult part being threading the servo extension lead down the relatively narrow boom. The rudder uses a conventional closed loop system except instead of steel cables and crimps it uses a cord with an inner 'glass' section to prevent stretch, these being tied to the rudder and associated servo. With my big thumbs I found it quite difficult to get a slop free system, so I added closed loop adjusters at the servo end to take up any slack, a couple of drops of cyano on the knots preventing them from undoing.

Once hooked up all that was left to do was to fit the receiver and ESC. Space in the fuselage is a bit tight, so a compact receiver is helpful, but as it's only a three-channel model this isn't difficult. Just remember to ensure the aerials are kept within the fibreglass front section as the carbon fibre boom will shield the radio signal.

The plans suggest the VP2600 will take a 3S 2200 mAh LiPo. This might possible if the LiPo is smaller than average, but all my 2200 packs wouldn't fit without a squeeze. Fortunately, 4-Max had provided a 1300 mAh 3S 60C Purple Power pack and this fitted under the hatch easily.

With the propeller fitted the balance was checked and few grams of weight were required just aft of the motor. Final model weight came in at 820 grams, just slightly

All-moving elevator only requires very small movement.

There's not much space under the hatch so the recommended 2200 mAh LiPo is a tight fit. However, the 1300 mAh Purple Power battery fits easily and will give many climbs to height.

Review model is covered in 4-Max translucent film. VP2600 looks like it will float around, even on the ground!

below that shown on the plans. A quick test of the motor with the 10" x 6" folding prop gave 14.5 amps and 160 watts, more than ample for this model.

IT'S A FLOATER

The build of the model took place over late autumn and early winter so there was a wait of a few weeks for suitable conditions for the test flight. Eventually a calm day came around, even if a bit overcast. Before powering away a few test glides were undertaken to check out the trim. These showed that not only did the VP2600 have a very shallow glide but also that very little elevator movement was required, so I dialled the movement down to +/- 12 mm at the elevator trailing edge, with as much rudder movement as possible.

It was at this point that we noticed that the elevator pivot pin, which is just a push fit, was moving laterally. Not wanting this to come out we added a couple of drops of cyano to the pin, unfortunately locking up the pivot which took a bit of time to free off.

With the elevator restored to full movement the VP2600 was launched on half power and climbed smartly away, full power giving an almost vertical climb. There is a slight tendency to pitch up under full power, as with most electric gliders, but this can easily be held down until an elevator-throttle compensation mix can be tuned in.

With power off the VP 2600 really floats around. Unfortunately, by the time we made the test flights the sky had become overcast and the resulting photos weren't up to magazine quality.

For the second round of flights, we had a day of light winds and blue skies, providing good conditions for taking flying photos. After the pictures were in the bag, I took the VP up to do

Floating on by, making descending for landing a leisurely affair.

Slight forward pressure on the elevator stick is useful to prevent a long walk!

DATAFILE

Model:	VP2600
Model type:	Kit or ARTF glider
Manufacturer:	Value Planes
UK importer:	4-Max Models Ltd. www.4-max.co.uk/aircraft-vp-VP2600.htm (kit) www.4-max.co.uk/aircraft-vp-VP2600-ARTF.htm (ARTF)
RRP:	Kit £169.99 or ARTF £299.99
Wingspan:	2600 mm
Weight:	850 g quoted (820 g, as built)
Functions:	Elevator, Rudder, Throttle
Power:	900 - 1000 kV, 22 – 28 mm dia. motor with 10 x 6
Propeller:	10" x 6" folding
ESC:	30 A
LiPo:	3S 1300 - 2200 mAh (1300 mAh used for review)
Control throws:	Elevator 12 mm up & down, rudder 35 mm each way

a bit of thermal sniffing and in no time at all it was circling up at a fair old rate, so much so that getting it down required the model to be put in a series of very tight turns and a couple of loops. It also tended to float on a long way in ground effect when landing so slight forward pressure on the elevator was required to save a long walk. The model is quite responsive to both the rudder and elevator controls but is easy to control both under power and when gliding.

SUMMARY

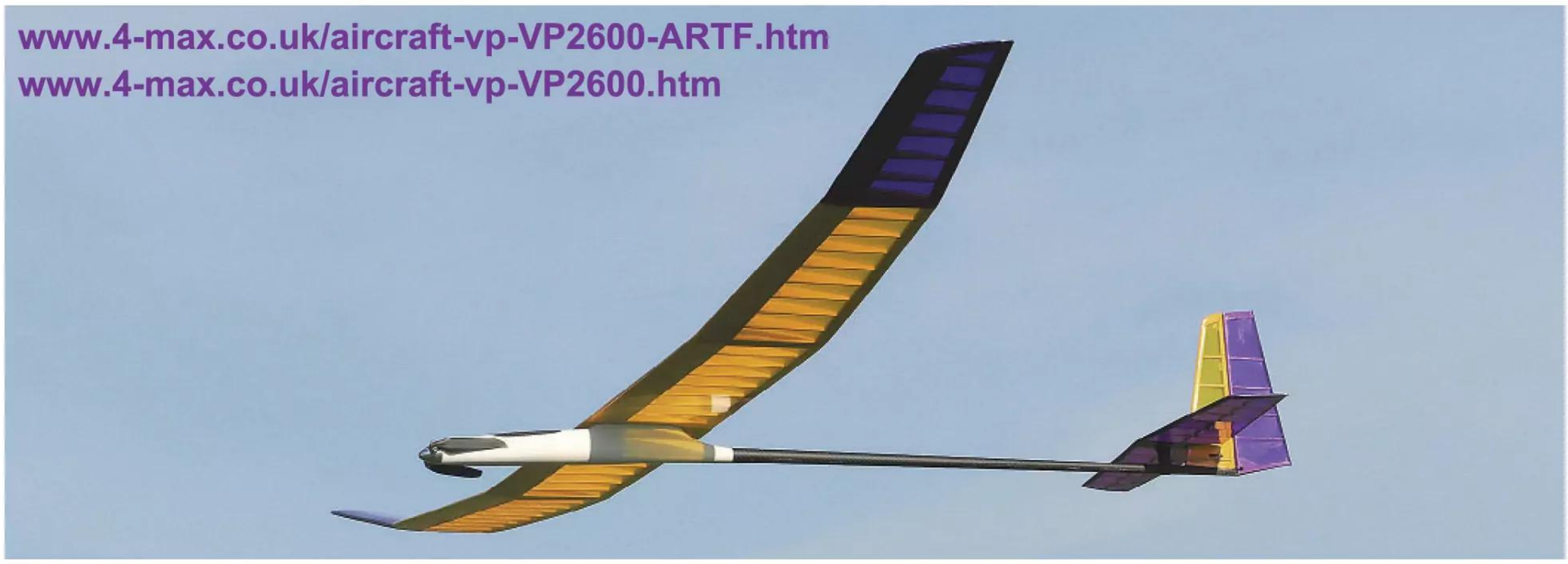
This first composite model is a departure from Value Plane's previous offerings. There were a couple of minor niggles, namely the fiddly closed loop cord and the lack of positive retention of the pivot pin, but these were easily addressed. The quality of the parts and laser cutting are excellent, so the model goes together very well and is quite satisfying to build.

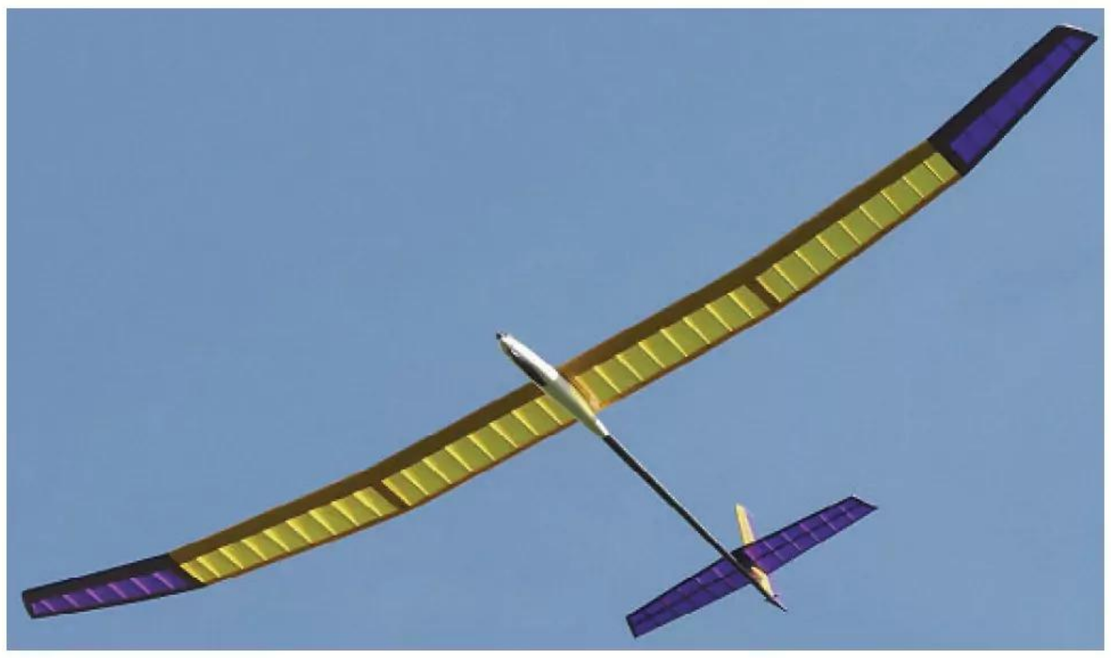
VP2600 flies well and once you are at height it may take some time to get back down again, making you wish the model was fitted with some spoilers. All in all, it's a very nice model, well suited to calm sunny days where, with a bit of thermal assistance, you'll be able to waft around for ages on a single battery charge - very relaxing.

If model building isn't your cup of tea, then the VP2600 is also available as an ARTF+ kit, including a brushless motor, spinner and propeller for £299.99, the plus indicating that you have to assemble and install the electronics yourself. ■

Value Planes VP2600 Thermal Glider Kit or ARTF

www.4-max.co.uk/aircraft-vp-VP2600-ARTF.htm
www.4-max.co.uk/aircraft-vp-VP2600.htm





Description	RRP
Value Planes VP2600 Glider - Kit only	£169.99
Value Planes VP2600 Glider - ARTF (includes Spinner, prop and Pre Installed SunnySky Brushless Motor)	£299.99
4-Max PO-2834-910 Brushless Motor (needed for kit version)	£27.49
33mm Diameter Aluminium Folding Spinner Assembly (needed for kit version)	£10.49
Pair of 10x6 Folding Prop Blades (needed for kit version)	£4.99
30A Brushless ESC with XT60 connector fitted and Programming Box (needed for kit and ARTF version)	£33.98
1x 4M-100AMG-022 and 1x ES3301 Servos (needed for kit and ARTF version)	£16.28
3S, 11.1V, 1300mAh LiPo Battery with XT60 Connector Fitted (needed for kit and ARTF version)	£17.00

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4-Max	4M-045DH-005	Sub Micro	4.5g	0.5Kg @ 4.8V - 0.10sec/60° 0.6Kg @ 6.0V - 0.08sec/60°	Digital, Light Weight, High Speed	1pcs £4.72ea 5pcs £4.25ea
EMAX	ES9051	Sub Micro	4.1g	0.8Kg @ 4.8V - 0.09sec/60°	Digital, High Torque, High Speed	1pcs £7.69ea 5pcs £6.92ea
4-Max	4M-056DHVMG-009	Sub Micro	5.6g	0.90Kg @ 4.8V - 0.14sec/60° 1.05Kg @ 6.0V - 0.12sec/60° 1.20Kg @ 7.4V - 0.10sec/60°	Digital, High Voltage, Metal Geared, 8mm Thick	1pcs £9.94ea 5pcs £8.95ea
New 4-Max	4M-053HVDMG-010	Sub Micro	5.3g	1.0Kg @ 4.8V - 0.09sec/60° 1.5Kg @ 6.0V - 0.08sec/60° 1.8Kg @ 7.4V - 0..07sec/60°	Digital, High Voltage, Metal Geared, 8mm Thick, High Speed	1pcs £11.10ea 5pcs £9.99ea
EMAX	ES9052MD	Sub Micro	5.5g	1.1Kg @ 4.8V - 0.11sec/60° 1.3Kg @ 6.0V - 0.09sec/60°	Digital, Metal Geared, Coreless Motor	1pcs £13.83ea 5pcs £12.45ea
4-Max	4M-094DMGB-014	Wing	9.4g	1.4Kg @ 4.8V - 0.12sec/60° 1.9Kg @ 6.0V - 0.10sec/60°	Digital, Metal Geared, Ball Raced, Wing, 8mm Thick	1pcs £11.54ea 5pcs £10.39ea
EMAX	ES08A II	Micro	8.6g	1.5Kg @ 4.8V - 0.12sec/60° 1.8Kg @ 6.0V - 0.10sec/60°	Analog, Light Weight, Great Value	1pcs £5.34ea 5pcs £4.81ea
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EMAX	ES3301	Micro	10.6g	2.0Kg @ 4.8V - 0.12sec/60° 2.2Kg @ 6.0V - 0.10sec/60°	Analog, Metal Geared, 9mm Thick	1pcs £8.79ea 5pcs £7.91ea
4-Max	4M-100AMG-022	Micro	10g	2.2Kg @ 4.8V - 0.12sec/60° 2.5Kg @ 6.0V - 0.10sec/60°	Analog, Metal Geared, High Torque	1pcs £7.49ea 5pcs £6.74ea
4-Max	4M-100DMG-022	Micro	10g	2.2Kg @ 4.8V - 0.12sec/60° 2.5Kg @ 6.0V - 0.10sec/60°	Digital, Metal Geared, High Torque	1pcs £9.05ea 5pcs £8.15ea
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New 4-Max	4M-130HVDMG-040	Micro	13g	3.8Kg.cm @ 5.0V - 0.112sec/60° 4.0Kg.cm @ 6.0V - 0.096sec/60° 4.5Kg.cm @ 7.4V - 0.083sec/60°	Digital, High Voltage, Metal Geared, High Speed, High Torque, Very Low Play in Gears	1pcs £11.10ea 5pcs £8.15ea
4-Max	4M-094DHVMG-026	Mini	9.4g	2.0Kg @ 6.0V - 0.09sec/60° 2.6Kg @ 7.4V - 0.07sec/60°	Digital, High Voltage, Metal Geared , Ball Raced, 8mm Thick	1pcs £14.99ea 5pcs £14.17ea
4-Max	4M-160AH-027	Mini	16g	2.7Kg @ 4.8V - 0.13sec/60° 3.0Kg @ 6.0V - 0.11sec/60°	Analog, Great Value Mini Servo	1pcs £6.29ea 5pcs £5.66ea
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4-Max	4M-175DMG-030	Mini	17.5g	3.0Kg @ 4.8V - 0.13sec/60° 3.5Kg @ 6.0V - 0.11sec/60°	Digital, Metal Geared	1pcs £9.99ea 5pcs £8.99ea
New 4-Max	4M-183HVDMG-044	Mini	18.3g	4.4Kg @ 4.8V - 0.101sec/60° 6.5Kg @ 6.0V - 0.078sec/60° 7.3Kg @ 7.4V - 0.059sec/60°	Digital, High Voltage, Metal Geared, High Speed, High Torque	1pcs £14.99ea 5pcs £13.49ea
4-Max	4M-253AB-028	Standard/Mini	25.3g	2.8Kg @ 4.8V - 0.12sec/60° 3.3Kg @ 6.0V - 0.10sec/60°	Analog, Ball raced	1pcs £6.79ea 5pcs £6.11ea
EMAX	ES3004	Mini	17g	3.0Kg @ 4.8V - 0.15sec/60° 3.5Kg @ 6.0V - 0.13sec/60°	Analog, Metal Geared, Ball Raced	1pcs £12.09ea 5pcs £10.88ea
EMAX	ES3054	Mini	17g	3.0Kg @ 4.8V - 0.15sec/60° 3.5Kg @ 6.0V - 0.13sec/60°	Digital, Metal Geared, Ball Raced	1pcs £17.59ea 5pcs £15.83ea
4-Max	4M-455AH-033	Standard	45.5g	3.3Kg @ 4.8V - 0.15sec/60° 4.0Kg @ 6.0V - 0.12sec/60°	Analog, Great Value Standard Servo	1pcs £6.99ea 5pcs £6.29ea
EMAX	ES3001	Standard	37g	3.5Kg @ 4.8V - 0.17sec/60° 4.8Kg @ 6.0V - 0.14sec/60°	Analog, Ball Raced	1pcs £7.69ea 5pcs £6.92ea
4-Max	4M-410ABH-052	Standard	41g	5.2Kg @ 4.8V - 0.20sec/60° 6.5Kg @ 6.0V - 0.16sec/60°	Analog, High Torque	1pcs £4.73ea 5pcs £4.26ea
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4-Max	4M-556DMG-087	Standard	55.6g	8.7Kg @ 4.8V - 0.15sec/60° 9.4Kg @ 6.0V - 0.13sec/60°	Digital, Metal Geared	1pcs £15.74ea 5pcs £14.17ea
New 4-Max	4M-490AMG-108	Standard	49g	10.8Kg @ 4.8V - 0.13sec/60° 13.8Kg @ 6.0V - 0.11sec/60°	Analog, Metal Geared, Waterproof	1pcs £17.76ea 5pcs £15.98ea
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4-Max	4M-556DMG-173	Standard	55.6g	17.3Kg @ 4.8V - 0.18sec/60° 20.4Kg @ 6.0V - 0.16sec/60°	Digital, Metal Geared	1pcs £17.84ea 5pcs £16.06ea

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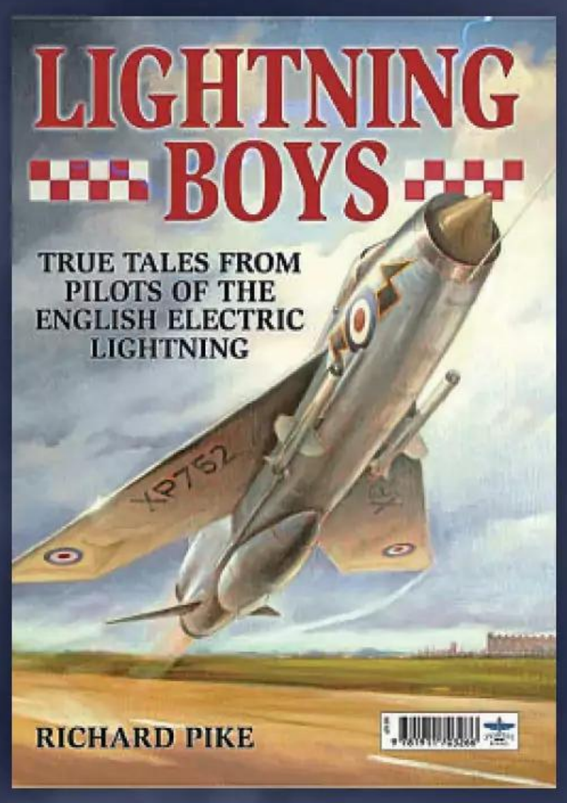

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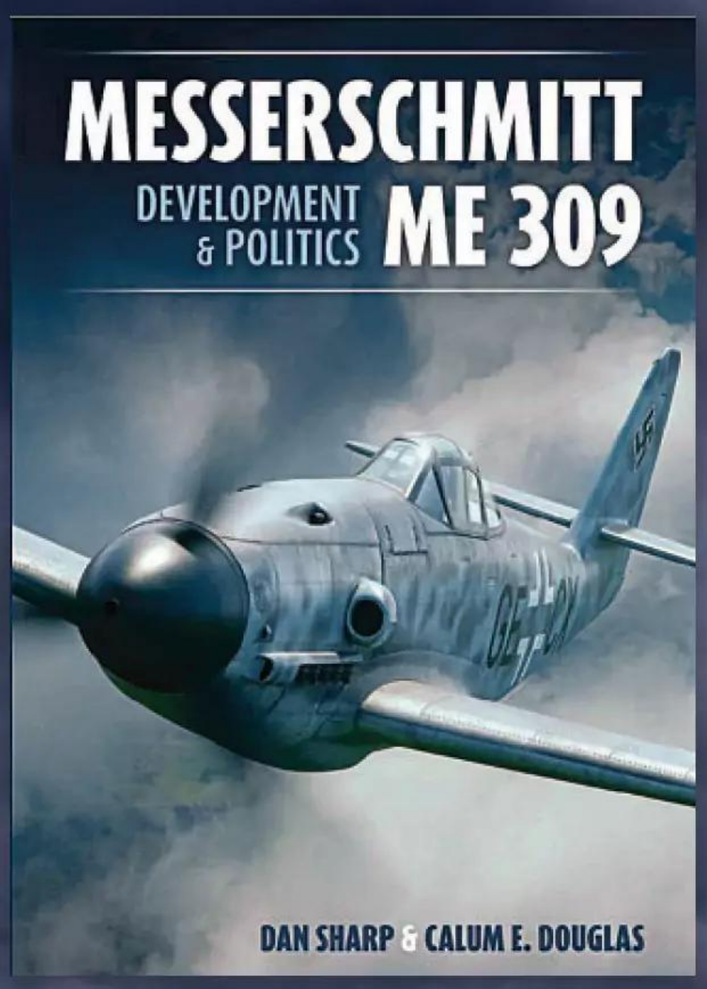

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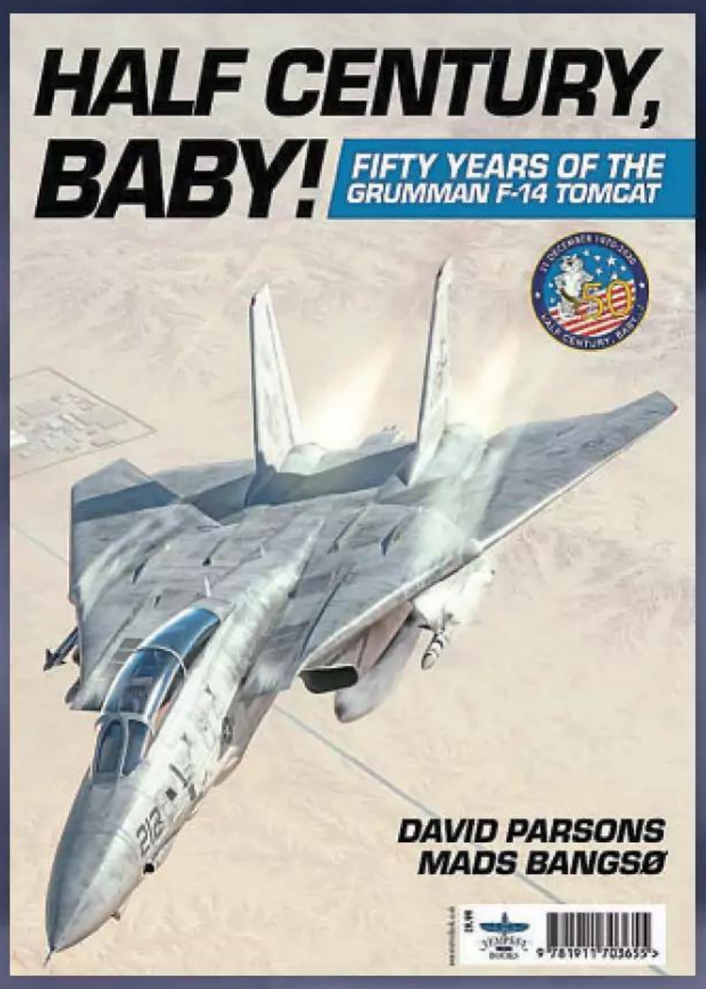

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ST8US-PART 2

Continuing from the last issue, **Mike Freeman** finishes and flies his one-metre span EDF flying wing built entirely from foamboard and brown paper

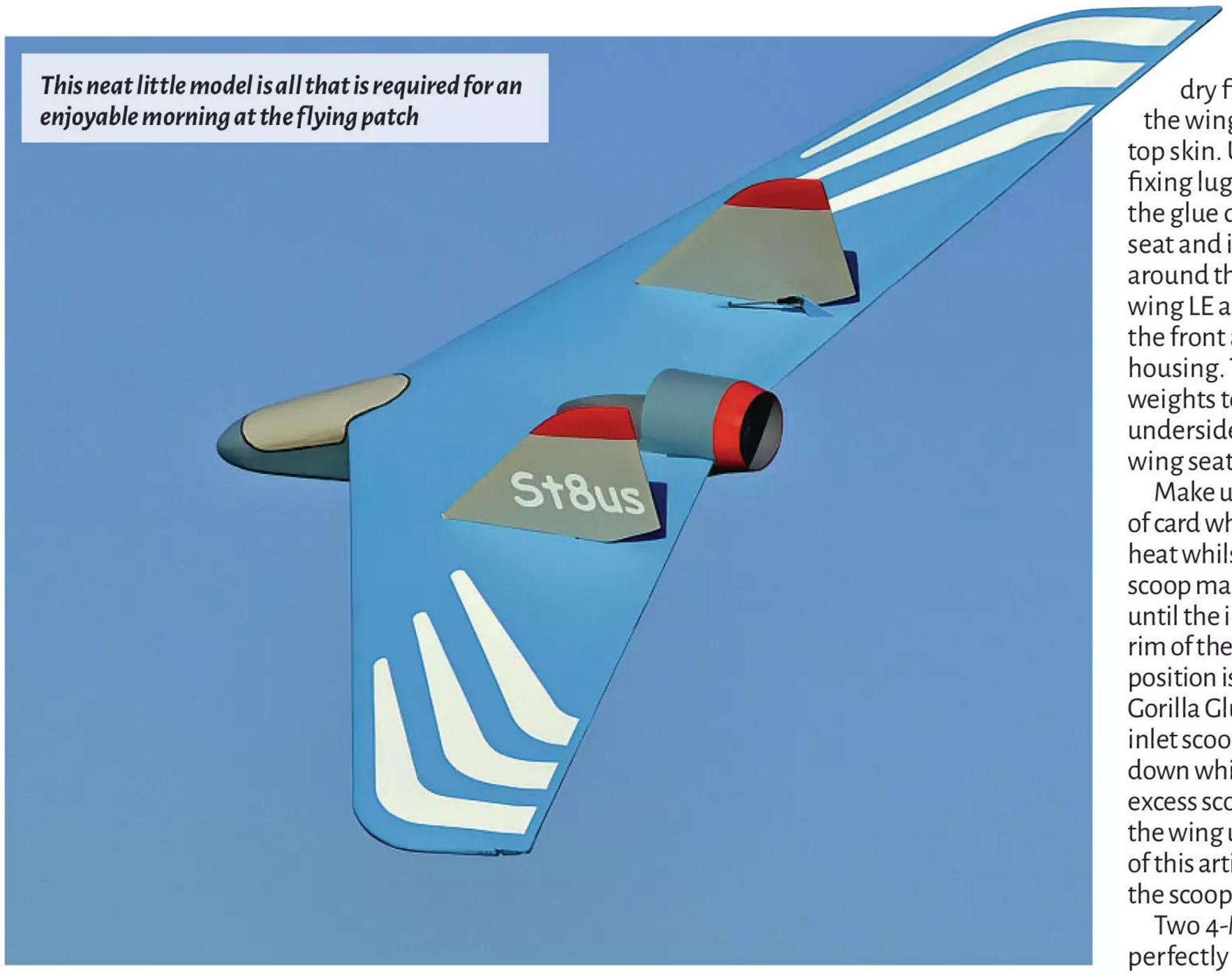
Words: **Mike Freeman**
Photos: **Mike Freeman, Al Freeman**

I found it easiest to finish the wing and the fuselage separately before gluing together. The quickest, easiest and cheapest method to finish the model is with Valspar emulsion paint from B&Q. This paint has proven to stand up well to damp conditions and only occasionally needs a bit of touching up to keep it in pristine condition.

Give the components a light sanding to remove any obvious lumps in the brown paper and to take the shine off the card surface. Then apply a thin coat of paint to seal the surface. Bulk up some paint with micro-balloons and brush this over the edges of the brown paper. Lightly sand to eliminate all the inevitable high spots and apply two final thin coats to finish, ready for some stick-on trim to be applied.

I shortened the ESC leads to the motor before installing the ESC, receiver and elevon extension leads into the fuselage. Before gluing the wings in place check for correct rotation of the EDF unit.

If you haven't seen it already then part one of Mike's build article, plus the matching pull-out Pro-Plan, is in the April issue.

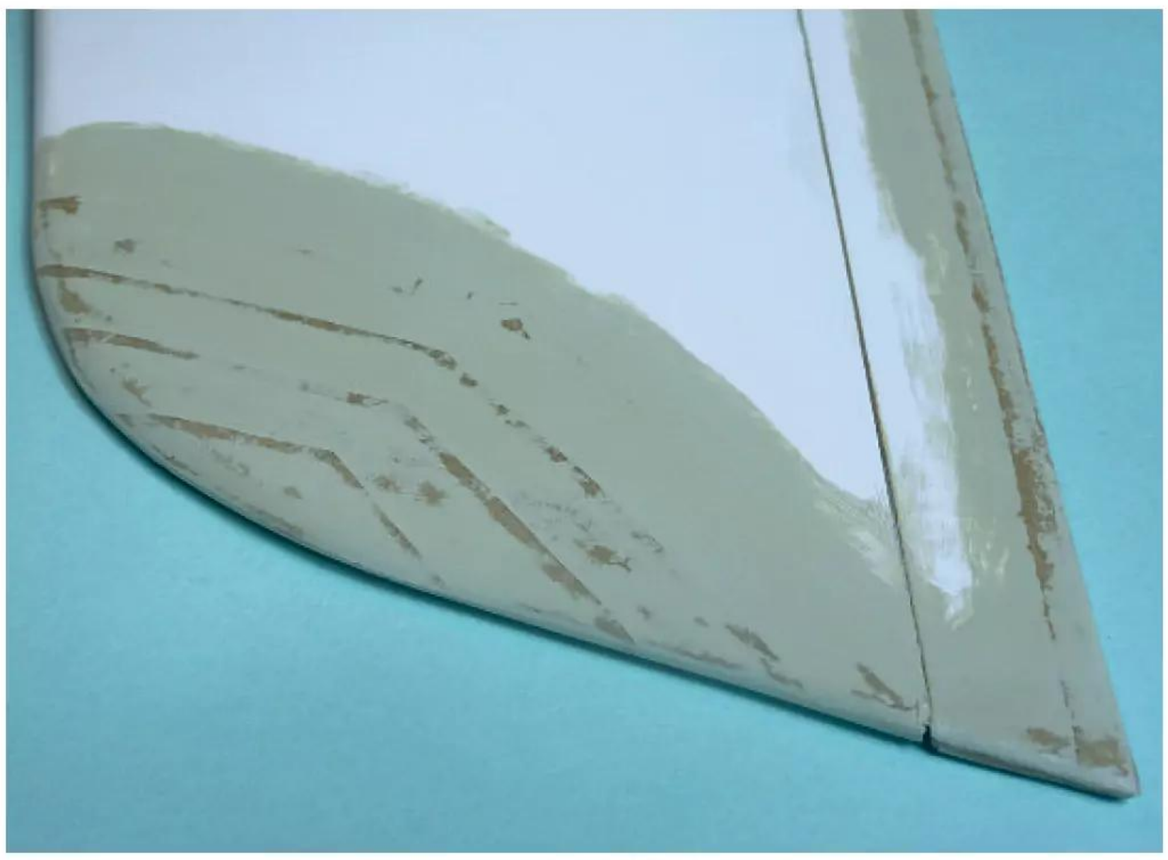


This neat little model is all that is required for an enjoyable morning at the flying patch

Remove F2, F3 and F4 and do a final dry fit of the wing to make sure it sits on the wing seat and blends in with the fuselage top skin. Using Gorilla Glue Clear, glue the wing fixing lugs into the slots in the wings. Before the glue dries run a bead of glue along the wing seat and into the gap in the wing seats and around the front of the battery plate. Slide the wing LE and battery plate into the fuselage at the front and slide the wing's TE over the EDF housing. The whole lot should self-align. Apply weights to the top of the wing to ensure the underside of the wing is in contact with the wing seat and leave to dry.

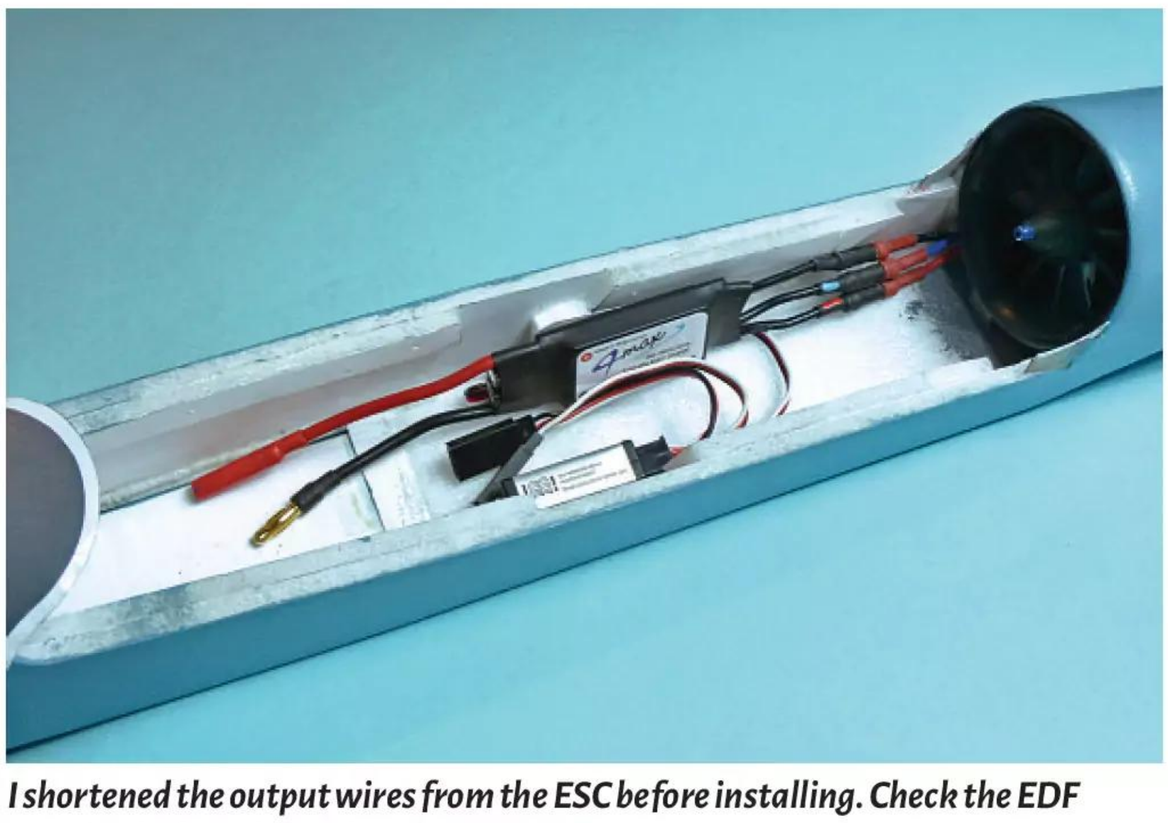
Make up the EDF inlet scoop from two pieces of card which are glued face to face by applying heat whilst they are formed around the EDF inlet scoop mandrel. Juggle F4 and the inlet scoop until the inlet scoop is in line with the outside rim of the EDF bell-mouth. Once the correct position is known glue them in place using Gorilla Glue Original to fill any gaps. Place the inlet scoop mandrel into the scoop and weigh down while the glue dries. When dry trim off the excess scoop so it is flush with the top surface of the wing using the special tool described in Part 1 of this article. Fill and touch up the join between the scoop and the wing.

Two 4-Max 4M-056DHVMG-009 servos are perfectly suited for the St8us elevons. I use

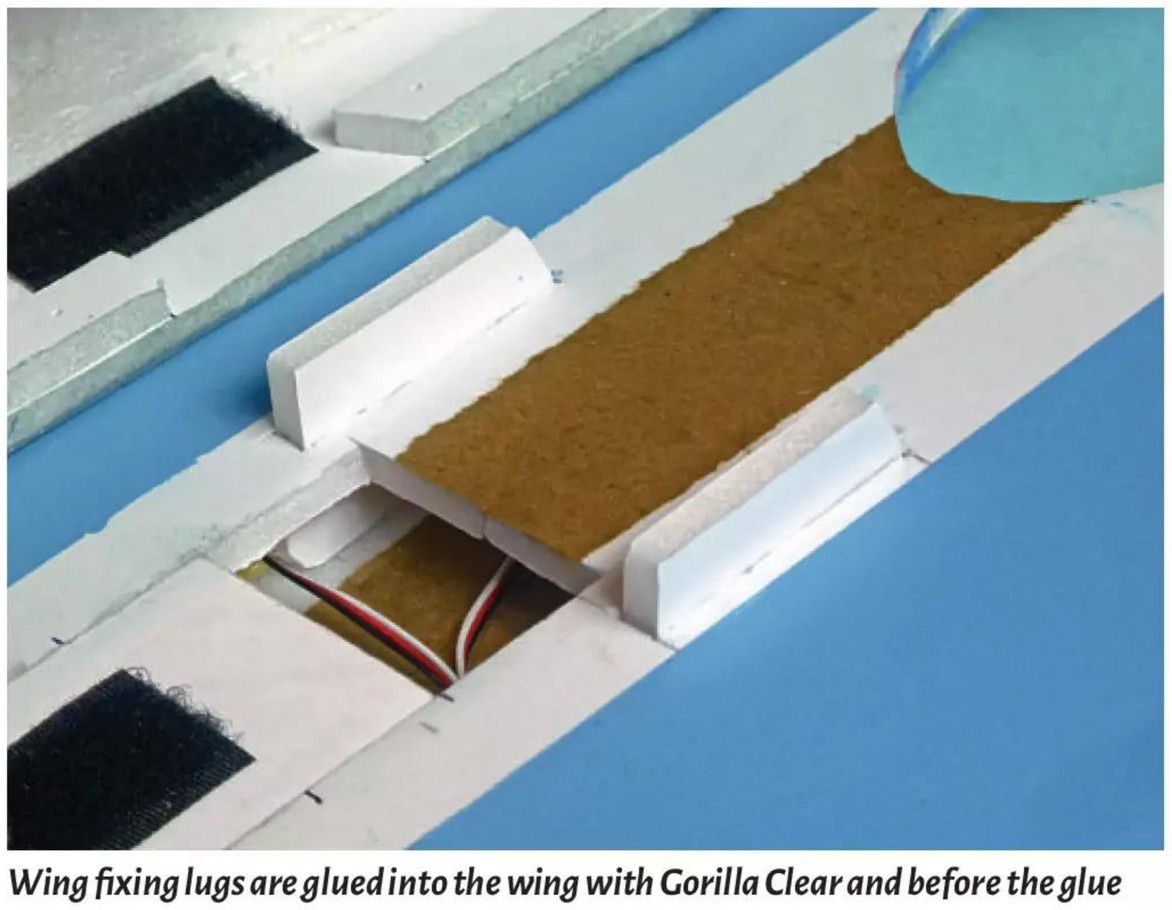


A wing tip sanded smooth and ready for final painting.

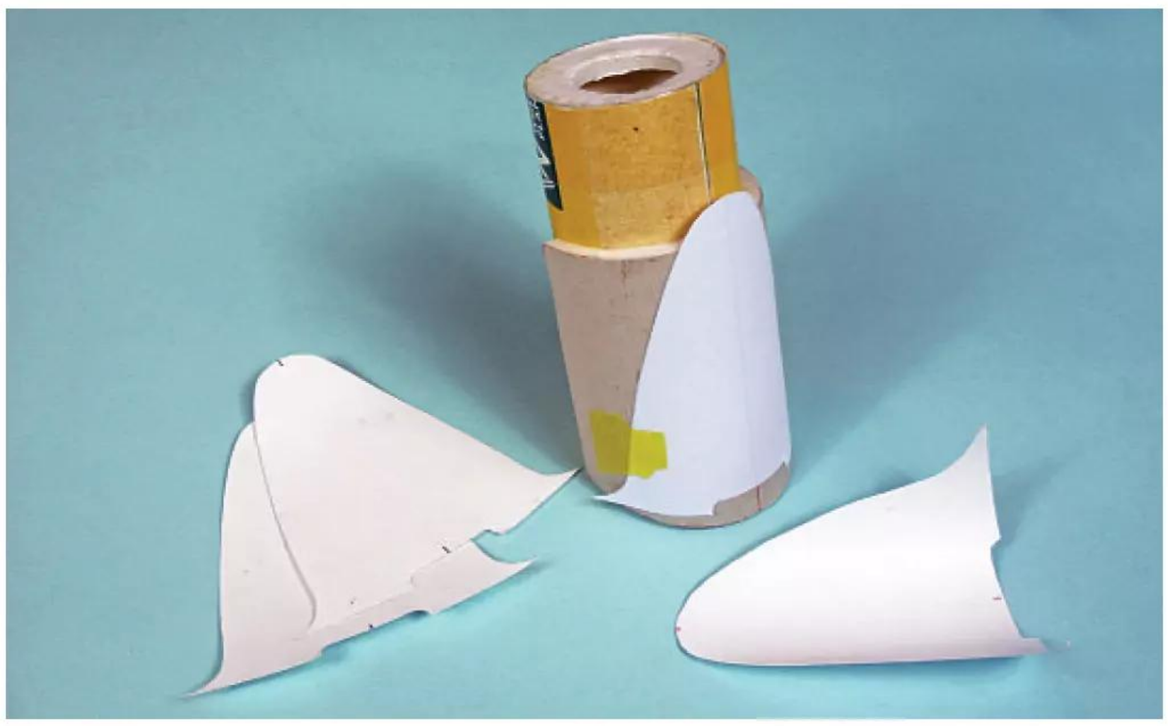
Fuselage nose sanded smooth and ready for final painting.



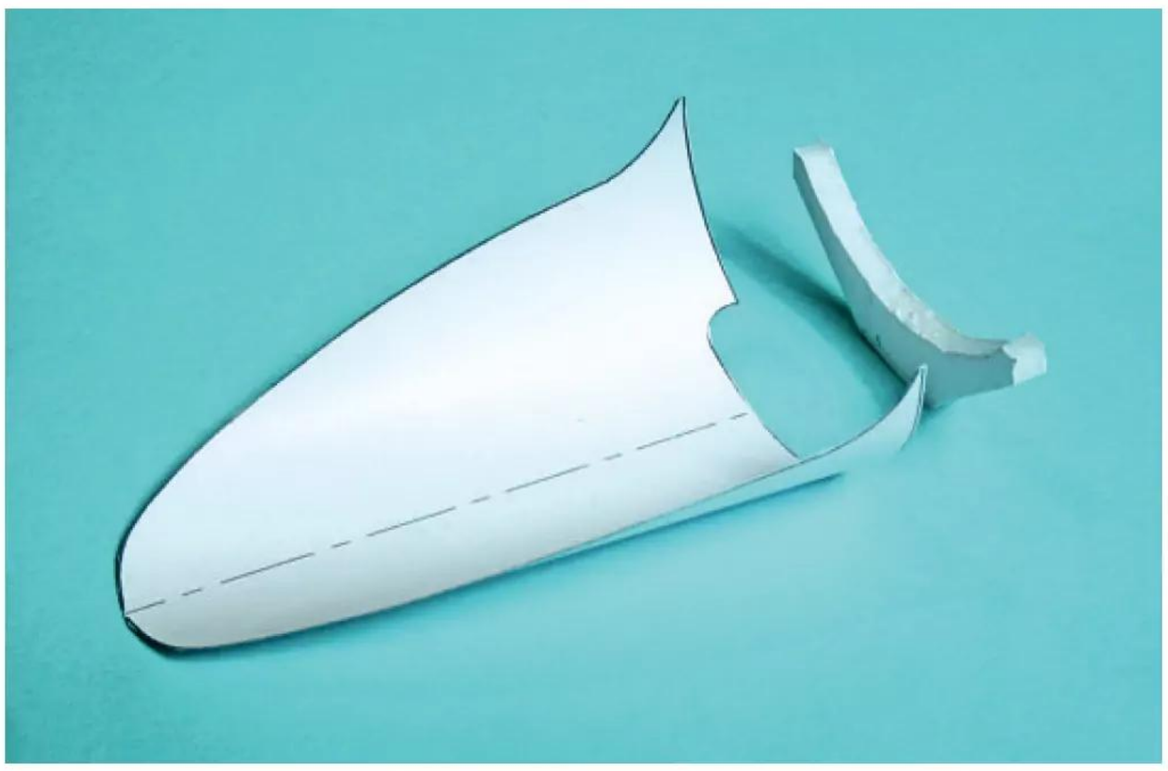
I shortened the output wires from the ESC before installing. Check the EDF rotation before gluing the wings on.



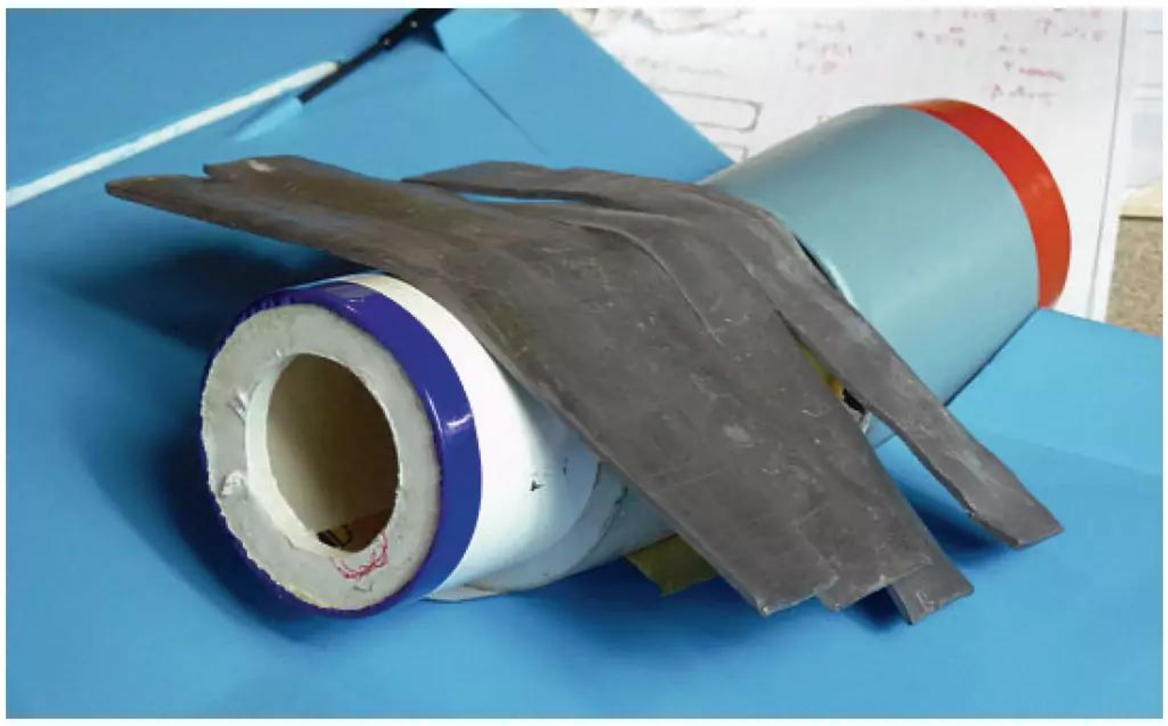
Wing fixing lugs are glued into the wing with Gorilla Clear and before the glue has dried the wing is glued onto the fuselage.



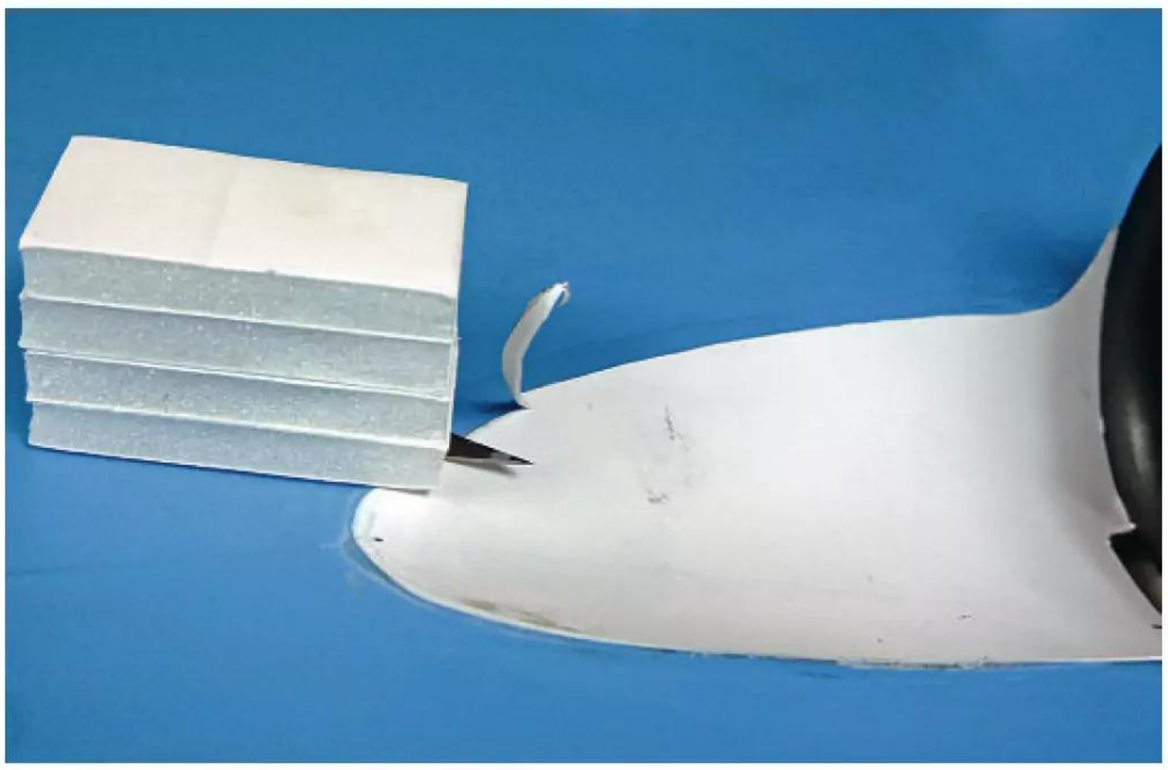
EDF inlet scoop is made from two pieces of card with the glue sides together and heated whilst held on the mandrel to form the curve.



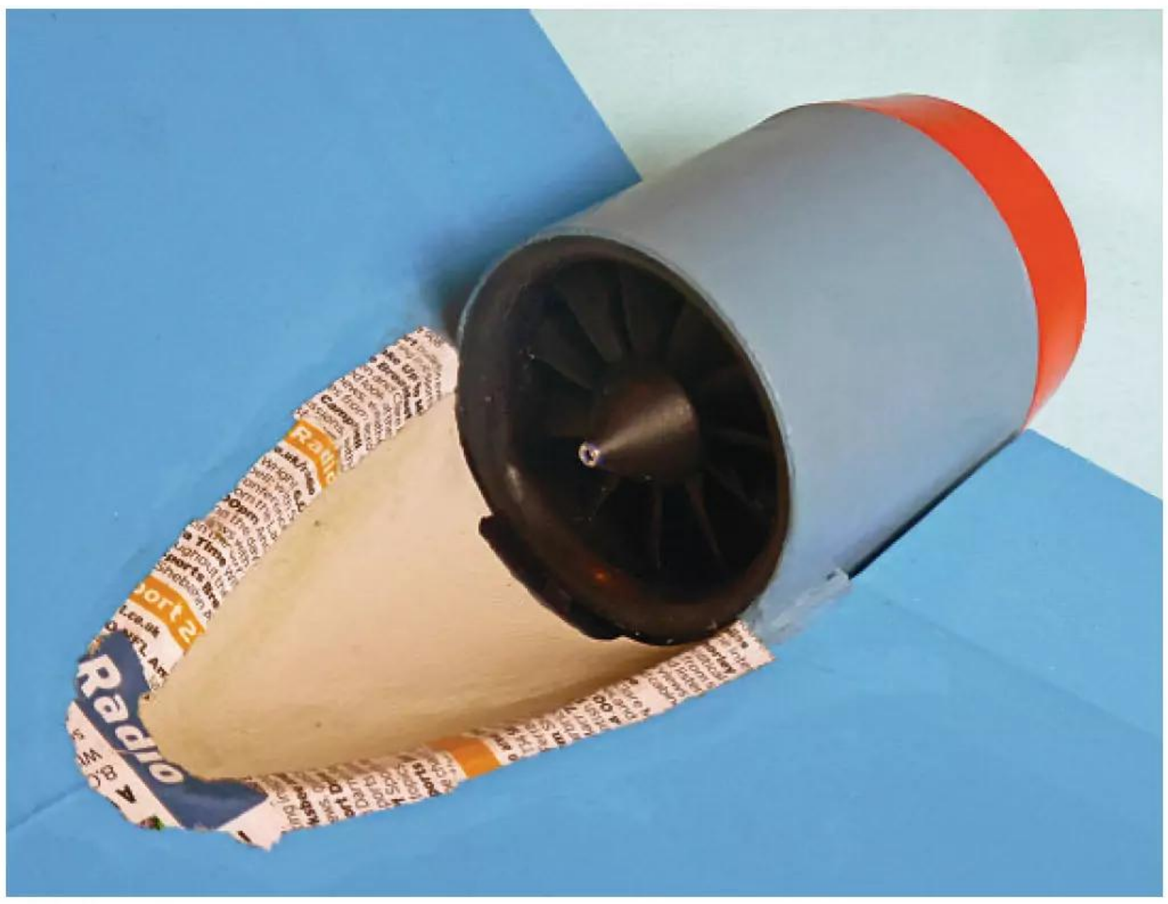
Inlet scoop and F4 ready to be glued in.



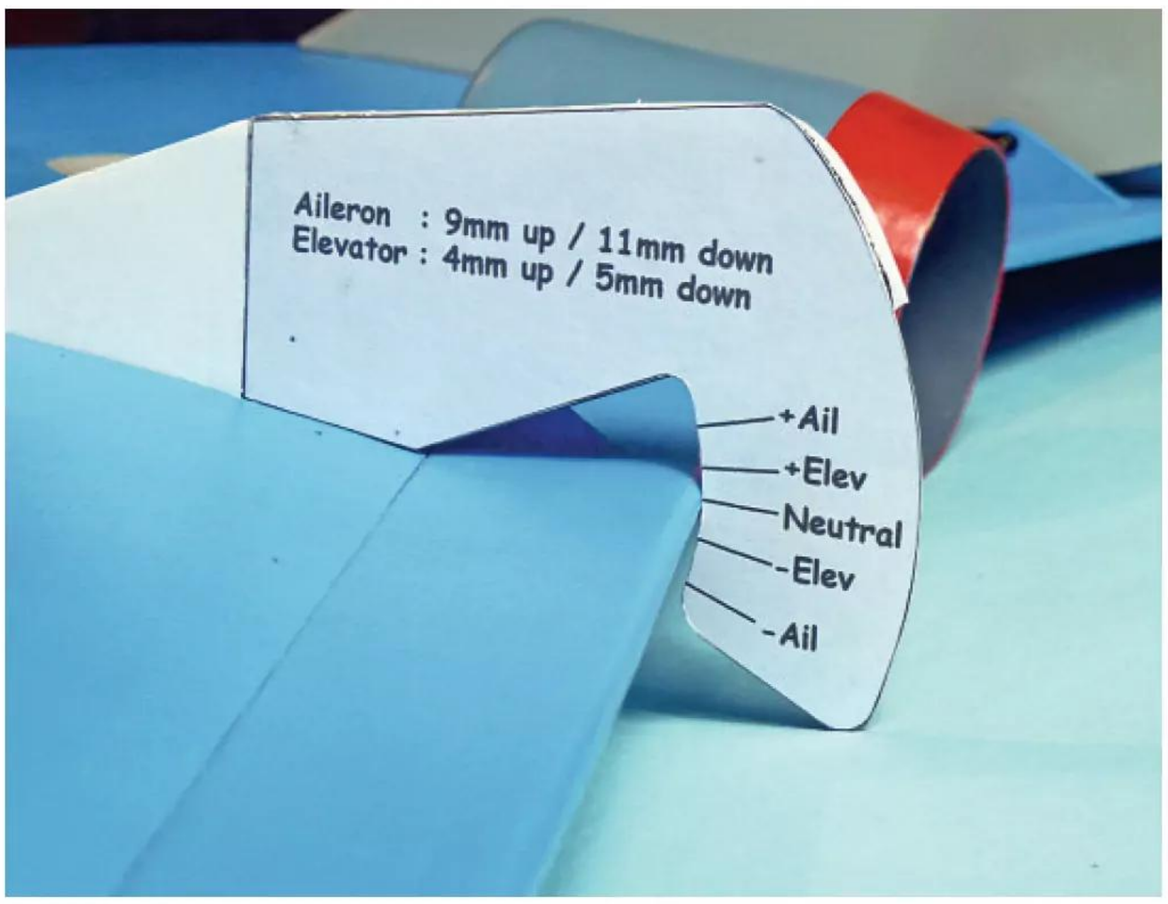
Place the inlet scoop mandrel into the scoop and weigh down to push the scoop into place while the glue dries.



Use the special tool to trim the scoop flush with the top of the wing.



If the junction between scoop and wing is a bit messy, tidy it up with some thin paper and thinned glue.



Elevon Throw Gauge in action. Slide into the fin slot and make sure it is sitting at the bottom of the slot before adjusting the clevis.

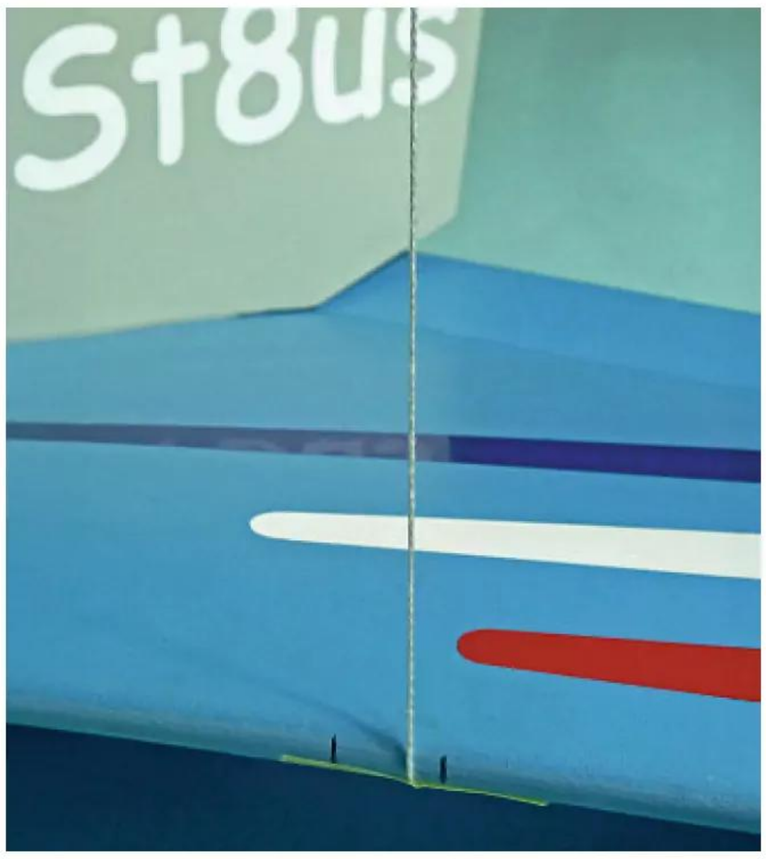
the metal geared versions for extra security. The plan shows a handy gauge to set up the elevon throws. Those shown are a good starting point.

Ready to fly, the original St8us weighs 615 g. Before heading off to the patch I plugged my Wattmeter into the circuit and recorded 10.2V, 43.6A, 440W. I also measured the thrust at 705 g. That's a thrust to weight ratio of 1.15:1 which bodes very well for some exciting flying!

TRIM TO SUIT

St8us has a very wide speed range. With a bit of up trim, she'll happily stooge around at 20 mph or so but once the throttle is opened up the combination of fixed pitch and high revs from the EDF unit, along with the low drag airframe, means she'll fly straight and level at 74 mph. That's only 9 mph slower than terminal velocity in a dive. Yes, I did measure them! This wide speed range means you'll have to choose which trim settings to go for.

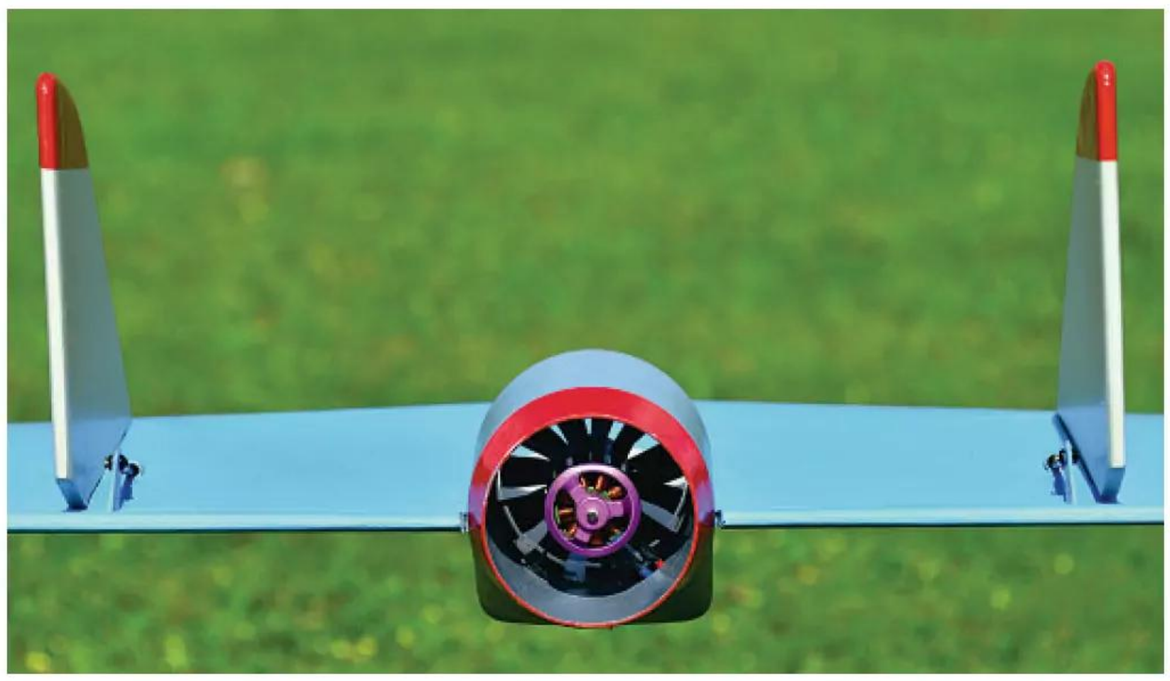
As presented here the 'sweet spot' CG, elevon reflex and control throws give a great sport aerobatic performance. There is a slight climb when the throttle is opened but some folks like that. The CG can be moved forward if preferred which eliminates any stall, but don't go past the forward limit as you'll start to lose elevator authority. Move it back at your peril though! Even at the rear limit shown there is an increase in pitch



String taped to the underside of each wing enables the desired CG to be easily achieved. My preference is slightly forward of the rear extreme.

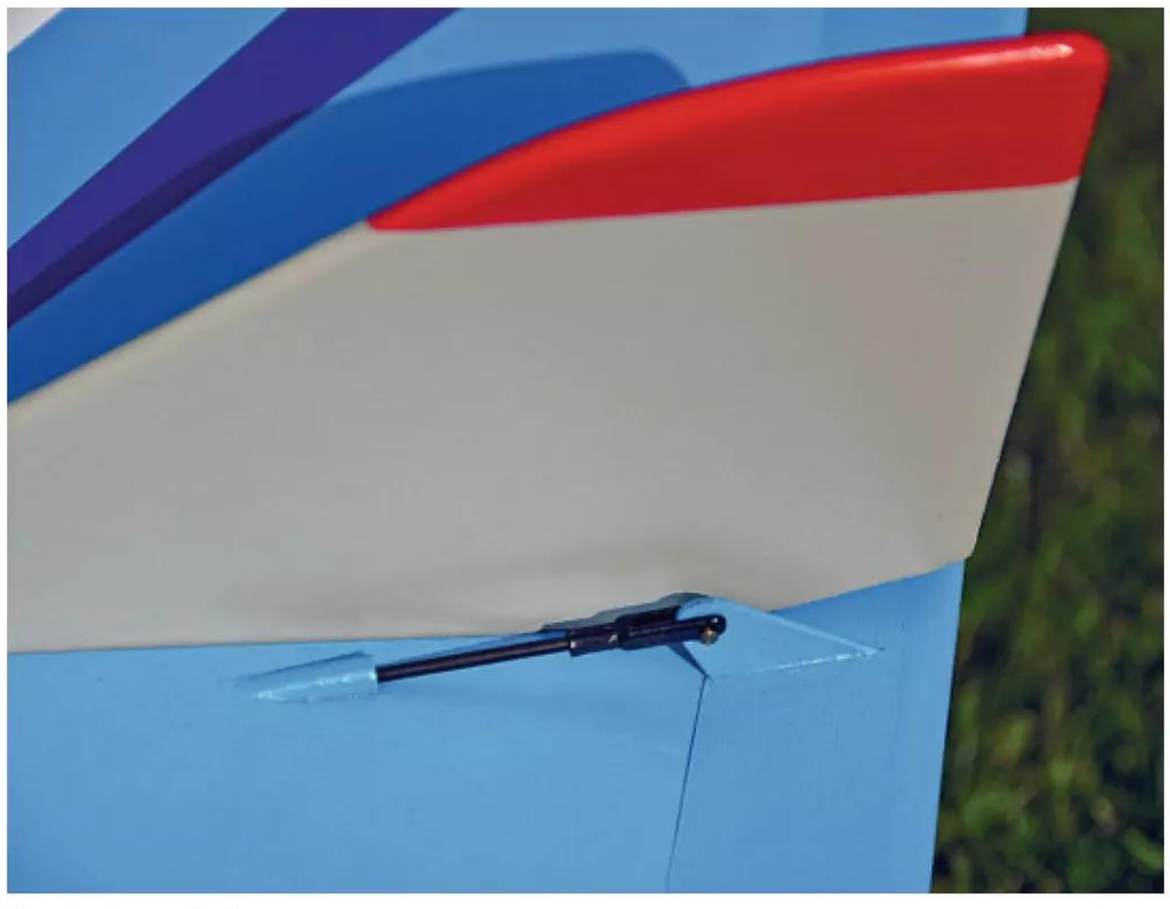
St8us will easily ROG in around six metres if the grass is closely mown and smooth.

A 50 mm PowerFun unit from 4-Max provides plenty of urge using a 3S LiPo.



Fan and fins' rear view.

Purists will say the air intake is pointing the wrong way but, fear not, negative pressure at the inlet to the EDF sucks in plenty of cooling air, through and over the LiPo.



Neat elevon linkage.

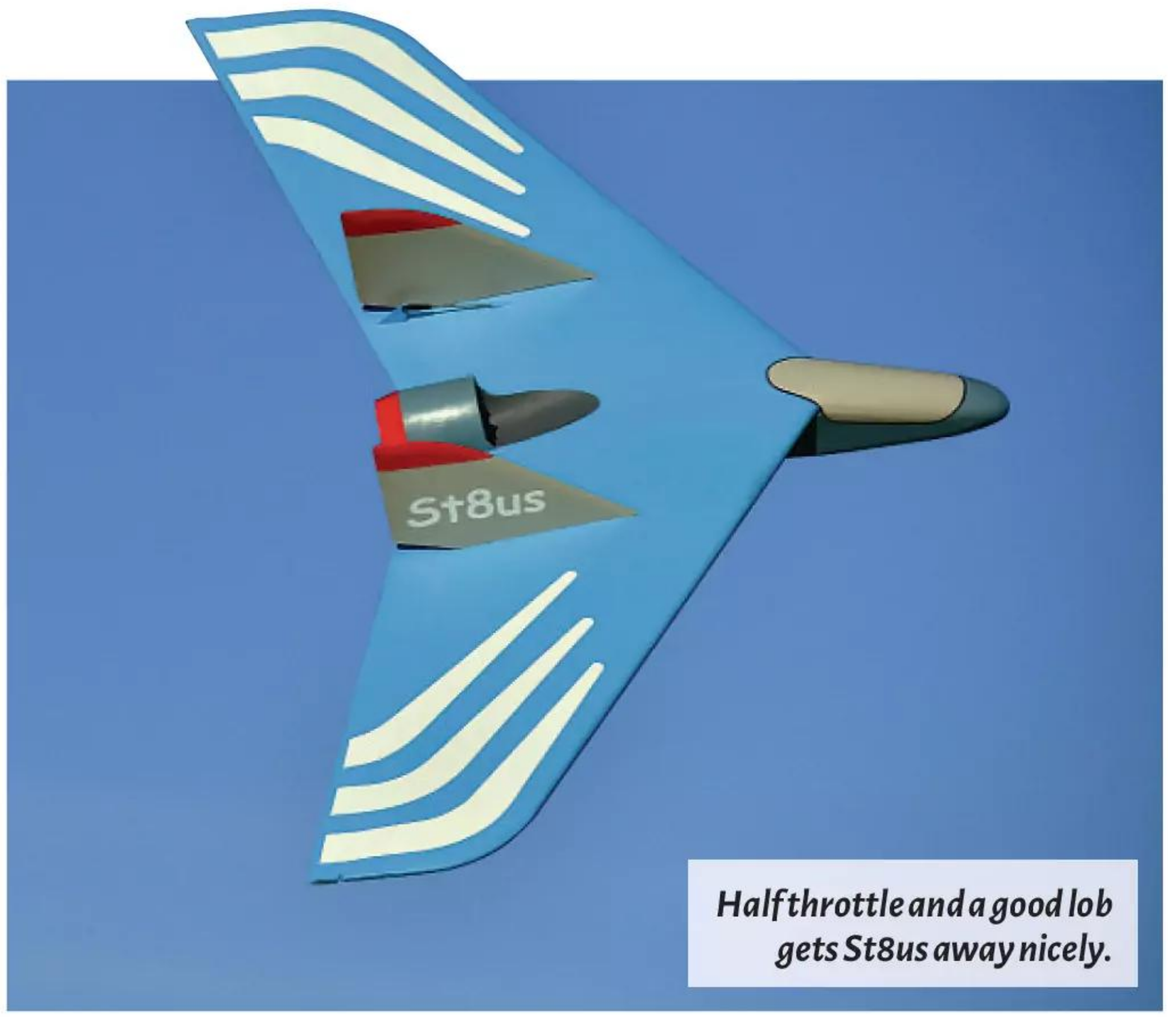
sensitivity, making her very twitchy and she'll tuck under in a dive. It's also very easy to drop into a flat spin which can take a full revolution to recover from - scary!

My personal preference is the set up as per the plan with a tiny amount of down elevator compensation mixed in with the throttle to cancel the climb out on full power. There is only the equivalent of three or four clicks of down trim introduced at full throttle, but this flattens out the flight path nicely and makes for some exciting high-speed aerobatics and low-level passes.

FLYING ST8US

St8us gets away from a hand launch with around 50% throttle and no worries of a damaged finger! She'll also easily ROG in around six metres if the surface is smooth. No rudder is required as there is minimal torque from the EDF unit. Once the EDF gets on song St8us is off and you can throttle back to get familiarised with how she looks and behaves. Once happy, have yourself a ball!

St8us is easy to fly but is quite fast, especially on full throttle and soon becomes very small. I find it best to only use full power on power



Half throttle and a good lob gets St8us away nicely.

With the CG shown as shown on the plan she only requires a touch of down when flying inverted.

When landing the glide can go on and on, especially if there is no headwind.

Scan this QR code, or visit the link shown, for construction shots and views of St8us: https://www.modelflying.co.uk/st8us-build/

Designer Mike Freeman and St8us toying with the summer thistles in the Derbyshire Dales.

hungry aerobatics and the occasional beat up the strips. This throttle management lengthens the flight times. I have my timer set to three and a half minutes throttle on to give me around six minutes total flying time, which suits me fine.

St8us will do all the usual aerobatics not requiring a rudder. She does some lovely big jet-like loops and with the CG shown on the plan she only requires a touch of down when flying inverted. I find 30% expo helps soften the controls around neutral while allowing some crazy antics with the sticks in the corners!

With power off St8us glides nicely. I've flown mine as a slope soarer and she handles the conditions very well. The good gliding performance becomes a bit of an issue though when landing, especially if there is no head wind as it can take a while to bleed the speed off to get her to settle.

FINAL ST8US REPORT

Foamboard has turned out to be a quite resilient building material. The first two prototypes took some abuse, with multiple crashes and cartwheels while I was sorting out the washout, reflex and thrust angles.

DATAFILE

Name:	St8us
Model type:	EDF flying wing
Designed by:	Mike Freeman
Wingspan:	1000 mm (39.4")
Wing area:	0.22 m² (341 in²)
Fuselage length:	510 mm (20.1")
Flying weight:	615 g (21.7 oz)
Wing loading:	28 g/dm² (9.2 oz/ft²)
Functions:	Elevons (2), throttle (ESC)
EDF Unit:	4-Max 50mm PowerFun 3S 5400 kV
ESC:	4-Max 50A Switch Mode BEC (4M-HESC 50AV2)
Battery:	3S 1800 mAh LiPo
Peak power:	440 W (325 W/lb)

The wing is particularly strong, but a few creases appeared on the nose which didn't curtail any of the test flying and can easily be filled and repainted. The only real nemesis of foamboard is water so make sure all areas are kept covered or painted to prevent moisture ingress.

I've thoroughly enjoyed working with this new material. Learning new skills and techniques during the design development has been a total joy. I'm really chuffed with how St8us turned out. She looks a lot better than my first attempt 33 years ago, shown in the last issue! The fabulous flying performance is the cherry on the top. I hope you get as much enjoyment out of building and flying your own St8us. ■

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It's good to be back flying. My new Fantasista 70 is ready to go.

FIRST FLIGHTS OF THE YEAR

Keith Jackson reports on more build projects on the go, getting ready for the new F3A season and flying the BJ Craft Fantasista 70

Words: **Keith Jackson**

Photos: **Keith Jackson, Dan Workman**

The BiSide biplane concept was originally launched by BJ Craft nearly 15 years ago and it is fair to say that the model didn't prove to be as popular as other BJ Park airframes at the time. In fact, it was so long ago I was still flying my YS four stroke powered Angels Shadow and Axiome models! Ten points to anyone who still remembers these lovely aeroplanes.

Fast forward to 2025 and the model has been substantially re-designed according to the current FAI schedules, along with input from top Spanish pilot Juan Rombaut. The model features a larger fuselage volume with increased side area, along with a reasonably heavy swept wing planform that has been so successful in the BJ Craft Anthem monoplane design in the last two years flying the P23 / P25 schedules.

The tailplane is now fixed and features separate elevators which are intended to be driven by servos in each half, rather than the All-Moving-Tailplane that was used on the original.

I understand Juan is intending to campaign this model in the 2025 season leading up to the World Championships being held in the USA later this year. His website **www.rombautrc.com** showcases the BiSide Ultimate, as it is now

named, in several informative video links. His version utilises the Dualsky CRS3500 AE contra rotating system rated at 3.5 kW along with a Summit 100XHV ESC, driving 23 x 20 propellers front and back. In addition, Dualsky servos are employed to drive all the surfaces as well as their range of LiPo batteries up to 5900 mAh in size.

Earlier this year I had the opportunity to assemble a Biside Ultimate and found the model followed conventional build practice employed on all BJ Craft models. The build quality was very good and it was nice to see that this appears to improve year on year. An Adverun XS v2 contra drive system was fitted with a D3 ESC for power control, the intention being to drive Falcon 23 x 20 propellers as per Juan's setup.

The model has now made its way up to Scotland and I look forward to seeing it fly in competitions in the coming months.

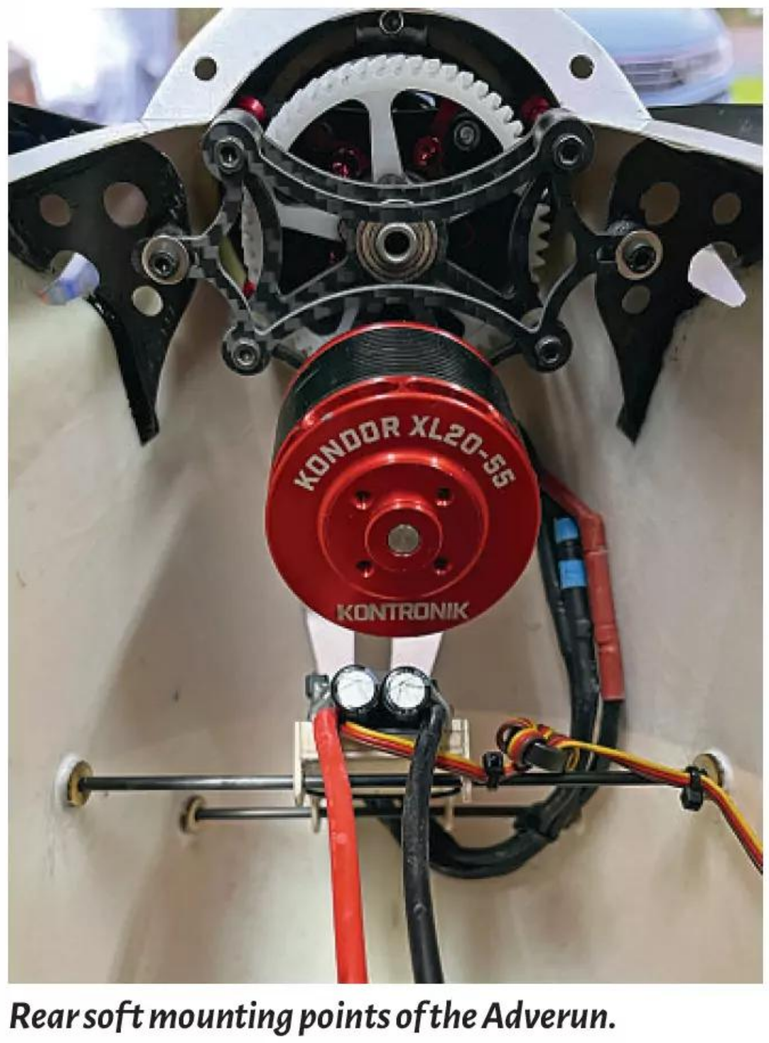
FLYING NOTES

It's great to finally get out and fly! I am writing this column in March, having not been able to fly since October last year due to flooding of our model site. First flights of the year, at the weekend just gone, were initially with the Chilli Breeze E, designed and built last year by Mike Delacole. At 48" span this lightweight 4S pocket rocket was the ideal choice to fly off a strip which was relatively rough after no rolling or cutting for six months. In fact, I needn't have worried at all as the grass surface

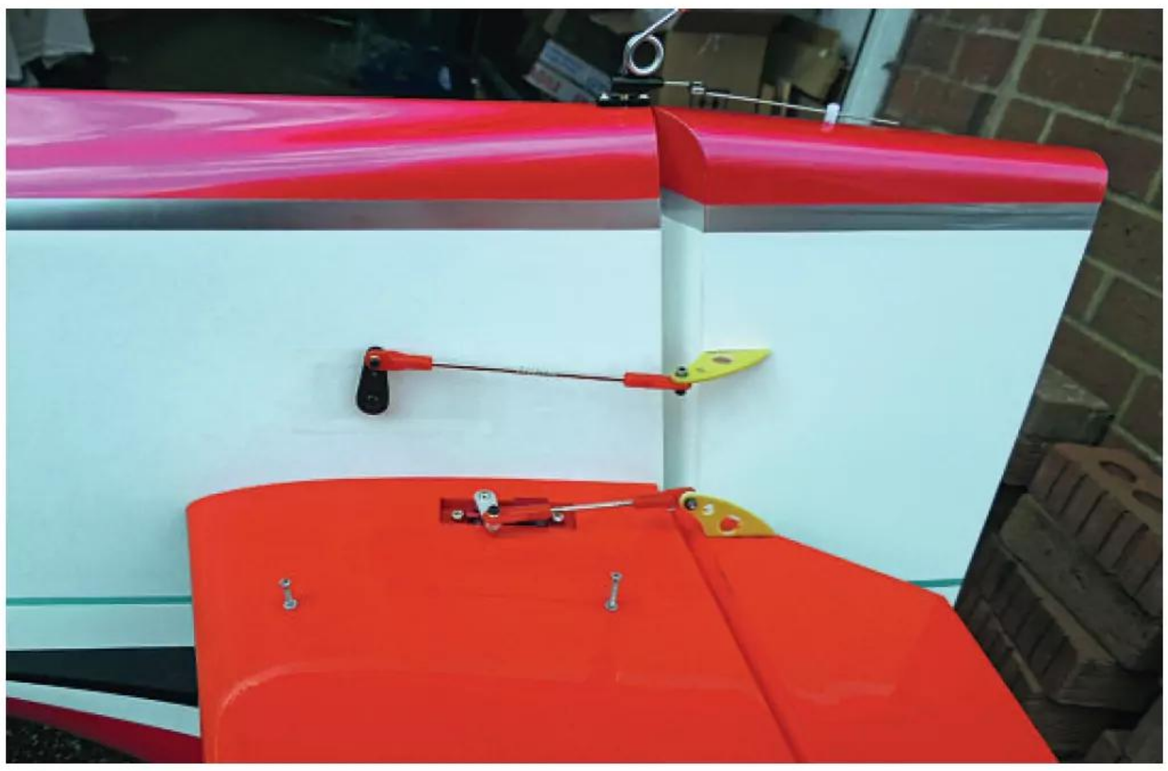
Gorgeous BiSide Ultimate from BJ Craft.

Rear view of the BiSide.

Early part of the build showing the all-important contra drive mounting ring being bonded into position.

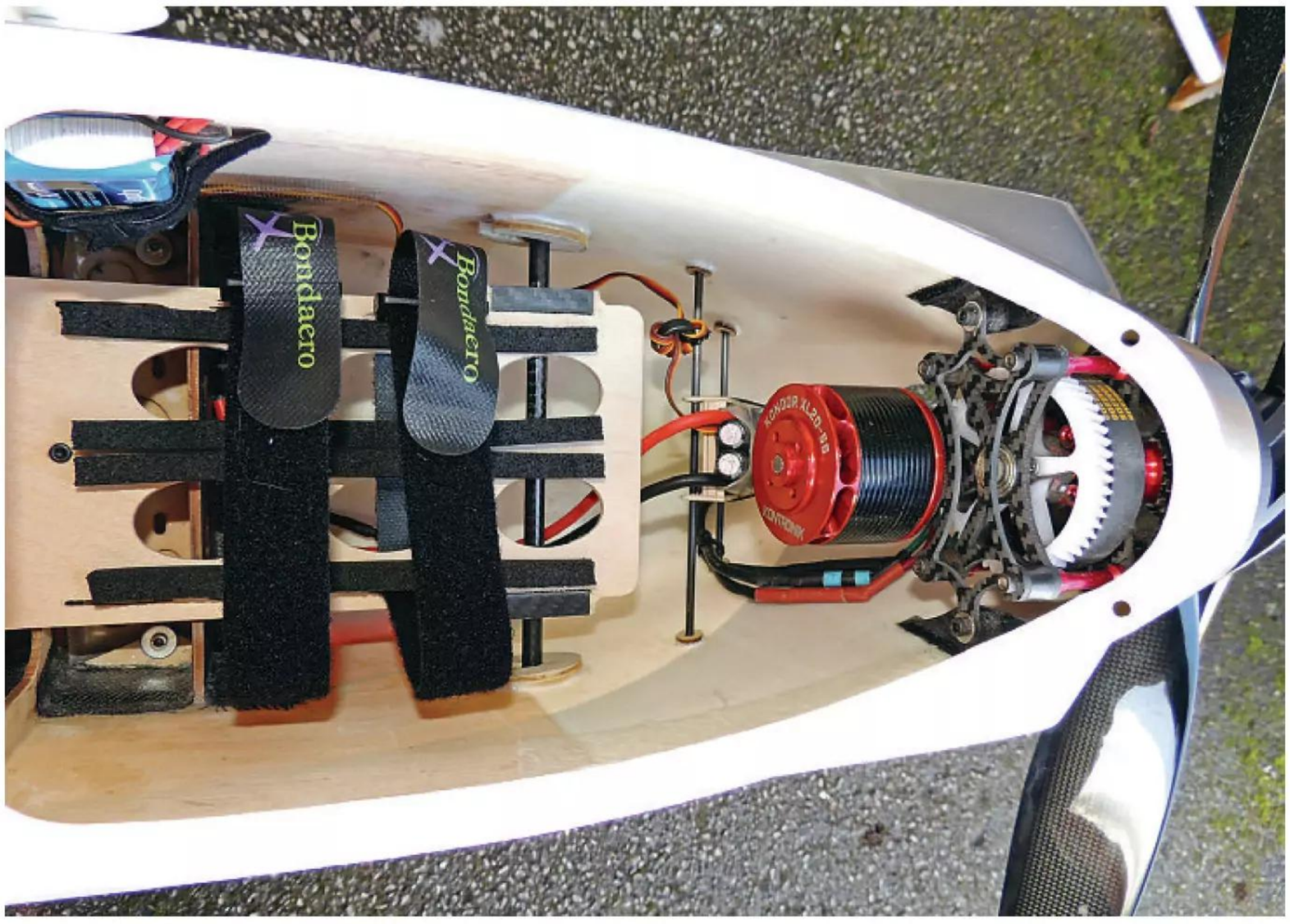


Rear soft mounting points of the Adverun.



Tailplane installation showing a nicely covered MKS HV747 rudder servo, with a MKS HV6130 for elevator (and aileron) control.

A three-servo wiring loom was constructed for the rear controls, shown here exiting into the cavernous fuselage where the receiver is mounted.



Forward fuselage installation showing the Adverun and D3 finally mounted along with the removeable battery tray.

Frontal cooling arrangement for the Adverun installation and a nice 3D printed cooling spinner from Stuart Mellor.

was in relatively good condition despite the 'horrible conditions throughout the winter period. Regardless, the Chilli Breeze fairly leapt into the air and I was soon settled flying in the warm and calm conditions that were uncharacteristically present in mid-March.

The Chilli Breeze E is a model I have not spent enough time with and it was apparent I was over controlling a bit in rolls and other manoeuvre elements. However, the model, being perfectly straight, fast and smooth made the first couple of flights of 2025 quite easy, slowing down on power off to allow a gentle landing on the uneven strip.

It was great, getting those first flights done and proving to myself I still knew what the sticks did! In those first flights I couldn't remember any of the current FAI schedules, so I just threw the model through some pretty standard manoeuvres, as a refamiliarisation of flying as opposed to doing any proper F3A type flying. I was mindful however of the last time I did this a few years ago, when after re-starting

"I couldn't remember any of the current FAI schedules, so I just threw the model through some pretty standard manoeuvres"

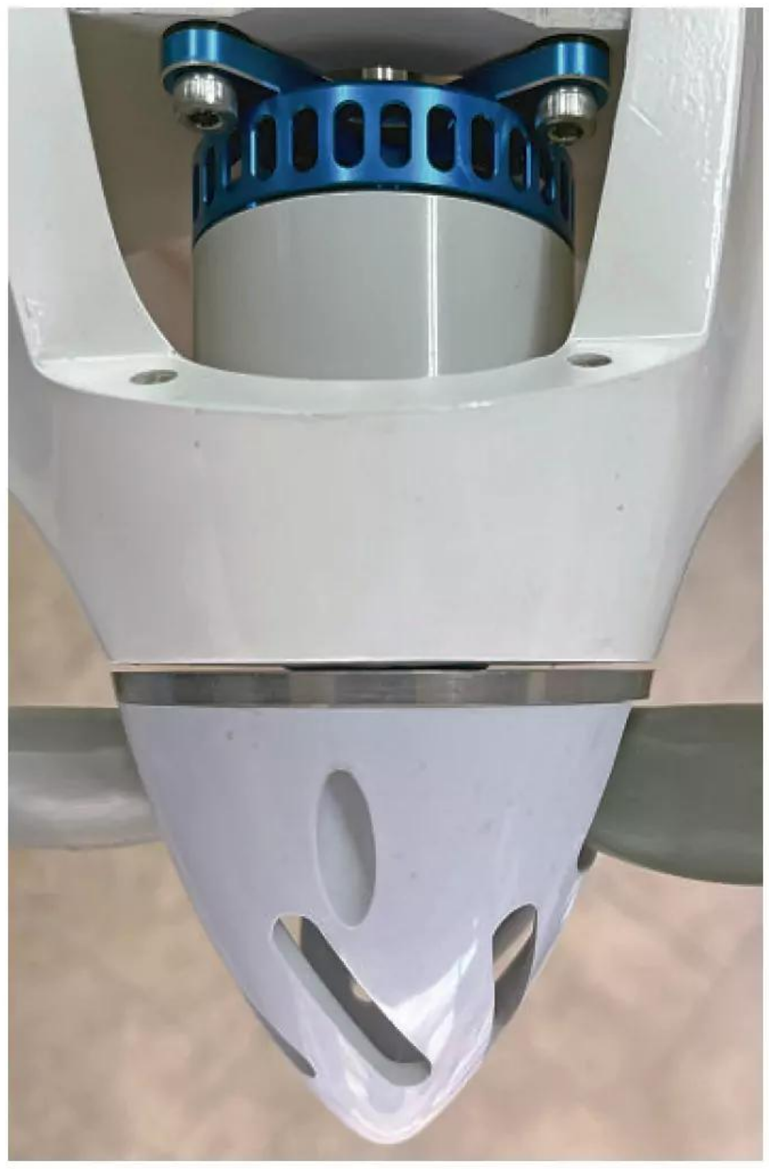
flying after recovering from a bypass operation, I managed to fly my pride and joy, my first BJ Craft Fantasista 70, straight through a tree lurking on the corner of the field that I hadn't noticed before! Suitably subdued, I then went onto the real objective of the outing, the first flights of my new, replacement Fantasista 70.

FANTASISTA FIRST FLIGHTS

Readers of this column will know that I consider the Fantasista 70 to be a gorgeous creation. It was designed by Japanese superstar pilot Yoichiro Akiba and has been very successfully kitted by BJ Craft since 2018. This is my second model of the Fantasista, for the reason mentioned above, and I had high expectations of this superb airframe. The model did not disappoint, flying virtually straight off the board with only minimal elevator trim required. It tracked straight and true and I felt that my aspirations for this model were about to be fulfilled. The model was powered by a SunnySky 4130 380 kV motor turning an APC 16 x 12e propeller using an Optipower 6S 4250 mAh LiPo pack, the latter weighing in at 636 g.

First flights are always a little deceptive. Sometimes they go well and you feel that this is the best model you've ever flown. Alternately, issues like wing / aileron warps show up very quickly, as was the case with my Skyleaf Biplane several years ago, which required 2 mm aileron offset to fly straight and level. In

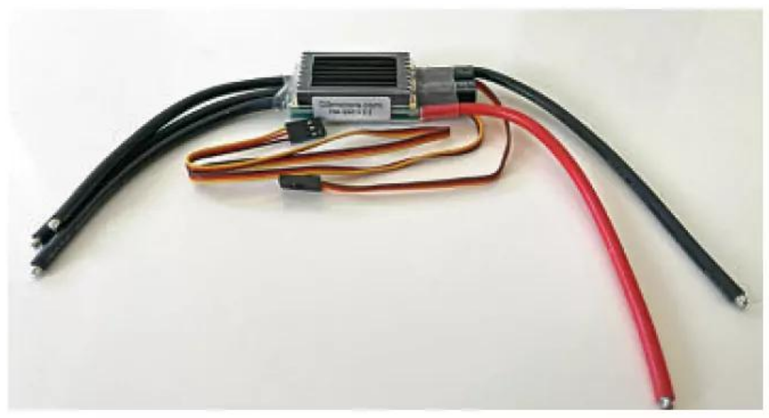
Plywood gauge used to set the All-Moving-Tailplane incidence for the Fantasista 70.



Spinner perfectly aligned to the nose ring with 1 mm clearance!

Rudder rate settings for low and general throttle stick position.

Rudder to Aileron mix for the Fantasista.



D3 ESC from Adam Debowski at D3Motors (www.d3motors.com).

that case replacement wings were provided by the manufacturer and the issue completely disappeared. Fortunately, nothing like this happened with the Fantasista and the model flew as well as I remembered the original.

Setting up the elevator, or in this case All-Moving-Tailplane (AMT) incidence, is a little tricky as there are no easy references on the model to align to. Initially, I set the tailplane up approximately using a plywood gauge supplied by BJ Craft, which centres the tailplane in the middle of the tailplane joining slot cut into the fuselage. The real AMT incidence, however, was arrived at after the first flights and was reassuringly very close to where I set it with the gauge. I then checked the incidence of the wings to the tailplane and this was confirmed to be 0.6° as expected.

Two more flights followed the day after, thankfully in very calm conditions, and this allowed me to tune the response of the controls more accurately. Back in the 1980s the advice was to set the aileron response to give three continuous rolls in five seconds. However, I feel that as we are all individual then the ideal is to set the response to where you are most comfortable, as long as it can achieve what you need to do in any particular schedule. I tend to set up the model to be as docile as possible, to counter my shaky hands! Others prefer really sensitive set ups where the pilot just needs to breathe on the sticks to enact a roll or loop segment. There are pros and cons of each approach. Too sensitive and you are forever chasing having the model fly straight and level; too little movement or too much negative exponential and control inputs can appear mushy, meaning that crisp direction changes cannot be executed.

With the relatively large side area of most modern F3A designs, rudder control should be set so as not to cause a direction change if you accidentally move the rudder stick. However, to enable the model to perform Stall Turns with a tight radius the maximum rudder movement possible is required. To facilitate this a control rate or a flight condition can be used, triggered by a simple switch or a more sophisticated defined point on a control stick input. For example, at low throttle, such as during a stall turn, the flight condition could be triggered to change rudder movement from a low setting (i.e. for normal flying) to a high setting.

Revoc covers.

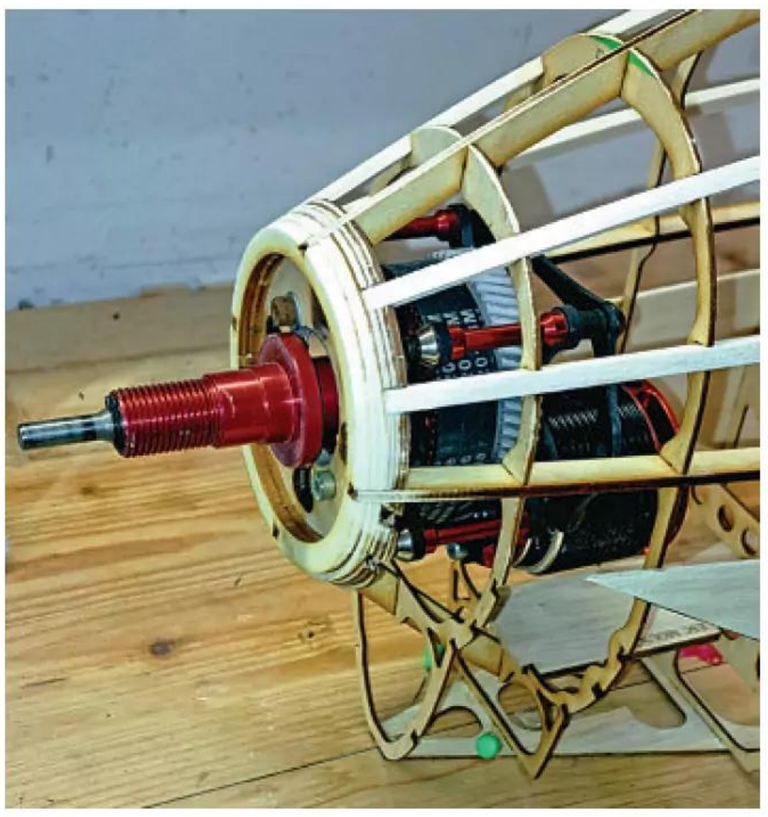
With the flight controls suitably tuned I then progressed onto checking thrust lines by pulling to a vertical climb to check right thrust (this being required for the mono propeller set up) and down thrust. The check for this is simple - in vertical flight, does the model pull to the canopy (downthrust required) or push to the belly (too much downthrust present). Similarly, does the model pull left or right, which requires the commensurate adjustment in thrust line to compensate.

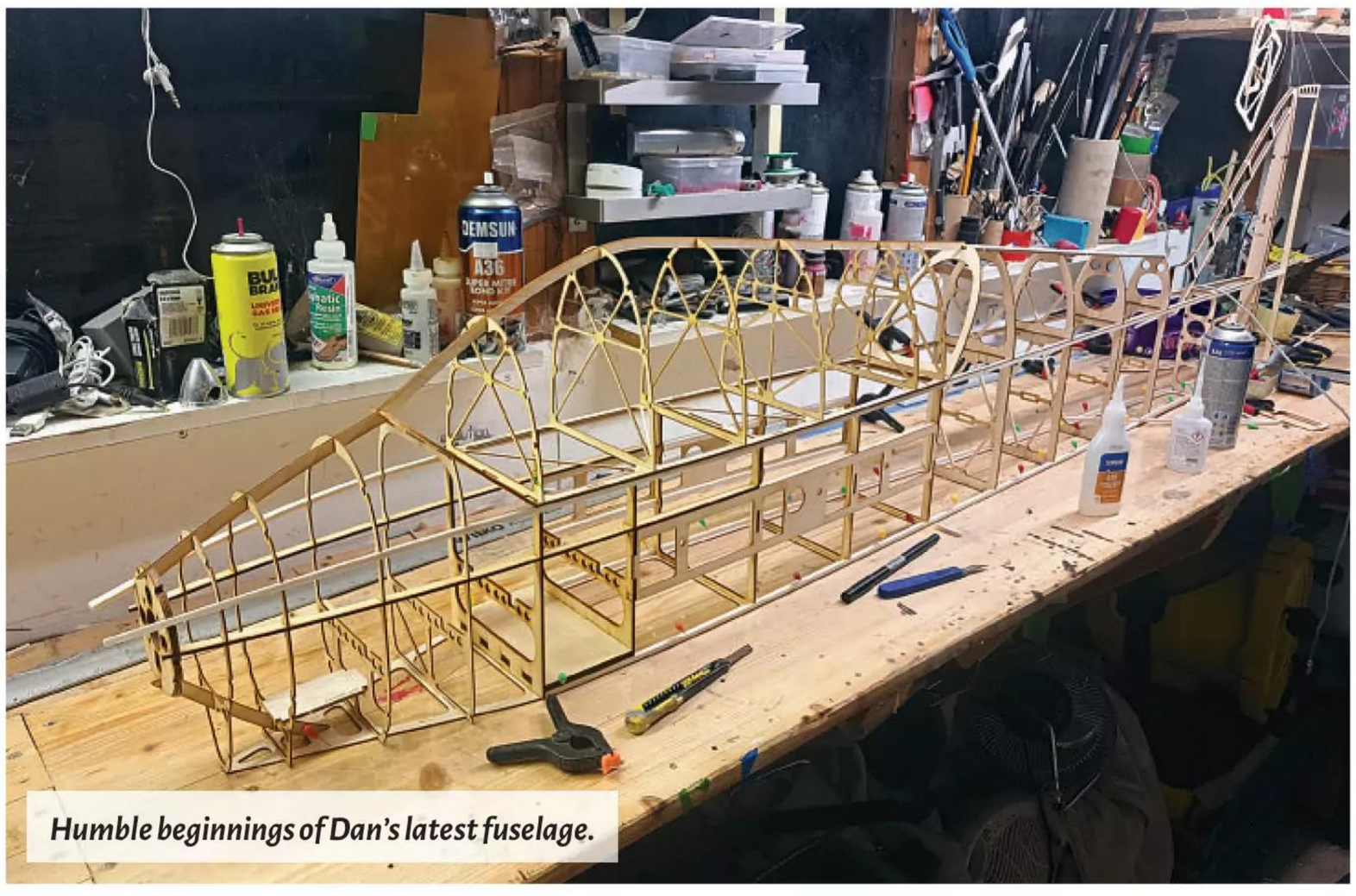
Thankfully these also proved to be perfectly correct with the model's spinner aligned to the nose ring of the fuselage. Pushing into a vertical power off dive revealed the normal pull to the canopy that is almost impossible to trim out. This can be counteracted be the careful use of a throttle to down elevator mix, only triggered when the throttle position is below a certain point. An alternative to this is to trim according to the 'Zero G' method, which has the wings and tailplanes aligned at 0° and motor thrust lines adjusted to give vertical climbs. The drawback to this is that the pilot then has to fly with constant elevator input to maintain straight and level flight.

The next flying session just days later allowed me to check the more subtle trimming points such as rudder to elevator and rudder to aileron coupling. Most transmitters have the capability to implement a mix to counteract this trim issue; my mixes are shown on the previous page. Fortunately, only very slight coupling occurred rolling in the direction of right rudder and rolling opposite to left rudder input. No pitching with rudder input occurred even with the relatively high rudder inputs required for knife edge loops.

The most recent session saw me pushing the Fantasista through the first half of FAI P25 with surprisingly good results. In fact, I was so impressed that I have started to think about optimising the propeller size to improve the power-off braking (the model does speed up significantly in downlines as expected) and have APC 17 x 10 and 17 x 12 sizes arriving shortly.

I also emailed Adam Debowski at D3Motors to see if they had a suitable ESC to govern the speed to the SunnySky motor which would create some additional propeller braking. It turns out that the standard D3 ESC can be configured to be used in a 6S setup, which would work very effectively at controlling the model's speed.


Adverun XS v2 installed.



Humble beginnings of Dan's latest fuselage.

Rear canopy area, now with some sheeting.

Fin structure.

Now complete after some careful shaping.

> "No pitching with rudder input occurred even with the relatively high inputs required for knife edge loops"

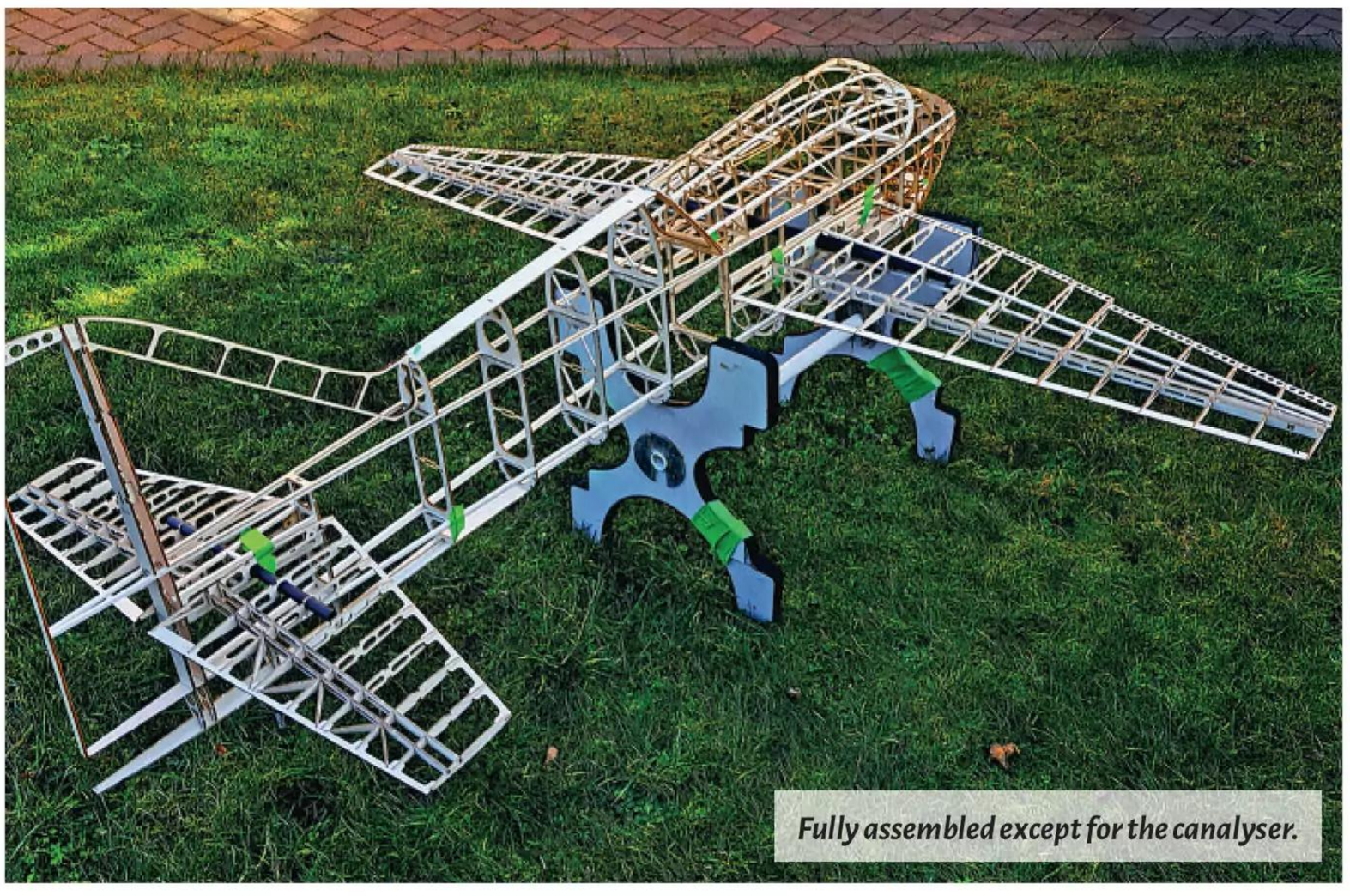
REVOC MODEL COVERS

Everyone will know the pain of finally completing your dream model only for it to be unceremoniously dented whilst moving it carefully from the garage or shed into the car and back. Model covers are the solution to these unfortunate events and whilst bubble wrap can go a long way to protecting your precious F3A model, some of the best covers commercially available come from Polish company Revoc.

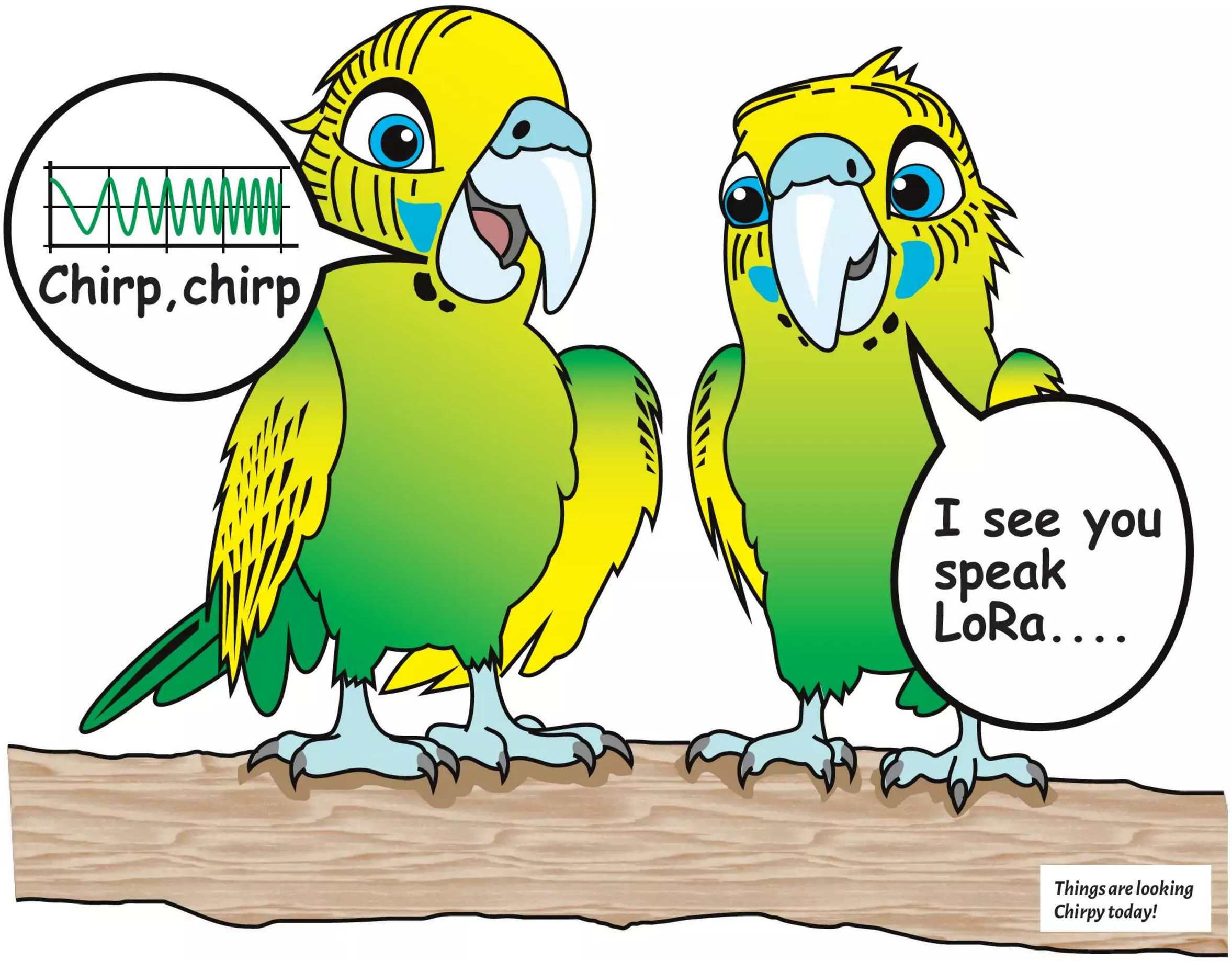
These fantastic model bags comprise a tough outer fabric layer with a soft fabric liner. High-quality, heavy-duty zips provide closure to a variety of bag styles depending on the model type and there are many bespoke covers designed specifically for the more popular airframes (e.g. Glacial, Proteus, Fantasista Super etc.). Different grades of fabrics can be chosen depending on the level of protection required, going from Standard, Soft line, Aluminium line and Hybrid line. These products are described in great detail on the website, which even offers a custom fitting service. Other products are also available such as sun covers, transmitter harnesses, canopy covers and more. More details can be found at **https://shop.revoc.eu.**

AND FINALLY...

No start to the season would be complete without a new design and build from Dan Workman. By his own admission he is lucky to have more than one season from one of his designs before new directions appear to him and a new model is born. Last year Dan built and flew his Halo biplane design and achieved his first UK team position. This year the biplane is gone and a new monoplane is taking shape, broadly similar to the Proteus monoplane. More details will be featured in the next edition but for now here are a few pictures from his (rather rapid) build. ■



Fully assembled except for the canalyser.



EXPRESS LRS

Kev Scott provides an introduction to ELRS

Words & Photos: **Kev Scott**

If you are looking to buy a Radiomaster, Jumper or FlySky transmitter, one of the options that you will come across is Express LRS (ELRS for short).

These radios also come with a graphical interface that uses EdgeTX (previously called OpenTX) but the two are separate. A transmitter can use EdgeTX but not use the ELRS protocol, for example.

In this article, I will give an overview of what Express LRS is, its benefits and quirks and then go on to cover EdgeTX in a future issue.

THE TECHNOLOGY

Before discussing ELRS we should start with LoRa (from 'Long Range') which it is based on. LoRa was patented by a French company in 2014, who were then acquired by another company called SemTech. Without going into too many details LoRa uses a chirp (think budgie!) waveform which is a frequency that increases over time. It also uses spread spectrum but there is nothing new with that; most R/C manufacturers like Spektrum already use that.

Due to this particular encoding scheme LoRa can use low power and work over very long distances and as a result is widely used in the 'Internet of Things' which can be thought of as Wi-Fi but operating over tens of kilometres. It is used to track cattle with GPS ear tags, talk to smart parking meters and to talk to sensors on fields to see if crops are sufficiently watered. These applications all use frequencies in the range of 900 MHz.

The author's RadioMaster TX12 Mk. 2.

Some of you might be thinking, '*Well, if it can track cows and where they are, can it track where my plane has come down?*' The answer is yes, as long as you have a GPS module on your plane as well. We will get into that more later.

ELRS is just a defined set of messages that run on top of the LoRa radio signals and it also uses the 2.4 GHz frequency that we are all familiar with.

WHAT SORT OF RANGE

You might ask what sort of range we are talking about. The maximum range that has been achieved with a fixed wing model running ELRS is just over 40 km, with the Tx (transmitter) power set to 25 mW, which is a good bit below the EU limit of 100 mW. This would have been under best case conditions however, but it can be seen that very long range is possible.

I did a small ground-based experiment of my own with my ELRS setup at one of my flying fields. I walked up the drive and over the main road and partially down the road opposite, which was approximately 350 metres. The Tx was using 10 mW power (it dynamically increases it as needed) and the signal strength at the Rx (receiver) was -83 dBm. Without going into all of the maths (because nobody other than me really cares, right!) that means the ground-based range could be up to 8 km.

All of this is maybe interesting from a geek's (e.g. my) point of view but for the flying we do it is, to a large extent, irrelevant as all model flying is line of site. So, it is only required to operate up to, say, 400 metres away. But it is nice to know that additional range is available if needed and, more importantly, that there is a lot of spare capacity should there be any interference - or trees in the way!

LATENCY

ELRS has its origins in drone flying and one thing drone flyers get very excited about is latency, which is the time it takes for information to be transferred from one place to another (come to think of it, they all talk fast as well!). They don't want any delay between starting to move a control stick and their drone reacting to it. With that in mind ELRS offers update rates all the way up to 1000 times a second. You can also trade update rates for greater range (it's a LoRa thing!) and you can reduce the update rates all the way down to 50 times a second.

TX12 telemetry display.

> "I did a small ground-based experiment of my own with my ELRS setup at one of my flying fields"

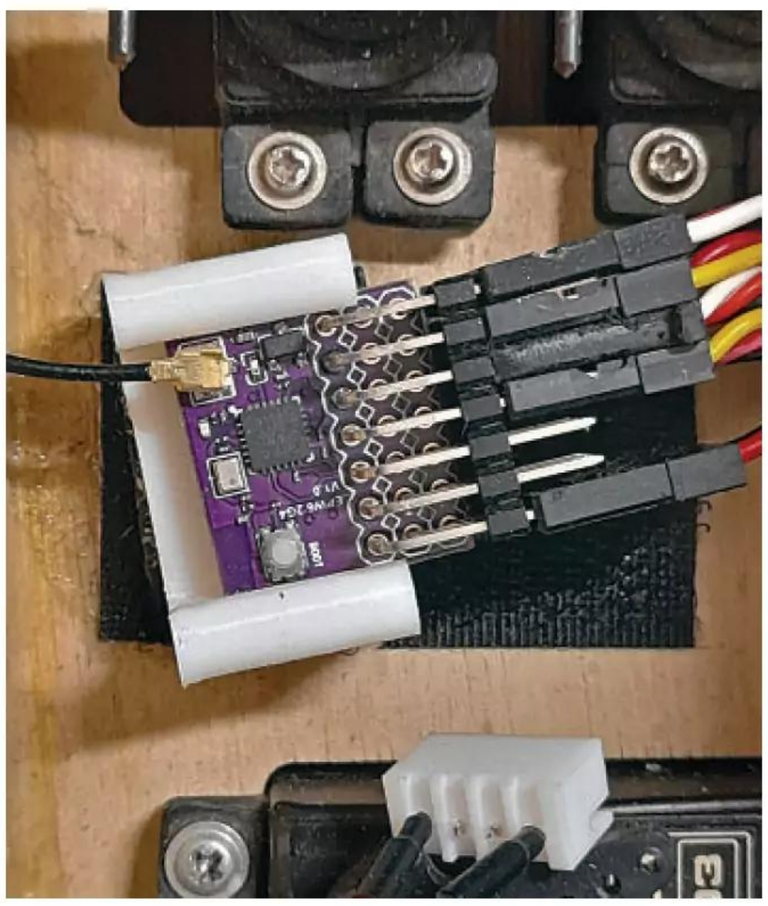
For our type of flying these faster update rates are generally not required. The typical person has a reaction time of 200 ms, so if you are landing your plane and it suddenly catches a gust and veers to one side by the time you react and the servo moves you are easily going to be looking at a quarter of a second at least.

SIXTEEN CHANNELS

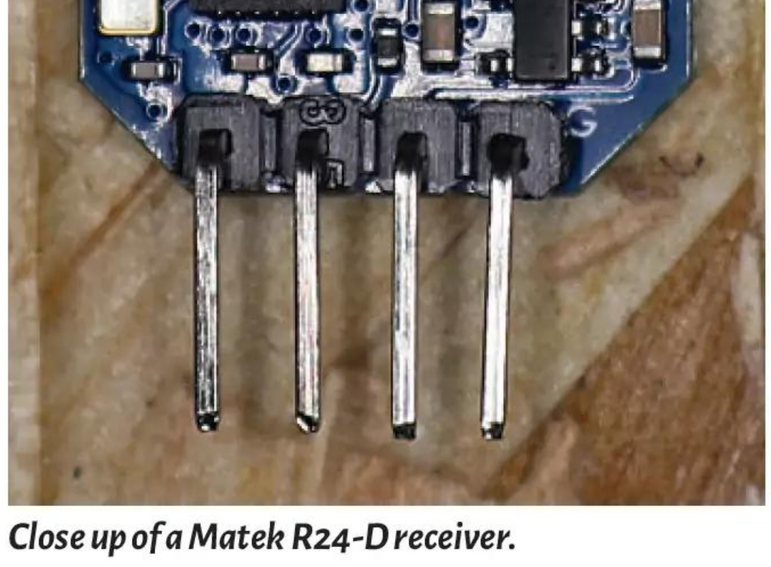
All ELRS receivers and transmitters are 16 channel capable. Receivers can be bought in the traditional servo output based configuration or with a serial output. I tend to use a combination of the two.

If I am putting a Rx in a typical 'throw about' plane, like my four channel Jumper 25 trainer, I usually go for the Happymodel EPW6 TCXO 6 channel receiver. You can see one fitted in my trainer in the nearby picture. At the time I installed this in the aeroplane I was mounting them in a small 3D printed bracket, as can be seen in the picture, but I have since stopped doing this. I now wrap them in clear heat-shrink, like you might see on an ESC. The EPW6 comes with straight pin outputs for the servos and you need to solder these on yourself. I like to replace the straight pins with right angled ones, as you can also see in the picture, but it isn't essential. If you are looking to get these connectors, I find you can either get 40 pin long ones on eBay and cut them up as needed or 'maker' type websites like Pimoroni sell them in shorter lengths (search for com1116).

This board weighs 1.49 grams and is 19 mm by 17 mm. It also has telemetry and in particular sends back the received power so that the transmitter can start to report when the signal strength is starting to get low. It also sends back a voltage sense measurement, typically the LiPo or NiCd voltage. This can also be reprogrammed to output Crossfire, should you want to talk to a flight

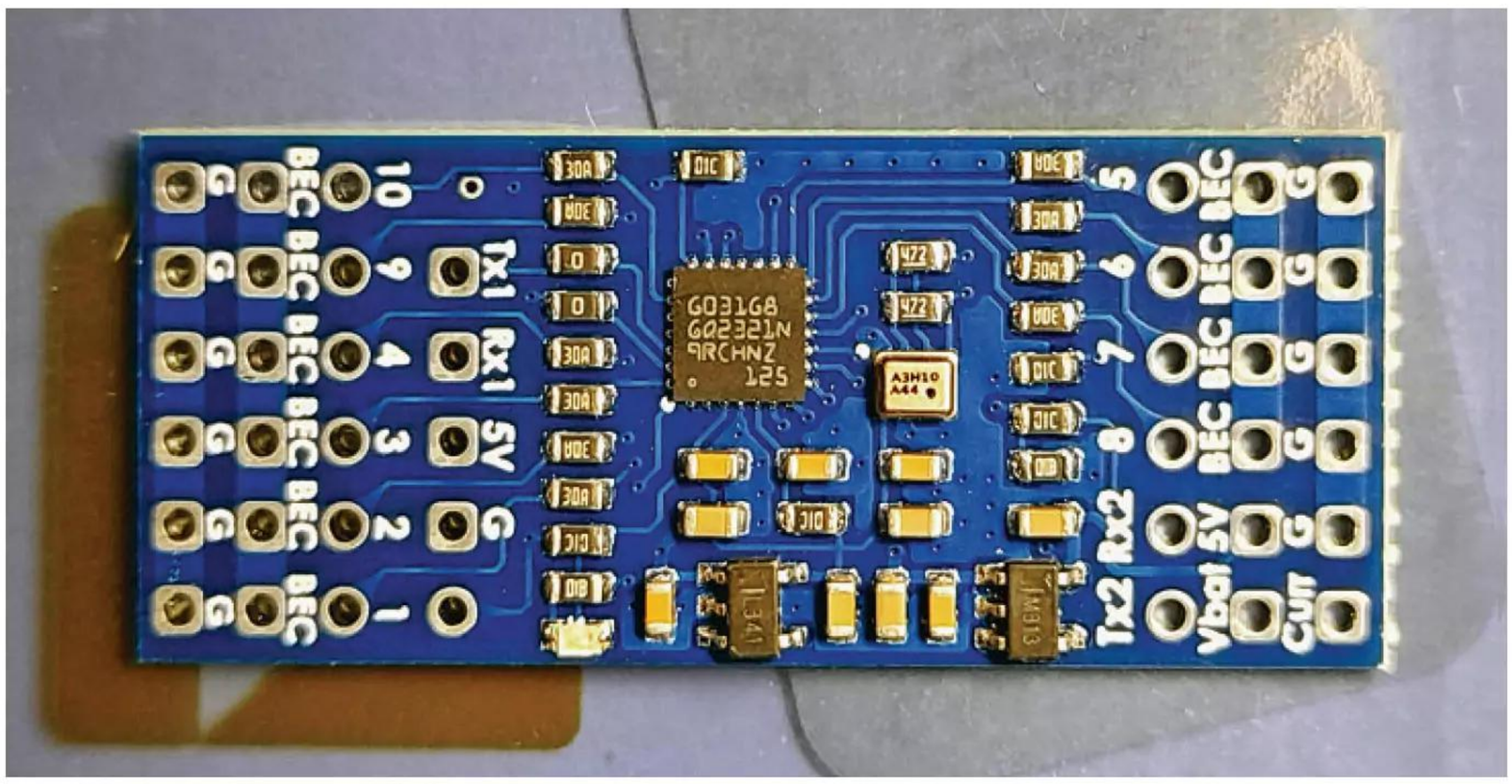


Happymodel EPW6 TCXO Rx in the author's Jumper 25 trainer.

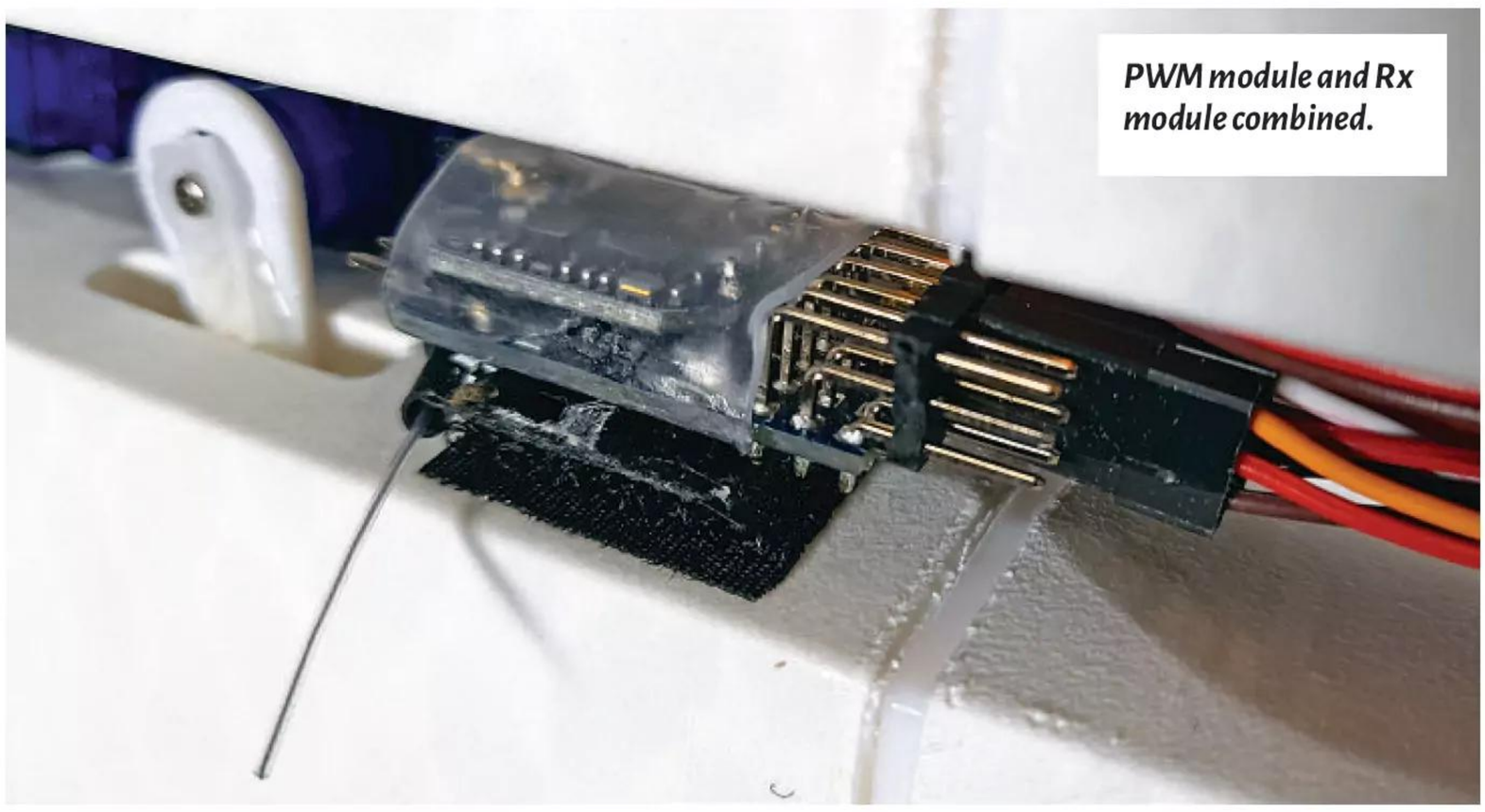


Close up of a Matek R24-D receiver.

Matek R24-D showing the dual antennas.



Matek CRSF-PWM-V10 includes a variometer.



PWM module and Rx module combined.

controller (more on that later). At the time of writing (and this is the best bit!) these can be bought for £11.85 from hobbyrc in the UK (**https://www.hobbyrc.co.uk**).

Note that receivers are available from a number of manufacturers (Happymodel, GEPRC, Matek, RadioMaster, to name a few). There is no lock-in forcing you to buy a receiver from the manufacturer you got your transmitter from, unlike some other brands.

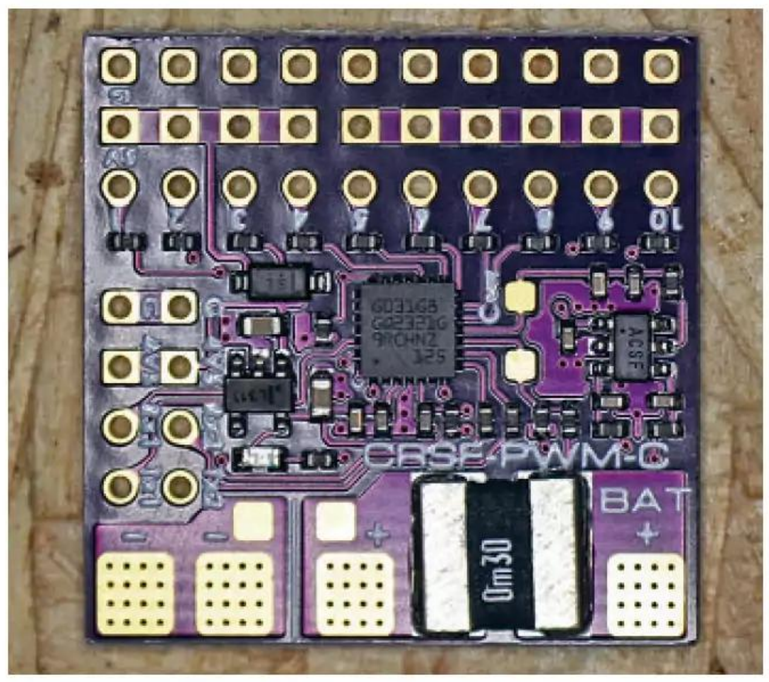
For some of my planes however, typically the higher value ones or ones I am going to use more as a test bed, I tend to choose a receiver that only has a serial output and instead comes with a transmit (Tx) and receive (Rx) pin. These are traditionally for connection to a flight controller and they output messages in a format called Crossfire, or CRSF for short. But they can also be connected to expansion boards that provide servo outputs again. These, therefore, give expansion opportunities; you can fly without a flight controller but then add one later if you wish. The receiver I like to use in this case is the Matek R24-D diversity unit. Again, I solder the connector pins onto the board myself.

If you are looking to control servos then the other board you need is a CRSF to PWM convertor. The ones I use are again from Matek and I always go for the 10 channel unit as the price difference between that and the 6 channel one isn't worth worrying about.

> "I typically put the Rx towards the tail of the aircraft to keep it as far away as possible from the high switching currents of an ESC"

There are two 10 channel boards to choose from: the CRSF-PWM-C has onboard circuitry to measure current being drawn, while the CRSF-PWM-V10 has a variometer. Both are capable of measuring battery voltage and can be connected to a GPS module and report the GPS telemetry back to the Tx.

In general, when I am using a separate Rx and PWM module, I usually place them some distance apart to maximise the sensitivity of the Rx. I typically put the Rx somewhere towards the tail of the aircraft; this keeps it as far away as possible from the high switching currents of an ESC, for example. The PWM



Matek CRSF-PWM-C has circuitry to measure the current being drawn.

module resides close to the servos and ESC in the middle of the aircraft. With only four wires to run between the PWM module and the Rx the connections are very straight forward.

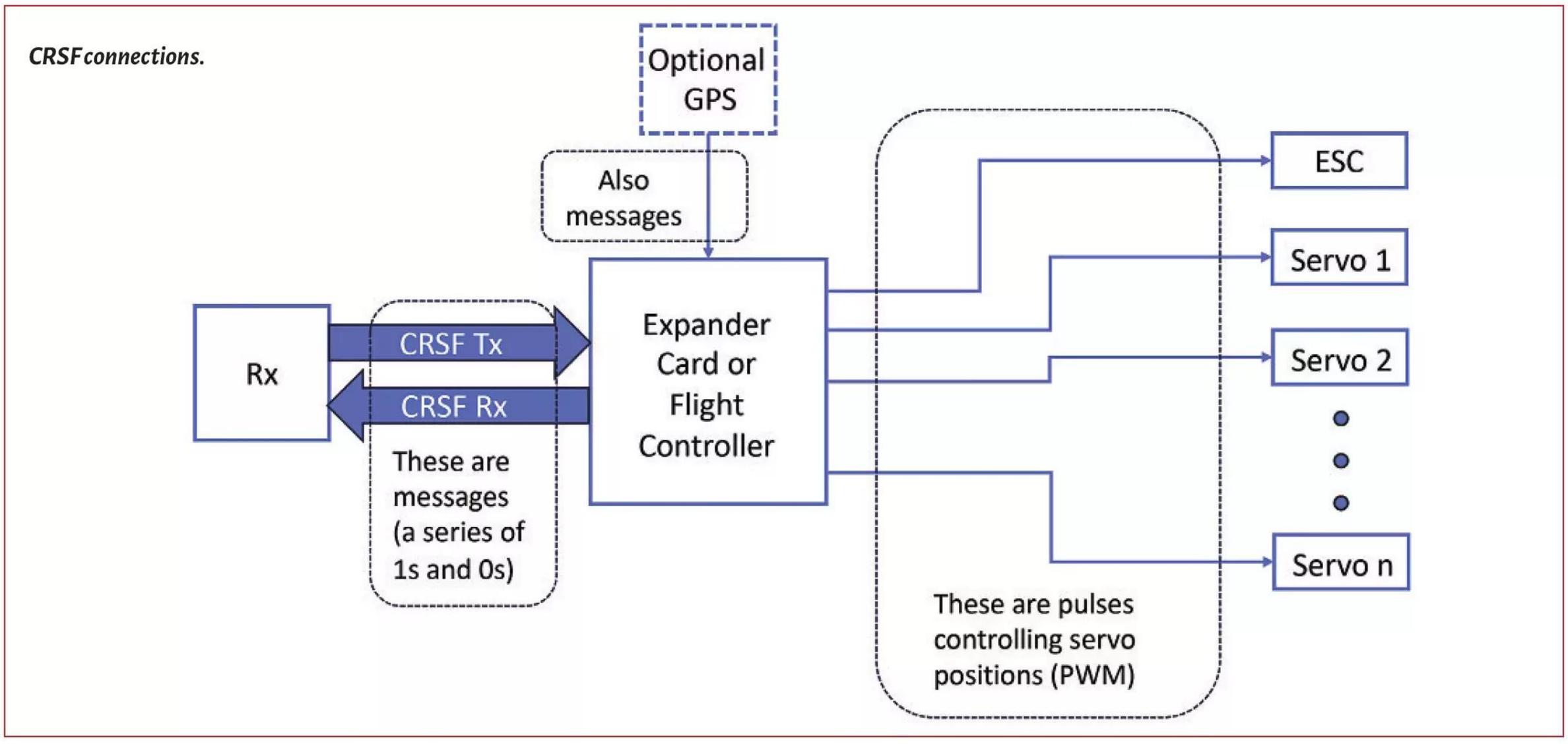
There are sometimes situations, however, where you want a diversity receiver but don't want to locate it any distance from the PWM module. Matek have considered this and allow you to directly solder the Rx on top of the PWM module as well. The picture nearby shows me using this very compact solution in a 3D printed 'paper plane' from PlanePrint.

When mounting these PCB based receivers, as I mentioned earlier, my usual technique is to put some clear heat shrink sleeving around them then, once it has been shrunk down, I glue some Velcro onto the back. Where you have a receiver that is very thin at one end (where the antenna is) and wider at the other (where the connectors are) I put a smaller diameter piece of heat shrink around the thin end (say 20 mm diameter) which then gives a tight connection onto the antenna connector. Then cover the whole PCB in a larger diameter piece (say 25 mm diameter). If you are looking for clear heat shrink, I have found the material sold by Switch Electronics to be very good. It comes in a minimum of 1.2 metres so you are unlikely to run out in a hurry!

CROSSFIRE

As described previously, when buying an ELRS receiver you get a choice. You can either buy a Rx with PWM outputs so that you can connect your Dupont servo connectors directly to it or you can buy one with a Crossfire (CRSF) output. Just to make things a little more interesting (I think that is the correct word for it!) some receivers with PWM outputs also allow themselves to be reprogrammed to talk Crossfire. We all know and love the PWM outputs, so I won't talk about that any more in this article. Instead, we will cover what CRSF has to offer in this brave new world.

CRSF uses a serial interface. It uses one wire to send information and another wire to receive it. You might see a term called UART if you are looking at documentation on this. Without going into the details, this just means that the transmitting end and the receiving end don't need to be accurately locked in frequency, which is a Very Good Thing! This means that a CRSF Rx only has four wires (Positive, Ground, Tx and Rx), irrespective of the number of channels it is controlling. The



CRSF connections.

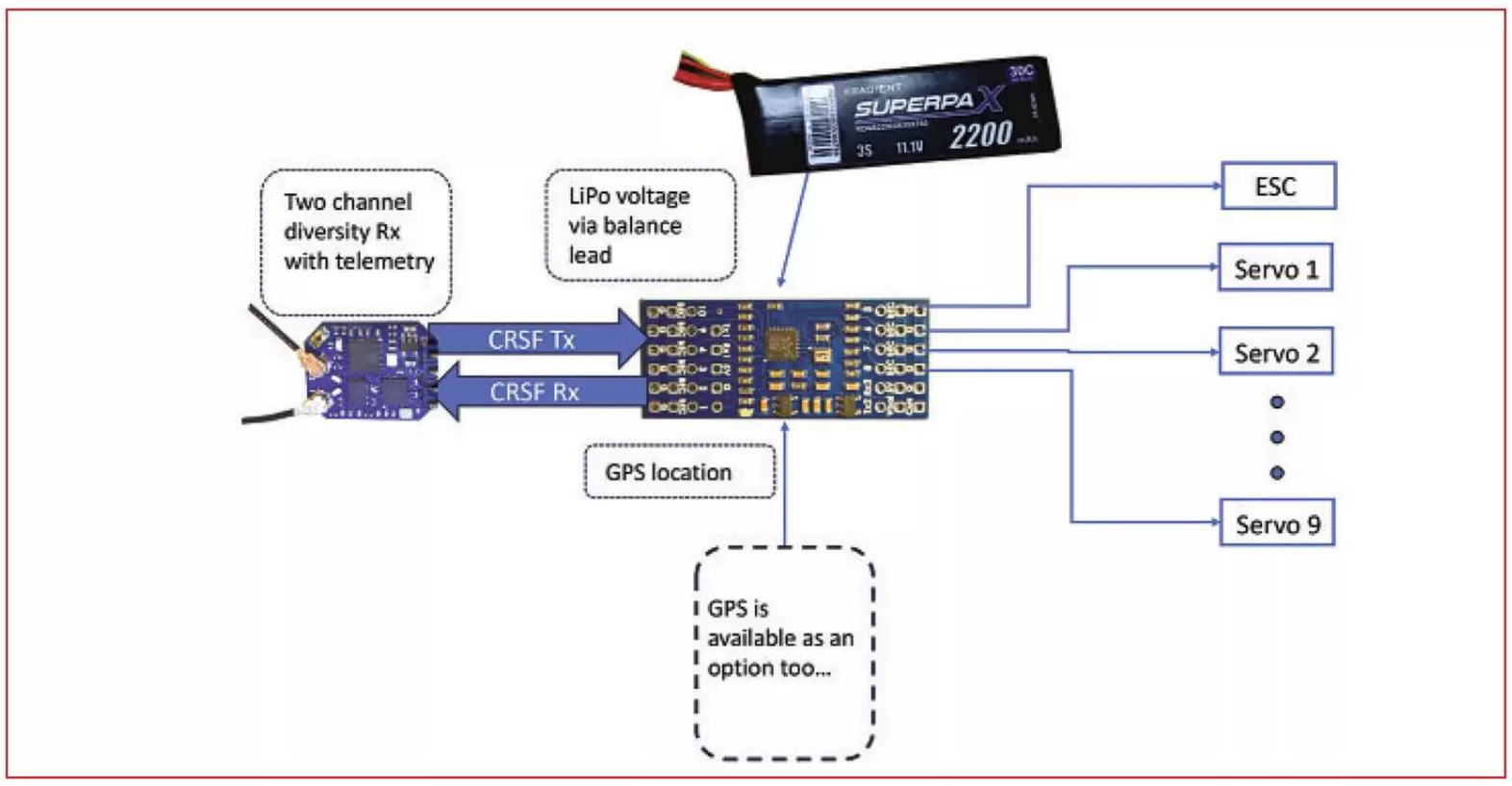


Diagram showing typical system parts.

Matek-F405-Wing V2.

the LiPo voltage. All of these are reported back to the Tx using telemetry.

I wouldn't be a frugal Scotsman if I didn't remind you how little all of this costs: Rx - £15.05, expander board - £8.45, both from hobbyRC. You do need to get the soldering iron out though and fit connectors and make up some cables yourself.

The connections between the Rx and expander card (or flight controller) are made of four connections in total: the 4.8V (or higher) supply, the ground return and the Tx and Rx lines. This is a bit different from the three-way (signal, supply and ground) connections that you will likely be familiar with. What I tend to do is make up a couple of two-way DuPont connectors, one carrying the supply and ground, and the other carrying the Tx and Rx lines. If you are accomplished with a crimping tool feel free to make up these cables. I, however, being an electronics engineer, get a bit nervous when I am using mechanical connections rather than something soldered and as a result I take a different approach which relies on the hope that someone else is better at crimping than I am! I take a standard three-way servo extension cable and use thin nosed pliers to pull back the retaining tabs and free the cable and connector. I then insert that freed connector into a two-way DuPont connector. Two-way connectors can easily be obtained from Switch Electronics (**https://www.switchelectronics.co.uk**).

If you are intending using a GPS module you should be aware that these boards are quite fussy about the GPS module you use and in particular the format of the messages. The module needs to output GPS NMEA format and, if doing so correctly, the receiver will send back GPS Location, Ground Speed, Heading, Altitude and the number of Satellites it is seeing as telemetry. I have yet to try using GPS myself, but YouTubers seems to be having good success with the HGLRC M100-5883 M10 GPS Module.

The benefit of this information is that if the aircraft should come down somewhere you

can look at your GPS coordinates and paste them into Google Maps and walk (or drive - hopefully not!) directly to it. There is still the risk that the plane could lose power when it comes down and no longer transmit any telemetry. This can be mitigated by setting up your Tx to log all of the telemetry to an SD card on a periodic basis (say every two seconds). You can then examine the logged data and get the last GPS coordinates from that. It's not quite so accurate but it will get you close.

With the connection of a flight controller (FC) you can take things a bit further. You can have the equivalent of the SAFE mode that is supplied on the Turbo Timber Evolution or Apprentice (both by E-Flite). For example, you can program a panic button that automatically puts the aeroplane back into level flight. The same FC can be used to take out turbulence effects on a windy day. The flight controller is also capable of adding information to an on-screen display (OSD) so if you are using an FPV headset it will give you pertinent information (and no, you can't get Match of the Day on it!).

If you use the GPS module in conjunction with the FC on your aircraft, you can take things a bit further. You can program in waypoints, for example, or have the aircraft loitering above you.

BINDING THE TX & RX

The way that a Tx and Rx is bound together is different from the way you may be used to. There are no bind buttons or bind plugs to put into one of the servo ports. Your options are either to use a traditional binding method, which in the case of ELRS involves powering the Rx on and off three times, each within two seconds or using a binding phrase. The binding phrase is the way that the ELRS developers encourage and is described in more detail below.

What will happen with a receiver is if it hasn't connected to a Tx after 60 seconds is it will then create its own Wi-Fi spot (and no, you can't get Match of the Day on that either!). You can then log into this using your mobile phone, which is handy if you have a problem at the field.

The screen grabs nearby show that happening. As I type in 'ILoveRCME' (which

> "ELRS is open source, which means the software source code is available for anyone to look at"

is a very personal and heart felt statement!) the UID (Unique Identifier) numbers change. These numbers are the ones that are used to create the binding code. You then separately type the same phrase into your Tx and the next time the devices are powered on they will find each other and bind.

This has some advantages over the traditional binding approach. For example:

If you sell your Tx and buy a new one, you don't need to rebind to all of the receivers. You just type your binding phrase into the Tx and you are good to go.

If you are using the traditional ELRS PWM output Rx you can increase the number of channels by adding a second Rx into your plane as they will both run at the same time. For example, if you had a 6 channel Rx (allocated to channels 1 to 6), you could add a second 6 channel Rx (allocated to channels 7 to 12) and get 12 channels in total. The webpages shown have the option to reallocate the channel numbers in each individual Rx. Remember that ELRS is always capable of sending 16 channels from the Tx.

OPEN SOURCE & GITHUB

ELRS is open source, which means the software source code is available for anyone to look at. You can see it at **https://github.com/ExpressLRS** but it is not for the faint hearted! More than that, it also means anyone is able to suggest changes to the code as well. There is a team of administrators who will check and test the changes before a new release is provided. Github (which is not a meeting place for grumpy old men!) is a platform used by developers and is owned by Microsoft. It has over 28 million users and is available for anyone to use; I have my own GitHub page at **https://github.com/KevScott** for example. The main reason for using it is to allow different versions of your software to be maintained. This is important when you are trying to fix bugs.

The ELRS team don't stop at software, however. They also give designs and PCB layouts for their receivers as well, if you really want to dive in at the deep end.

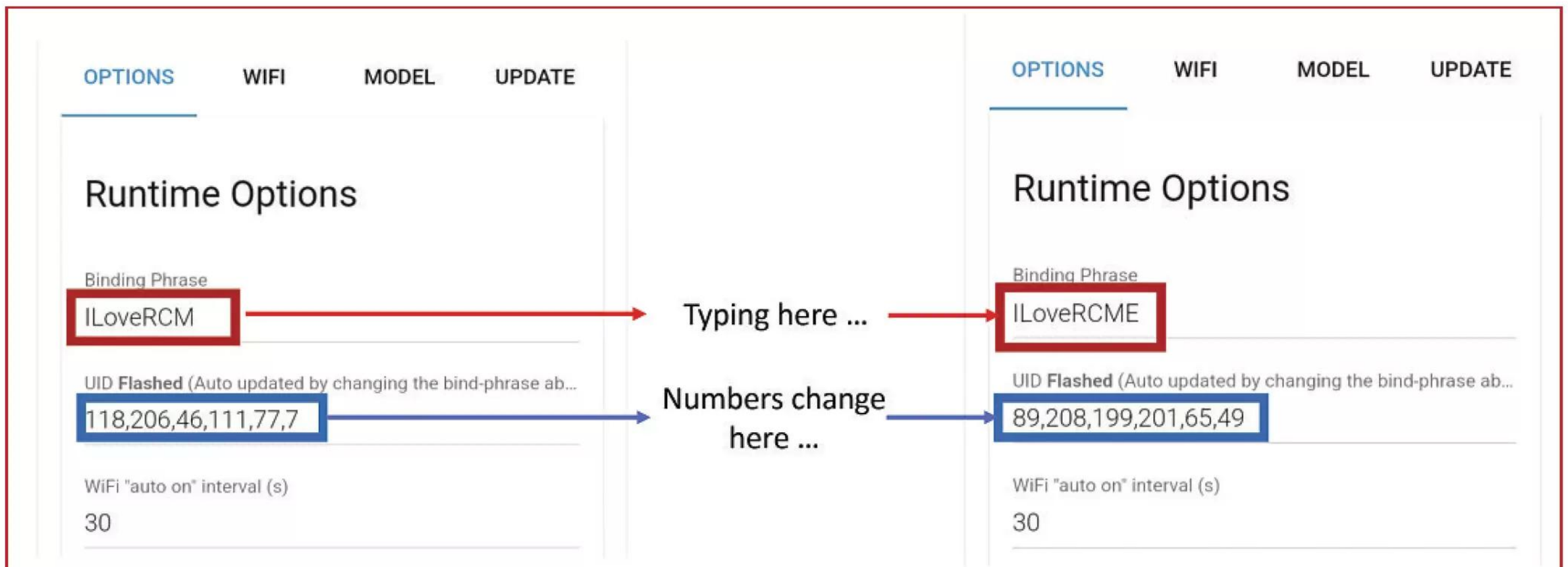
FIRMWARE UPDATES

Most of the time you don't need to think about updating the firmware on either your Tx or Rx, as long as they have the same major version number. So, if your Tx is 3.1.4 and you have a selection of receivers, some of which are at 3.0.3 and some are at 3.2.6, you don't need to do anything because they all start with a 3. If at some time in the future you buy an Rx that is 4.1.3, for example, you have two choices: you can either upgrade your Tx and other receivers to the latest 4.x.x version or you can usually set an earlier firmware version on the new Rx, i.e. set it back to start with 3.x.x. In general, there are a lot more firmware changes happening that you would find on Spektrum or Futaba, for example, partly because new hardware is being designed by different companies all of the time and partly because new features are also often being introduced. Do remember though that if you are happy with the features you have, you generally don't need to worry about updating.

When you do need to update the firmware on either the Tx or Rx there are a number of ways of doing it, from letting your Rx have access to your home network information and letting it do it all on its own, through to loading new files onto the receiver from your PC.

NEXT TIME

In the next article we will discuss EdgeTX. This is the control system that runs on Radiomaster, FlySky, and Jumper radios. It is extremely powerful and adaptable but with great power comes great responsibility, as you will see! We will then finish up with a look at the pros and cons of ELRS and EdgeTX as compared to more traditional systems. ■



Setting up a Binding Phrase.

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DJI's Neo drone, Goggles N3 headset and FPV Remote Controller 3 are an excellent way to try out First Person View flying. If things get a bit uncomfortable or out of control, simply stop and hover the little drone until you get your bearings.

DJI NEO FPV

The Editor pulls on some First Person View goggles and explores his local flying field

Words & Photos: **Kevin Crozier**

In the February issue I described the palm size DJI Neo drone and its 'Fly More Combo' which I purchased for taking 'fly-by' videos of review models. Due to the soggy state of my local flying field over winter, plus the relatively long turf (making models look like they are parked in elephant grass!) I haven't had a chance to take any usable footage yet, but I have had a couple of practice sessions.

Soon after buying the Neo, I was browsing the DJI support pages on their website when I came across reference to this tiny drone being used for FPV (First Person View) flying. This intrigued me as FPV seems to be gaining traction and whilst one or two pilots in my local clubs have been flying with goggles for the past year or two the number of people trying this immersive form of model flying seems to be on the rise, at least in my local area.

LATE ADOPTER

Although I've long been intrigued by the prospect of FPV flying a couple of things were putting me off.

Goggles N3 do not have diopter adjustments but can be worn with prescription glasses.

My son used to use goggles when flying racing drones several years ago but the resulting fuzzy and broken up images were, I thought, quite disappointing. I only ever used them outdoors, so goodness knows how he and his friends used them when high-speed racing around dim halls between neon lit obstacles. But time and tech has moved on and I knew from those using them that modern FPV goggles now offer quite a realistic view.

I'm also one of those folks who gets a bit queasy when watching certain types of footage, especially when the model is getting bumped around a bit, and some of the FPV flights that I had watched on my computer were definitely in that category. So having that kind of feedback via a headset didn't really appeal. However, having seen how stable some of the recent DJI drones are in flight, even in quite strong and gusty winds (including the tiny Neo), got me

My choice of controller is the R/C style FPV Remote Controller 3. A nunchuck style controller is also available.

N3 goggles are supplied in a nice box but with no cover. I purchased this close-fitting carry case for my pair online.

thinking that using one could provide the gentle kind of introduction to FPV that I was looking for – with no emesis bag required!

After a bit of research I discovered that the Neo can be paired with a pair of DJI Goggles and, maybe, some other brands of FPV headsets too. However, having seen some of the shenanigans that have happened to my clubmates who have been experimenting with various types of DIY drone style R/C products, including FPV setups, I decided to play safe and stick to genuine DJI equipment purchased from a well-respected local camera shop so that I could benefit from their support if the official Neo FPV set up was going to give me any problems. Fingers crossed, it hasn't!

EXTRA EQUIPMENT

Originally, the Neo was only compatible with DJI's relatively expensive Goggles 3 headset. This will set you back £579 at current prices so there was a bit of a cost mismatch between this and the (relatively!) budget priced drone. It was way over my budget, especially as I didn't even know if I would take to FPV flying.

However, a recent DJI release has made FPV flying a lot more affordable, in the shape of their new Goggles N3 headset, currently retailing at £229. Still not cheap, I know, but neither are decent

> "It was way over my budget, especially as I didn't even know if I would take to FPV flying"

FPV headsets from other manufacturers and at least this one is designed to pair with my drone.

However, there was another sting in the tail I was not prepared for and that was to find that the RC-N3 controller that came as part of the Neo 'Fly More Combo' is not compatible with the N3 headset. So, I needed to buy another controller in the shape of either the R/C style 'DJI FPV Remote Controller 3' (£139) or the 'nunchuck' gamer style 'DJI RC Motion 3' (£79). Having failed miserably to master the nunchuck controller that came with my sons' Wii games console many years ago, I disregarded the RC Motion 3 and furnished the camera store with yet more money to purchase the R/C style controller.

Finally, I needed to make one more purchase and that was to buy a carry case for my precious new goggles. That famous on-line shopping website came up trumps, posting me a well-padded, tailored-to-fit bag for just under £25.

FIRST FLIGHTS

Following DJI's instructions the goggles were quickly and easily paired to the drone and the controller. I did find that subsequent power ups could be a bit hit and miss but that was due to finger trouble, especially if not quite getting the arming sequences correct. Each device is switched on by a quick press of the power button and then holding it until all the LEDs light up in sequence. I found it best to switch on the Neo first, then the goggles, followed by the controller. It's obvious when you've got it right as the screen lights up inside the goggles and the Neo's props give a quick shake. Looking through the goggles will give you your first view of what the drone's camera is pointing at – but don't forget to take the protective lens cover off!

AT FIRST GLANCE

My first tentative FPV flights were undertaken during the drone & heli slot of an indoor model flying session. I like to have full control of the Neo during take-off and landing (until the

Annoyingly the RC-N3 controller (right) that came as part of the Neo 'Fly More Combo' is not compatible with the Goggles N3 headset. I had to buy another controller, the R/C style 'DJI FPV Remote Controller 3' (left).

The goggles rechargeable battery pack is mounted on the back of the headband. Despite its chunky looks it's unobtrusive in use. The dial adjusts the strap for a comfortable fit.

Goggles functions, including camera settings, are accessed using the 5D joystick on top of the visor. Power switch is just below, whilst the USB-C port and microSD card slot are in the centre.

Auxiliary controls are situated on top of the controller. Neo is best flown in Normal mode whilst learning FPV (rocker switch, front left). Flight Pause/RTH is alongside. Opposite right is the video/photo shutter with a customisable rocker alongside. Start/Stop switch at the back is for flying in full Manual mode - but only for experienced pilots!

last little bit, at which point it lands itself) so I usually forego the auto take off function and start the rotors myself by pushing both sticks into their opposite bottom corners. This works well when flying visually as reacting to any drift when lifting off is an automatic reflex after many years of flying rotorcraft, especially helicopters. But with the goggles on I found it easy to overcontrol the little quad and during my first FPV flight it appeared to drift rather alarmingly, resulting in a quick and untidy return to the gym floor! I decided the best way to get going was to manually take off and let the Neo hover a few feet up. It's so stable, especially indoors, that I knew I could take my eyes of it for a few seconds while I put the goggles on. I only needed to do this a few times before my confidence had risen enough to allow for a quick take off straight from the ground, but it was a handy trick to be able to do when first trying FPV. In fact, it's this ability to quickly stop and put the Neo into a hover whist having a breather and gathering my thoughts that really appealed to me, maybe at some distance when flying outdoors. There's even a button on top of the controller that allows you to do this called Flight Pause. This same button doubles up as the Return to Home control when activated by a long press and hold.

With the Neo in the hover, I took a deep breath and pushed the 'elevator' stick gently forward to initiate my first FPV flight down the length of the hall. I stopped for a brief hover then gently spun her around using the 'rudder' stick before returning to face a rather comatose looking figure sitting slumped in a garden chair, with his head almost on his chin. This was my first glance at seeing myself when FPV flying and even today, many flights later, I still have a chuckle when I spot myself, head down, often drooped to one side, looking as if I'm fast asleep in my chair. I'll then pull my head up with a start, feeling like a naughty boy whose just been caught napping at his desk at school!

After a short while I started to pull together complete circuits of the hall and even passable figure of eights, combining a little 'aileron' in the turns to make banked rather than yawed turns. It was all reassuringly comfortable and thankfully my stomach wasn't complaining either, so I felt ready to explore the great outdoors.

FPV OUTSIDE

In the small adjacent field at one of my local flying sites there is a line of trees at the bottom of a small ridge. A track runs alongside the trees, then bends around and returns behind them at a slightly higher level before turning again as it goes up the hill. At the apex of this second bend there is a gap between where the trees end and some brambles begin to cover the side of the slope. This gap provides a perfect route for the Neo to follow down to where I would be sitting at the side of our winter pits and parking area.

I set out the Neo, the FPV goggles and the controller on my fold out heli pad, which I use to provide a reasonably level take off area, and switched them all on, Neo first, headset second, then the FPV controller. With everything connected I backtracked a few feet to my chair and settled down for my first FPV flight outdoors.

By this stage I was confident in my abilities to perform a manual take off with the goggles on, so the Neo was quickly made airborne and flown along the tractor track leading to the trees. I kept her a few metres high and soon we came to the first bend, where I flew a slightly banked turn to bring her around the back of the trees. Since we were following the track as it begun to rise up the hill the altitude display at the bottom of the headset screen started to decrease as the drone flew closer to the slope. It also turned red and started to flash, giving me plenty of notice to increase altitude. A bit of extra throttle soon sorted that out and we resumed the intended circuit around the back of the trees, rapidly coming to the second, uphill bend in the track. It was now time to turn away from the track and start my approach to the landing pad, down through the gap in the brambles and past that strange looking chap in his garden chair!

I slowed the Neo as I approached the bright orange pad, using the gimbal dial on the top left shoulder of the controller to dip the camera. This way I was able to see an overhead view of the circular pad and position the Neo over the printed H in the middle. As the throttle was reduced and the Neo hovered low over the pad her ground sensors took over and she performed a perfect automatic touchdown. There was nothing I could do at this point but watch as the camera gimbal was automatically raised back to its upright position, showing a clear forward view from the drone as the rotors powered down.

THAT WAS FUN

Indeed it was and I've had lots of enjoyment since that first tentative outing flying the Neo around our patch. I've even done a spot of circuit bashing with her when other pilots were not flying their fixed wing models. This was great fun too, but you really need to pay attention to

DJI controllers feature rubberised slots for storing the control sticks. This time they are located in the inner hand grips.

that blinking red altitude display to keep clear of the ground as she swoops in on the approach.

You can playback your flights by either letting the Neo record to its on-board 22GB memory or by fitting a microSD card in the slot at the top of the goggles. It's also possible to record to both devices. This, plus a host of other functions, are accessed by using the stubby 5D joystick on top of the N3 headset. Using the joystick takes a bit of getting used to while the goggles are on your head, but it soon becomes second nature. Files can be read by connecting the USB-C port to a computer or smartphone.

I won't go into all the functions you can access whilst wearing the headset but one that I will mention is a camera setting called RockSteady and HorizonBalancing. Initially,

> "Using the joystick takes a bit of getting used to while the goggles are on your head, but it soon becomes second nature"

Ready to fly FPV outside for the first time, the Neo, controller and FPV headset sit on the editor's portable heli pad.

I selected the latter as I thought the video recordings would be smoother (making me feel less queasy!) if the horizon was kept level but in practice, for me anyway, I feel that watching RockSteady footage is more comfortable.

The strange thing here is that whilst flying in FPV I haven't felt nauseous at all; it's just watching the footage that this sometimes kicks in at a low level. I find this aspect of FPV quite reassuring, in my limited experience at least, as I was a bit worried about it making me feel uncomfortable whilst flying. As I say, it's only watching footage back that causes this as, fingers crossed, I've never been airsick (a good thing, having piloted full-size aircraft!).

I can only put this down to the fact that the goggles cut out all external visual references so there is no peripheral view, which would stay level whilst your forward view moves around with the aircraft, so sending contradictory information to your inner ears and affecting your sense of balance. But put that same view on a screen, whilst the room around me stays still and things can start to get a little bit queasy. Hopefully this will reassure those of you who might be a bit worried about this aspect of FPV flying - it certainly put me off for a while!

IN SUMMARY

I will leave it there, although there is plenty of more to say about flying the Neo in FPV. Suffice to say that it has provided me with an ideal introduction to First Person View flying and has allayed any fears of motion sickness that I may have had – at least while flying, anyway!

Watch out for some review model flypasts using the Neo, as soon as the sun shines and the grass is cut. Hopefully, I'll make them as 'rock steady' as I can! ■

PALM CONTROL

The DJI Neo has a neat flying mode that I haven't previously covered, mainly because it is outside the remit I purchased this small drone for, i.e. taking short videos of review models. Called 'Palm Control' it lets you take off and land from the palm of your hand. I had the chance to test this out at a recent indoor meeting and I can report that it works really well. There are several automatic flight modes that you can select by pressing the Mode button on top of the drone, but the default one is 'Follow' which I wanted to try out. With the Neo sitting on an outstretched palm, facing you, it will lock onto your image. You can either press the Mode button to initiate take off or press a virtual button on the DJI Fly app, which is what I did. The little drone will then lift off and hover, facing you, at head height. You are then free to walk around, even with your back to the drone, and it will follow you. Stop, face the Neo, put out your hand and it will land again on your outstretched palm. Wonderful stuff - I can't wait to show the grandkids!

Going Places

Diary dates for the coming season

If you are planning an aeromodelling event over the next few months, then please send details - up to 100 words maximum - to Beth Ashby at: **Beth.Ashby@artichokehq.com.**
If you intend to visit any events listed, then please check with the organisers before travelling in case of any last-minute changes.

APRIL

Apr 15

PMAC Swapmeet At Chelford Village Hall, Knutsford Rd, Chelford, Macclesfield SK11 9AS. Please note this venue is a replacement for this well-established Swapmeet (ex Deanwater). From 7pm to 9pm, doors open for table holders at 6:30pm. Tables £10 each (includes entry for one person). Entry £3 per person. Tables limited to 30 only, table booking required. Vehicles greater than 2.1m tall will need to be advised to the organiser (use contact below) due to parking restrictions. Table bookings required by contacting Tim Cheal. email: tim.cheal@btinternet.com

Apr 16

Waltham Chase Aeromodellers Medium Hall Indoor R/C Meetings at Crofton Community Centre, Stubbington Lane, Stubbington, Hants PO14 2PP. From 6.30pm to 9pm. The sports hall is four-badminton court size and particularly suitable for lightweight indoor R/C models. Flying at these events will take place in accordance with our indoor flying guidelines (available on our website). Admission £8 for fliers and £2 for spectators and junior fliers, whilst accompanied junior spectators and parents of junior fliers admitted free. Fliers will be required to show proof of insurance. These events are supported by the BMFA Southern Area. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

Apr 17

Waltham Chase Aeromodellers Small Models Meeting at Wickham Community Centre, Mill Lane, Wickham, Hants, PO17 5AL. From 7pm till 9.30pm. Hall is suitable for smaller indoor R/C models. Models to be limited to a max. weight of 95g for fixed wing inc. battery (max. 2S LiPo), helicopters limited to 305mm (12") rotor dia. Models will be weighed and judged on their suitability for the venue. Flying will be in accordance with our indoor flying guidelines on our website. Admission £6 for fliers, £2 for spectators and junior fliers. Accompanied junior spectators and parents of junior fliers admitted free. Fliers to show proof of insurance. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

Apr 18

Watton Radio Model Club Bring & Buy at Hingham Sport/Social Club, Watton Road, Hingham, NR9 4HB. Sellers from 5.30 pm. £5 per table additional helpers £1. Doors open 6 pm, entry £1. Bar open. Contact Martin Pawsey on 01953 883892 or email: martin.pawsey@btinternet.com or visit www.wrmc.uk

Apr 26-27

Scale Indoor RC Nationals and Scale Indoor FF Nationals at Walsall Campus Sports Hall the University of Wolverhampton, Magdalene Road, Walsall WS1 3TA. Competitors can enter both days by completing the electronic entry form found on the BMFA Scale Technical Committee Website at: https://scale.bmfa.org. Spectators are welcome to view proceedings from the seated gallery area overlooking the sports hall. The fee for spectators is a bargain £5.00, allowing entry for both days (free for accompanied under 16s). There is ample free car parking for visitors onsite at the University. Why not come along and take part or be simply inspired by viewing the best in UK and European Scale Indoor aeromodelling. For further details please contact enquiriesbmfascale@yahoo.com

MAY

May 3-4

Festival of Fun Fly at BMFA Buckminster. Two days of informal competitions and practice for all of the BFFA Classes, including the Foamy Class. This is an ideal event for first timers to come and have a go and for the more experienced to shake some dust off. As this event will be held at BMFA Buckminster with camping available via manny@bmfa.org . Rules and general info at www.funfly.bmfa.org or via the Fun Fly Group Facebook page. Note that this has to be electric power only due to bank holiday restrictions. If you would like to come along, please contact James Gordon, jamesrrg@hotmail.com or tel 07966 439835.

May 8

White Sheet RFC BMFA F3f League. Please note the reserve date of 8th June. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club.

May 11

White Sheet RFC Scale Event. Scale Days could be either Saturday or Sunday, with the preferred day always being a Sunday. After analysing the forecasted conditions, the Scale Secretary will make the final on/off call on. Please note the reserve date of the 25th. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club

May 17

Waltham Chase Aeromodellers Medium Hall Indoor R/C Meeting at Crofton Community Centre, Stubbington Lane, Stubbington, Hants PO14 2PP. From 6.30pm to 9pm. The sports hall is four-badminton court size and particularly suitable for lightweight indoor R/C models. Flying at these events will take place in accordance with our indoor flying guidelines (available on our website). Admission £8 for fliers and £2 for spectators and junior fliers, whilst accompanied junior spectators and parents of junior fliers admitted free. Fliers will be required to show proof of insurance. These events are supported by the BMFA Southern Area. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

May 17-18

PSSA 'Fly for Fun' event at The Great Orme, Llandudno, North Wales. Meet at the 'Tank Track' car park for pilots brief 10am each day. Proof of BMFA (or equivalent) Insurance and Pilot Competency certificate required. All models to be fitted with compliant CAA OpID number. Note due to slope access restrictions in place during Spring this event WILL NOT RUN as listed if the prevailing winds are Easterly and we would need to fly over the pier. In this case a decision will be taken in the week running up to the event and we will look to defer the date as best we can. For more information contact Phil Cooke on 07772 224719, email webmaster@pssaonline.co.uk or go to // www.pssaonline.co.uk/about-us/events/

May 18

White Sheet RFC Open Slope for Vintage Scale, Modern Scale soarers, F3f and F5j competition models or 'Anything In Between', such as PSS gliders. The scheduled Sundays are preferred but as always Saturdays are an option. The Open Slopes Secretary will analyse the forecast and attempt to choose the most suitable day. The decision is usually made on the Friday before the event, occasionally earlier if conditions are more settled. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club.

May 24-25

Don Valley MFC Open Weekend at Bentley Moor Lane, Carcroft, DN6 7BD. Free entry and camping. Food and drink with an onsite toilet and night flying. No certs required to fly - be safe, enjoy. Proof of insurance please. Relaxed atmosphere aimed at the club flyer. Tabletop sellers welcome, no fee involved.100 cc limit on I.C. If you intend camping give us a shout, it helps with organising space. Please contact John on 07934 689317 or email info@donvalleymfc.co.uk

May 29

Waltham Chase Aeromodellers Small Models Meeting at Wickham Community Centre, Mill Lane, Wickham, Hants, PO17 5AL. From 7pm till 9.30pm. Hall is suitable for smaller indoor R/C models. Models to be limited to a max. weight of 95g for fixed wing inc. battery (max. 2S LiPo), helicopters limited to 305mm (12") rotor dia. Models will be weighed and judged on their suitability for the venue. Flying will be in accordance with our indoor flying guidelines on our website. Admission £6 for fliers, £2 for spectators and junior fliers. Accompanied junior spectators and parents of junior fliers admitted free. Fliers to show proof of insurance. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

JUNE

June 1

White Sheet RFC Scale Event. Scale Days could be either Saturday or Sunday, with the preferred day always being a Sunday. After analysing the forecasted conditions, the Scale Secretary will make the final on/off call on. Please note the reserve date of the 22nd. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club

June 7

Prestbury Park Model Flying Club Scale Model Helicopter Fly-In and BBQ at What3Words glad.thatched.lads. Entrance sign posted off B4079 Pamington Road (North of Oxenton). 2.7 miles from M5 J9, Tewkesbury, Worcestershire. Relaxed scale helicopter fly-in. Scale helicopters only please. BMFA Membership and CAA Flyer/Operator ID required. Electric, piston engine and turbine power permitted. BMFA 82dB noise limit applies (except for turbines). Organisers may exclude excessively noisy models. No requirement for A or B test but you must fly safely. Pilots Briefing at 9:30 am. £10 per pilot. Enquiries: ppmfcrc@gmail.com

June 12

Waltham Chase Aeromodellers Small Models Meeting at Wickham Community Centre, Mill Lane, Wickham, Hants, PO17 5AL. From 7pm till 9.30pm. Hall is suitable for smaller indoor R/C models. Models to be limited to a max. weight of 95g for fixed wing inc. battery (max. 2S LiPo), helicopters limited to 305mm (12") rotor dia. Models will be weighed and judged on their suitability for the venue. Flying will be in accordance with our indoor flying guidelines on our website. Admission £6 for fliers, £2 for spectators and junior fliers. Accompanied junior spectators and parents of junior fliers admitted free. Fliers to show proof of insurance. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

June 15

White Sheet RFC Open Slope for Vintage Scale, Modern Scale soarers, F3f and F5j competition models or 'Anything In Between', such as PSS gliders. The scheduled Sundays are preferred but as always Saturdays are an option. The Open Slopes Secretary will analyse the forecast and attempt to choose the most suitable day. The decision is usually made on the Friday before the event, occasionally earlier if conditions are more settled. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club.

June 21

Waltham Chase Aeromodellers Medium Hall Indoor R/C Meetings at Crofton Community Centre, Stubbington Lane, Stubbington, Hants PO14 2PP. From 6.30pm to 9pm. The sports hall is four-badminton court size and particularly suitable for lightweight indoor R/C models. Flying at these events will take place in accordance with our indoor flying guidelines (available on our website). Admission £8 for fliers and £2 for spectators and junior fliers, whilst accompanied junior spectators and parents of junior fliers admitted free. Fliers will be required to show proof of insurance. These events are supported by the BMFA Southern Area. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

June 26

Waltham Chase Aeromodellers Small Models Meeting at Wickham Community Centre, Mill Lane, Wickham, Hants, PO17 5AL. From 7pm till 9.30pm. Hall is suitable for smaller indoor R/C models. Models to be limited to a max. weight of 95g for fixed wing inc. battery (max. 2S LiPo), helicopters limited to 305mm (12") rotor dia. Models will be weighed and judged on their suitability for the venue. Flying will be in accordance with our indoor flying guidelines on our website. Admission £6 for fliers, £2 for spectators and junior fliers. Accompanied junior spectators and parents of junior fliers admitted free. Fliers to show proof of insurance. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

June 28 – July 6

PSSA 'Fly for Fun' event with the Lleyn MAC – Nr Abersoch, North Wales. Meet at the Londis car park in Llanbedrog for 09:30am each day. Slope map will be left in shop window for late arrivals (weekends only). Proof of BMFA (or equivalent) Insurance and Pilot Competency certificate required. All models to be fitted with compliant CAA OpID number. For more information contact Phil Cooke on 07772 224719, email webmaster@pssaonline.co.uk or go to // www.pssaonline.co.uk/about-us/events/

JULY

July 3

Waltham Chase Aeromodellers Small Models Meeting at Wickham Community Centre, Mill Lane, Wickham, Hants, PO17 5AL. From 7pm till 9.30pm. Hall is suitable for smaller indoor R/C models. Models to be limited to a max. weight of 95g for fixed wing inc. battery (max. 2S LiPo), helicopters limited to 305mm (12") rotor dia. Models will be weighed and judged on their suitability for the venue. Flying will be in accordance with our indoor flying guidelines on our website. Admission £6 for fliers, £2 for spectators and junior fliers. Accompanied junior spectators and parents of junior fliers admitted free. Fliers to show proof of insurance. For further details please contact Alan Wallington on 01489 895157, email indoor@wcaero.bmfa.club or visit https://wcaero.bmfa.club

July 6

White Sheet RFC Scale Event. Scale Days could be either Saturday or Sunday, with the preferred day always being a Sunday. After analysing the forecasted conditions, the Scale Secretary will make the final on/off call on. Please note the reserve date of the 27th. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club

July 12 - 13

Woodspring Wings 25. Model Aircraft Show. From 10.00am to 16.30pm. The Woodspring Wings Model Aircraft Show has been a regular fixture on the flying calendar since shortly after the club began in 1989. It has since grown to be the biggest model aircraft show in the Southwest and attracts around 4000 visitors each year. The show features all-day model flying displays by some of the country's top pilots, plenty of traders and food and drink to suit all tastes. In recent years we have also enjoyed fly pasts by the BBMF Lancaster, the Red Arrows and the BBMF Spitfire, something we hope to continue every year. Located near Yatton in the Somerset Levels, Woodspring Wings is ideally placed to run a show of this size and popularity. The club owns a total of 21 acres of land including the flying field itself and adjacent fields meaning ample space for the event and plenty of free parking available. For more information please visit www.woodspringshow.co.uk or on Facebook. Camping available on site for the weekend with good advance discounts.

July 12 - 13

Pontefract 13th Annual Fly-In Weekend at Pontefract Park, southwest corner of junction 32 of the M62. Sat nav - WF8 4QD. Entry via huge white gate 1/4 mile south towards Pontefract. Further details see map on www.pandas.bmfa.org. Saturday 12th July - any R/C model type (electric or IC), plus control line (no free flight). On Sunday 13th July - Single Channel and Retro Fly-In for all age-appropriate IC and electric powered vintage and retro models (ideally up to the late 1970s but we are flexible as long as they fit in with the general theme of the day). Free entry, further details and updates at www.singlechannel.co.uk. To fly you must have insurance and your CAA documentation up to date plus any model over 7.5 kg requires BMFA B, LMA proficiency or equivalent recognised certification. However, feel free to bring along your models and display them if you don't want to fly. Limited free camping available, contact: Phil Green (philg@talk21.com) or Shaun Garrity (aeroomodeller@gmail.com)

July 19

Christchurch & District MFC Open Waterplane event is at Longham Lake on Saturday 15 July, 9:00 am to 15:00 pm. For electric power models, no IC or turbines. EDF by arrangement. Longham is a few miles north of Bournemouth. Full details are at www.cdmfc.org and the Longham pages. Parking is 200 m from the flying point and there are toilets on site but no other facilities so bring your own lunch! There will be a rescue boat for unlucky models. Contact Mike at roachfoxwood@aol.com three days before for weather check.

July 20

White Sheet RFC Open Slope for Vintage Scale, Modern Scale soarers, F3f and F5j competition models or 'Anything In Between', such as PSS gliders. The scheduled Sundays are preferred but as always Saturdays are an option. The Open Slopes Secretary will analyse the forecast and attempt to choose the most suitable day. The decision is usually made on the Friday before the event, occasionally earlier if conditions are more settled. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club.

AUGUST

Aug 2-3

PSSA 'Fly for Fun' event at The White Horse, Westbury, Wiltshire. Meet at the White Horse car park. Pilots brief at slope location at 10:30am each day. Proof of BMFA (or equivalent) Insurance and Pilot Competency certificate required. All models to be fitted with compliant CAA OpID number. Note this meeting will only run with locally forecast winds from West through to North. For more information contact Phil Cooke on 07772 224719, email webmaster@pssaonline.co.uk or go to // www.pssaonline.co.uk/about-us/events/

Aug 3

White Sheet RFC Scale Event. Scale Days could be either Saturday or Sunday, with the preferred day always being a Sunday. After analysing the forecasted conditions, the Scale Secretary will make the final on/off call on. Please note the reserve date of the 31st. Please check with the WSRFC before travelling: https://whitesheet.bmfa.club

Marketplace

Sell off your unwanted airframes and engines or maybe buy a few new ones

To use our **FREE READERS' AD SERVICE** simply fill in the coupon provided and we'll print your advert here, in Britain's best-selling R/C flying magazine

FOR SALE

AXMINSTER PERFORM ELECTRIC 400m Fretsaw, good condition, has had little use - £45. Call Tony on 01162 313377 (Leicester).

SEVEN A/C, Solartex covered, flown twice. For trimming with battery, motor, some with FRSKY Rx. Also, two IC models - Pete 68" wingspan, WOT 4 53" wingspan, both with Futaba Rx. RCV91 CD unrun, new and boxed. OS 46 AX run in only and boxed. Flight box, starter – offers? Buyer to collect (Suffolk).

GENTLE LADY GLIDERS, Phase 4, Phase 2 and others – offers? Call Graham on 01453 757904 (Glos).

TEN YEARS OF RCM&E, complete sets – free? Buyer to collect. 07771785505 or email blue.hills@btinternet.com (Battle).

BRIT PACK KIT, Ambassador Products 'Musketeer'. 40 size aerobatic airframe built during lockdown, brand new and unflown. Fitted with an O.S. 40 Surpass 4-stroke, four servos and Rx battery. Fit your Rx and fly - £80. Buyer to collect. Call Ian on 01460 394579 (Somerset).

O.S. FS70 Surpass - £75, O.S.40 Surpass - £50, O.S.40 4 stroke, earlier one - £40, O.S. Max 40 R/C - £25, JBA 61A ABC (Chinese) - £40, Frog 80 - £15, Flexible exhaust extension for FS40 and FS61, brand new unused - £5, Pair of Williams 5W diameter (5th scale) vintage wheels - £25 brand new, unused. Call Ian on 01460 394579 (Somerset).

FREE PLANES & radios. Funboy, Tiger Moth, 4-channel, Easy Star, Spectrum, DXGi transmitter. Loads of spares, inc. servos etc. Selling due to having a clear out. Contribution to Alzheimer's society required. Buyer to collect. 01789 721225 (Stratford on Avon).

FLAIR BRISTOL FLIGHTER KIT NIB - £250. Buyer to collect. 01525 370205 (Bedfordshire).

4 x 6-CHANNEL and 1-channel Hi-Tec Optima receivers – offers? Email sandytough@btinternet.com (Aberdeen).

SLEC HIGH TECH PROPELLER BALANCER x 2. One is complete, the other is missing a spindle - £20 par inc. P&P. Hawker Hind plan 37", Bristol Scout Hansa D1 49" - £12 each inc. P&P. Call John on 01407 710312 (N.W. Wales)

GÖPPINGEN WOLF scale glider from RCM&E plan, ready to fly – offers? Stampe, built and partially covered and comes with a Laser 150 – offers? VK DR1 complete original kit - £200. Two OS91 motors NIB – offers? 01508 570941 (Norfolk).

SURPASS, many used motors, two and four stroke – offers? Clipped wing Cub in yellow Oratex, just needs a motor and radio – offers? Various other unflown gliders – offers? 01508 570941 (Norfolk).

TOPFLITE STINSON RELIANT, 2.55 m span. Fitted with Saito 150S Black Knight, never flown - £400 ono. Call Chris on 01584 890486 (Worcs).

WWI PLANES with petrol engines, never been used and in good condition. Fit your receiver and fly. Selling due to house move. Call David on 01371 852297 (Essex).

SE5a large R/C model, never flown. Made from free plan, all reasonable offers considered. Japanese WWII fighter plane – offers? 01393 463196 (Somerset).

SARIK HOBBIES HAWKER HUNTER FCA9, 48" span, 62" length, 4 lbs weight from laser cut balsa. Building manual and two sheet plan. Uses 6S LiPo and 90 mm EDF, lovely kit - £75 + P&P of £5.90. 07946 414532 (W.Yorks).

UNTOUCHED CARL GOLDBERG KITS, anniversary edition Piper Cub, 76" wingspan - £120. Electra powered glider, 78" wingspan, motor, prop and spinner included in kit - £60. Buyer to collect. 01789 293209 (Stratford-on-Avon).

WANTED

D.B. BARNSTORMER 50" bi-plane plan. Will pay full price. Call Tom on 01443 670462 (Cardiff).

ALL R/C MODELS WANTED, new or old, planes, gliders, kits, engines, boats, cars, radios, complete collections or job lots, countrywide collection. No hassle, cash buyer. Call David on 07940 791959 or email deserteagle357@hotmail.com (Clevedon).

ALL R/C MODELS, planes, boats, cars, kits, engines, radios etc. Complete collections wanted. Cash buyer, will collect countrywide. Email dorsetmodel@aol.com or call Michael on 01747 229725 (Dorset).

ALL UNMADE plastic aircraft kits; Frog, Airfix, Revell etc. Also aviation and military books, diecast aircraft etc. Please call 07973 885754 (Kent).

RCM&E

Post to: RCM&E, Marketplace, PO Box 99, Horncastle, Lincs, LNP 6LZ

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Next issue

COSMIC CLOUD 150

This month's Pro-Plan for the Fundroid fun fly model has proven a bit too big to fit comfortably on just two sides of one pull-out plan sheet. So, there's one more side of the plan to come, which will appear in the June issue. But what to do with the other side? Fill it with a tiddler, of course!

Cosmic Cloud 150 has been enlarged and updated for R/C by Dave Goodenough from its original 33-inch span free flight format, as kitted by Performance Kits in the early 1960s. Dave says, *"I've decided lately that I prefer my models a tad bigger for ease of construction, handling and flying. Adding minimal radio control and a fan at the front makes life a lot simpler when chasing flyaway models is no longer an option. So Cosmic Cloud has grown up a bit in my eyes and is presented here at 150% size, it still being a small 50" lightweight model but more practical and manageable for fumbling fingers."*

SKYHAWK

Reviewed by Alex Maxfield, the Skyhawk is the brainchild of Steve Haley, one of the top thermal soaring pilots in the UK. Steve flew a Skyhawk to win the 2024 UK Nationals for F5L class gliders. The Skyhawk has taken many months to perfect and is now available in kit form from Steve's company Sky High RC. Within the F5L competition class many models do look quite similar and offer similar levels of performance, but the main takeaway from Alex's review is that this kit is designed in the UK, by a UK pilot for UK conditions.

ARTF REPAIRS MADE EASY

Much as Dick van Mourik enjoys designing and building his own models his busy job leaves him little spare time. So, his fleet also contains several Almost Ready To Fly models, in his case all being either Extreme Flight or SebArt designs. These models are hard to beat, being lightweight, with a good finish and no bad habits. Some time back Dick treated himself to the 73" Extreme Flight Extra. This model only enjoyed a brief life as it crashed on its fifth flight, having forgotten to connect the aileron servo wires. The model ended up halfway submerged in a ditch! All the bits and pieces were collected from the scene and taken home. In his latest article Dick shares the process of repairing the Extra and returning it to flying condition. You will find, though, that the information provided can be used to repair most wooden ARTFs currently available.

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Shutter Speed:	1/1250 sec
Lens:	Nikon VR 18-200mm f/3.5-5.6
ISO:	320
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NEW!

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- Wingspan: 1200mm/47"
- ESC: 40A
- Flying Weight: 1350g
- Wing area: 22dm^2
- Motor: 3541-KV745
- Properller Size: 11x7" 4-blade
- Servos: 9g servos x 6
- Recommended Battery: 4S 2600-4000mAh
- Radio: 6CH- aileron, elevator, throttle, rudder, retract, flaps
- Skill Level: Intermediate

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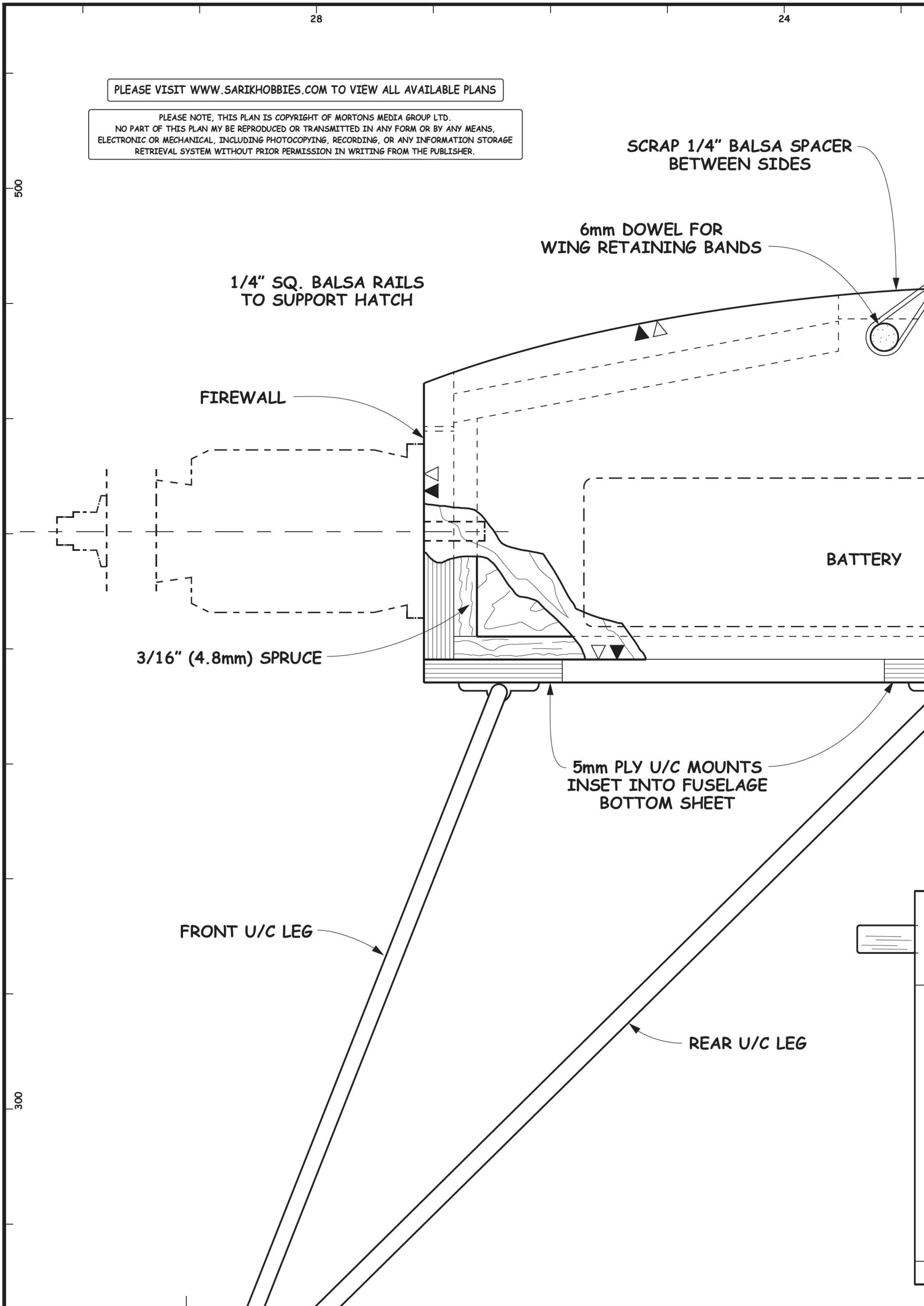


20

16

CG

RX

SERVO

SER

POSITION SCARF JOINT IN FUSELAGE SIDES
TO BE COVERED BY DOUBLERS

FIREWAL
6.4mm PLY

SLOT
PARALLEL TO

12

8

SCRAP FOAMBOARD
OR BALSA INFILL
BETWEEN SIDES

6mm DOWEL FOR
WING RETAINING BANDS

SERVO

CUT SLOT IN DOUBLERS
FOR CARBON STRIP

0.5mm x

3/16" (4.8mm) SPRUCE LONGERONS

FIREWALL
6.4mm PLY

SLOT FOR TAILPLANE IS
PARALLEL TO FUSELAGE SIDE LOWER EDGE

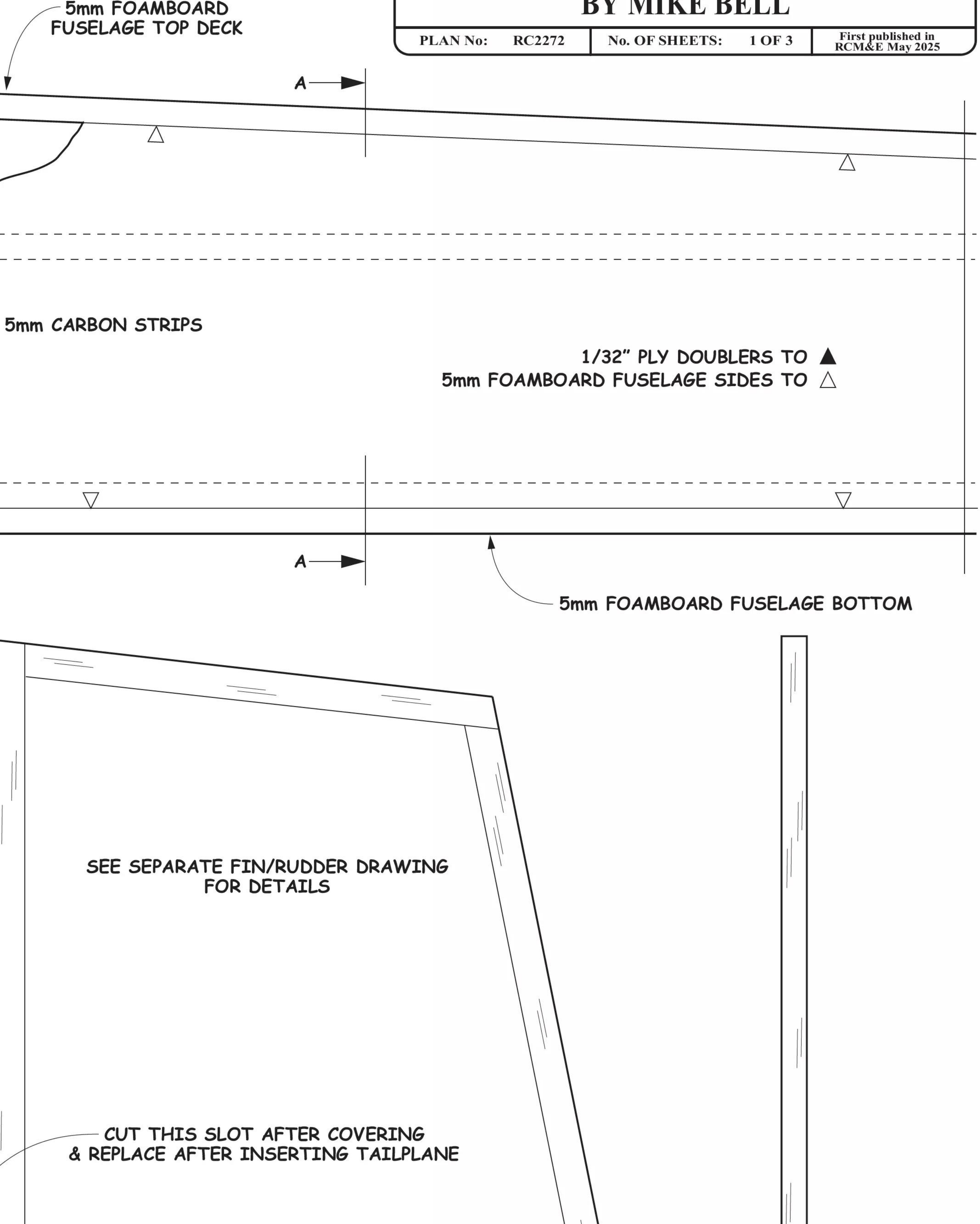
SCALE
INCHES

RCM&E

FUNDROID

BY MIKE BELL

PLAN No: RC2272	No. OF SHEETS: 1 OF 3	First published in RCM&E May 2025



Ø2" - Ø2.5" WHEELS

SPRING CATCH TO
RETAIN HATCH

1/4" SHEET BALSA

1/4" SHEET BALSA SANDED
TO MATCH FUSELAGE

CARBON RODS
INTO FIREWALL

HATCH DETAILS

1/4" SQ. BALSA RAILS
TO SUPPORT HATCH

FIREWALL

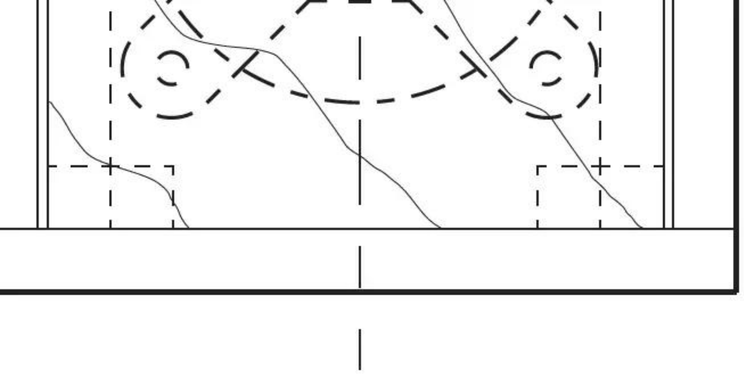
5mm PLY U/C MOUNT

SCRAP 1/4" BALSA SPACER

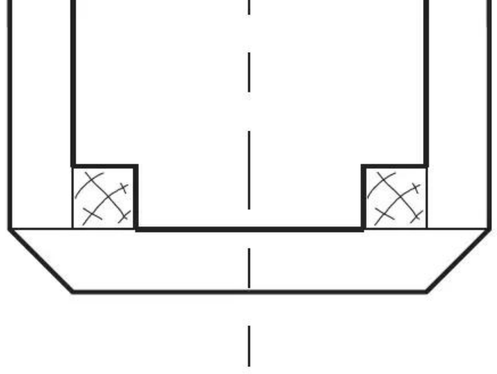
SCALE
MM

100

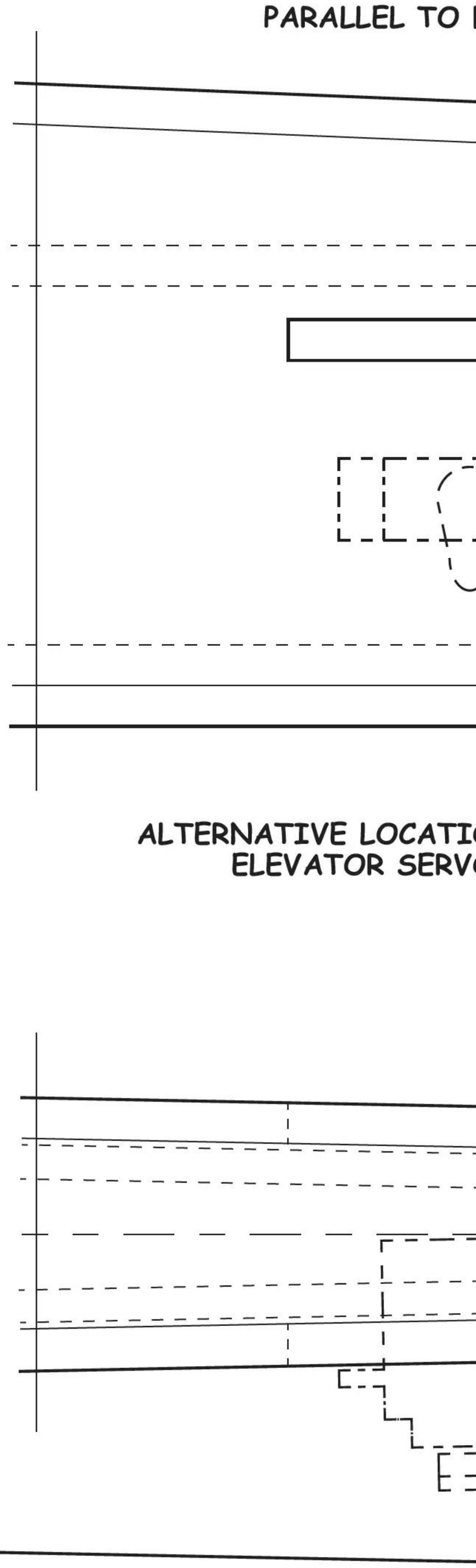
200



FRONT VIEW OF FUSELAGE



SECTION A-A
SHOWING CHAMFERED
FUSELAGE CORNERS



MODEL TYPE:	COMPETITION OR SPORT FUN FLY
DESIGNED BY:	MIKE BELL
WINGSPAN:	1300mm (51in)
WING AREA:	0.43m² (4.6ft²)
LENGTH:	1010mm (43.5in)
WEIGHT:	1.2kg (2.63lb) (INC. 3S 2200 Li-Po)
WING LOADING:	2.8kg/m² (9.1oz/ft²)
MOTOR:	3548 OR SIMILAR OUTRUNNER
ESC:	60A
LIPO:	3S OR 4S 2200mAh
CONTROL THROWS (DEGREES):	AILERONS: +/- 30°
	ELEVATOR: +/- 30°
	RUDDER: MAX. POSSIBLE

6.4mm PLY

SLOT FOR TAILPLANE IS
PARALLEL TO FUSELAGE SIDE LOWER EDGE

NATIVE LOCATION FOR
ELEVATOR SERVO

CUT AWAY TO CLEAR WIDTH
OF ELEVATOR JOINER

SLOT FOR FIN

6mm DOWEL

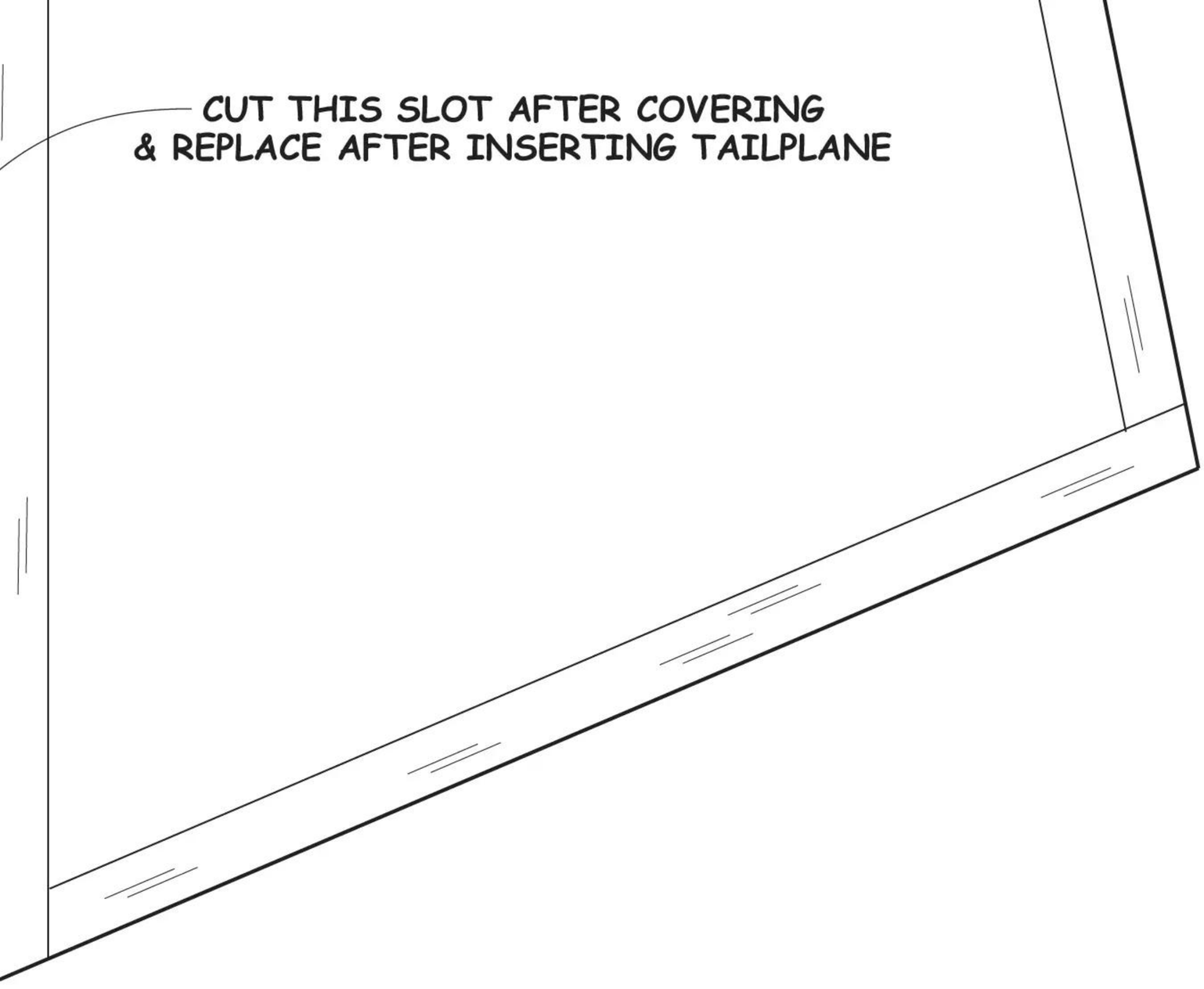
1/4" SQ. BALSA
SERVO RAILS

SCRAP FOAMBOARD
OR BALSA INFILL

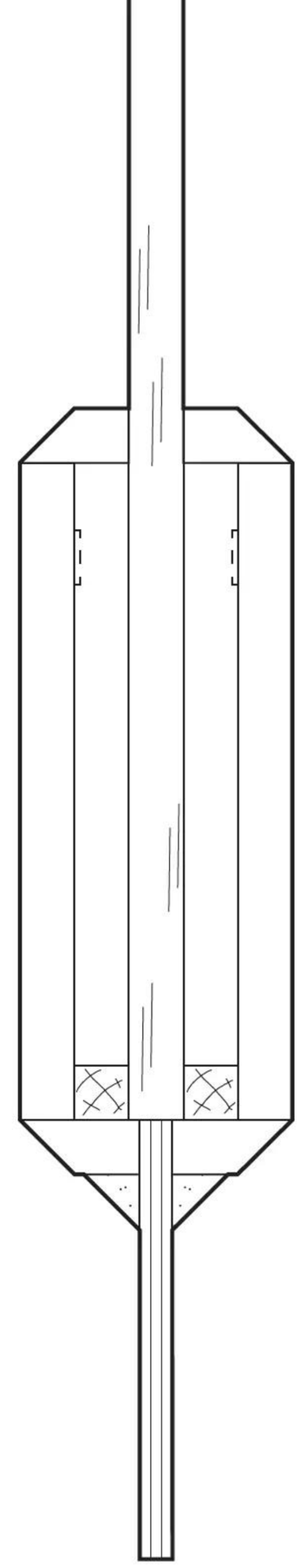
400

500

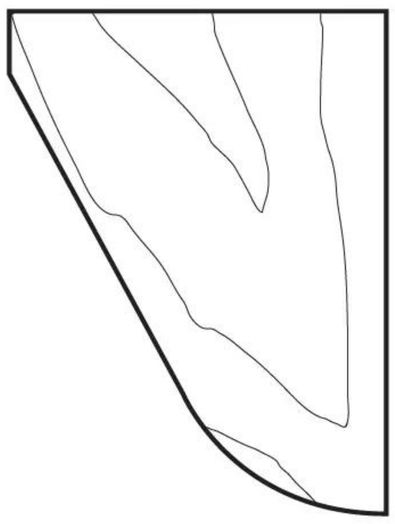
CUT THIS SLOT AFTER COVERING
& REPLACE AFTER INSERTING TAILPLANE



TRIANGULAR BALSA
EACH SIDE OF SKID



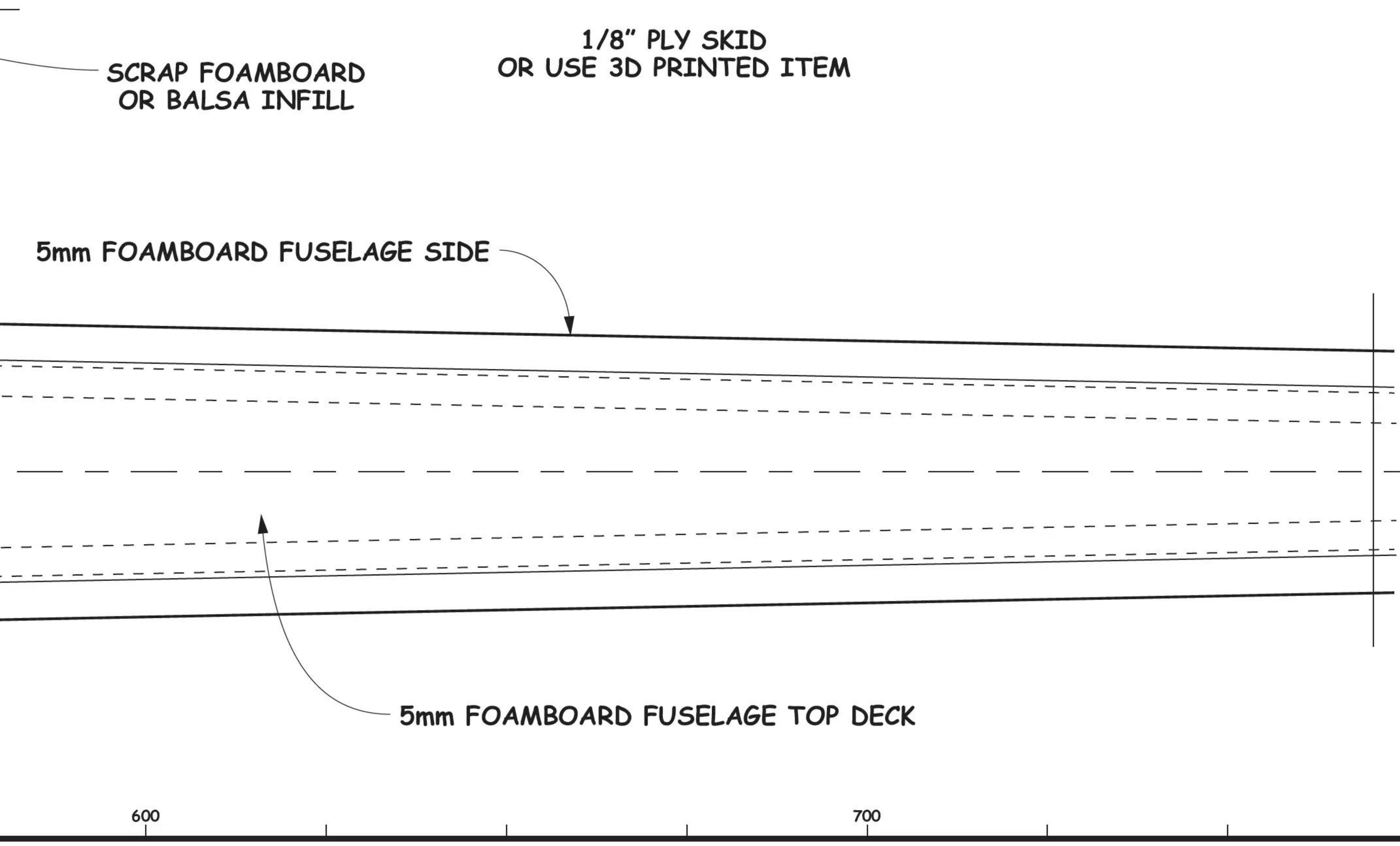
REAR VIEW OF FUSELAGE



1/8" PLY SKID
OR USE 3D PRINTED ITEM

SCRAP FOAMBOARD
OR BALSA INFILL

5mm FOAMBOARD FUSELAGE SIDE



5mm FOAMBOARD FUSELAGE TOP DECK

28

24

500

6.4mm x 5mm
SOFT BALSA

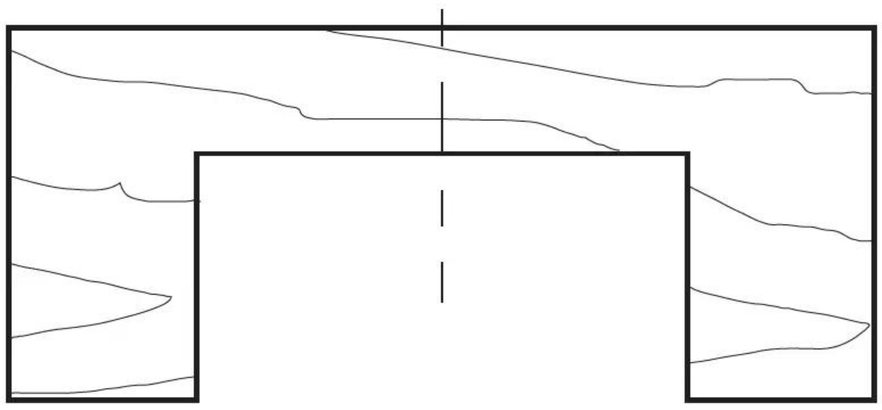
300

W1

20

16

12.5mm x 5mm SOFT
BALSA TAILPLANE L.E.



1/32" PLY ELEVATOR STIFFENER
2 REQ'D FOR TOP & BOTTOM

12.5mm x 5mm SOFT BALSA
TAILPLANE T.E. & ELEVATOR L.E.

REAR U/C
Ø4mm W

12

8

T
E.

5mm FOAMBOARD
TAILPLANE CORE
(FULL SPAN)

POSITION OF
ELEVATOR STIFFENER

6.4mm x 5mm
SOFT BALSA
ELEVATOR OUTLINES

REAR U/C LEG
Ø4mm WIRE

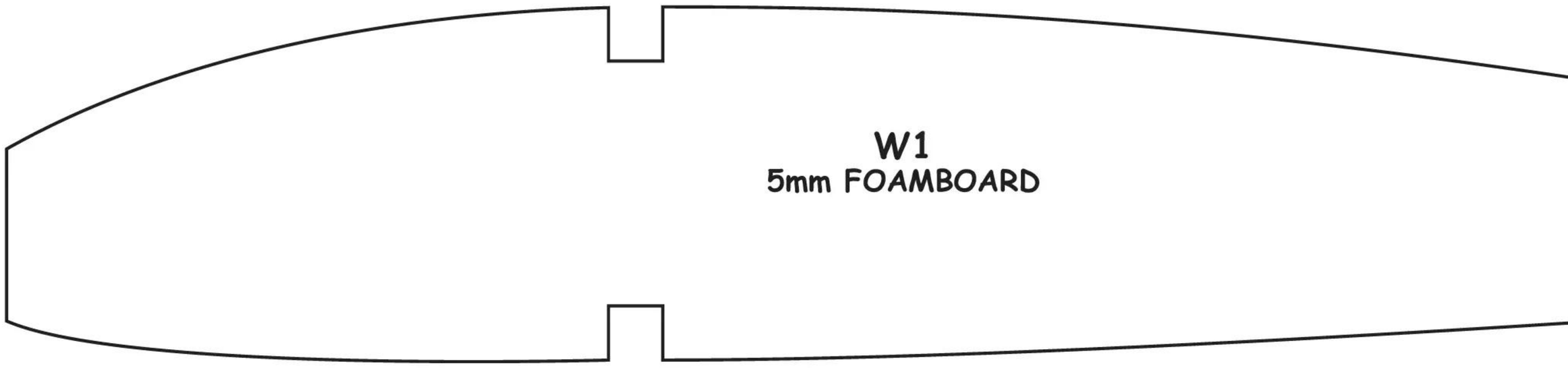
SCALE
INCHES

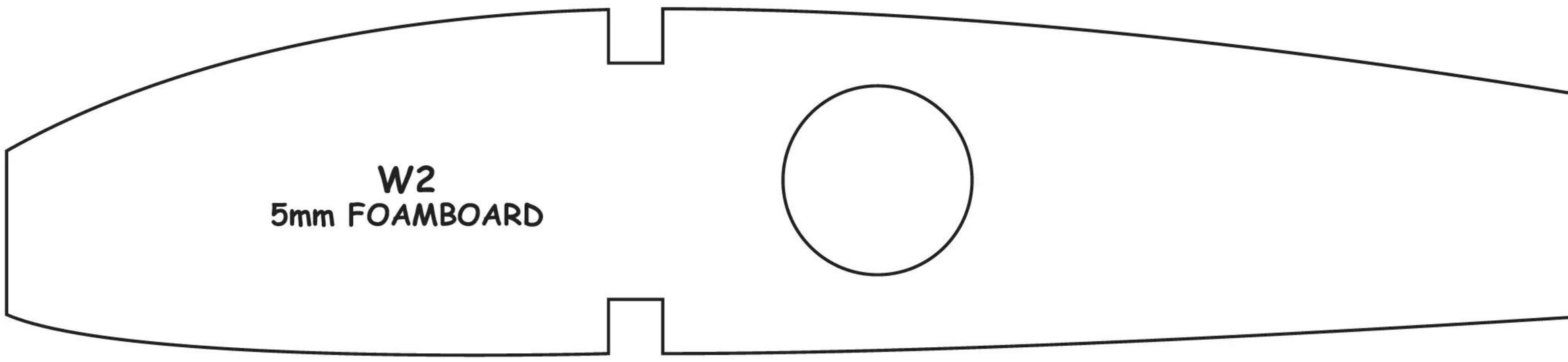
RCM&E

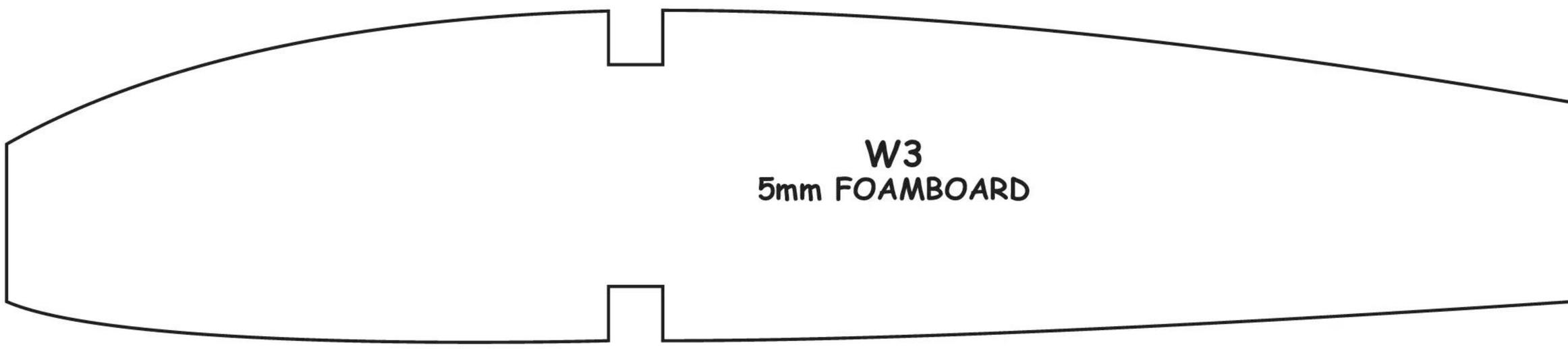
FUNDROID

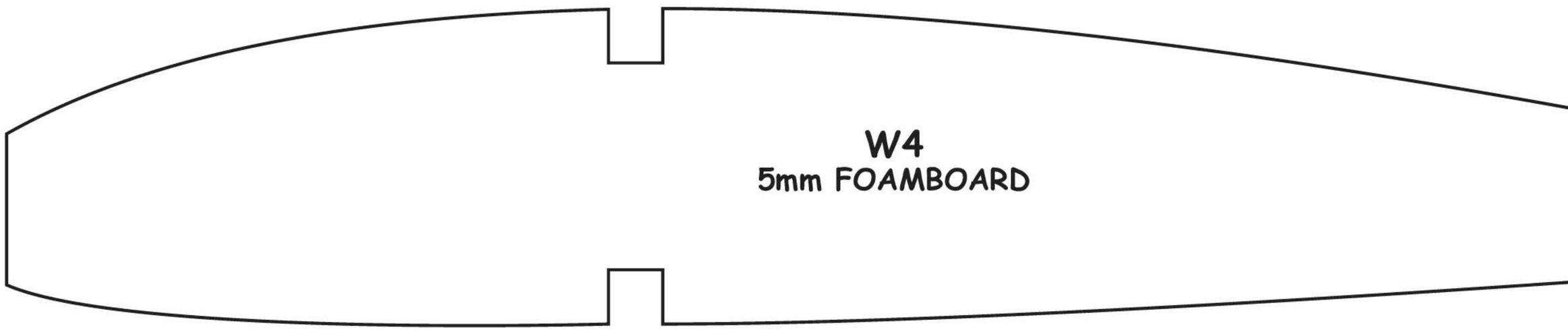
BY MIKE BELL

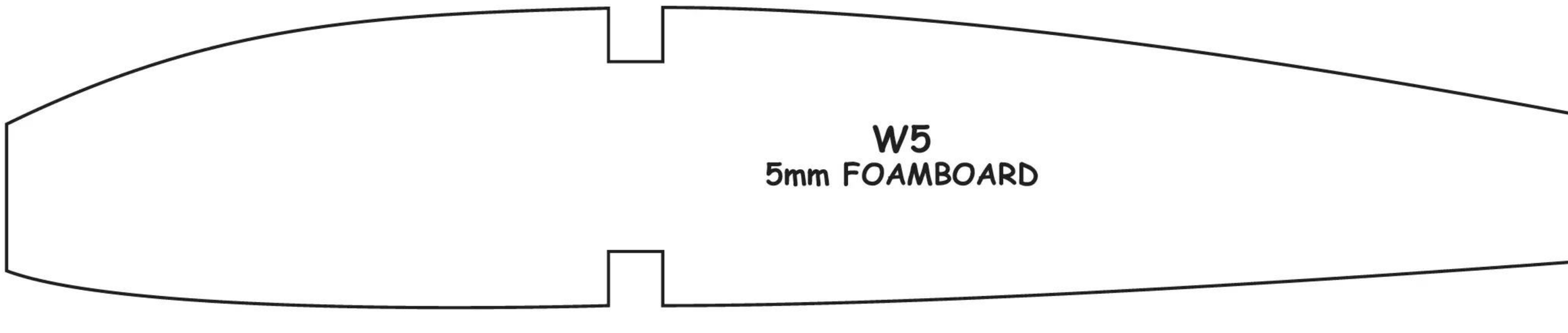
PLAN No: RC2272	No. OF SHEETS: 2 OF 3	First published in RCM&E May 2025

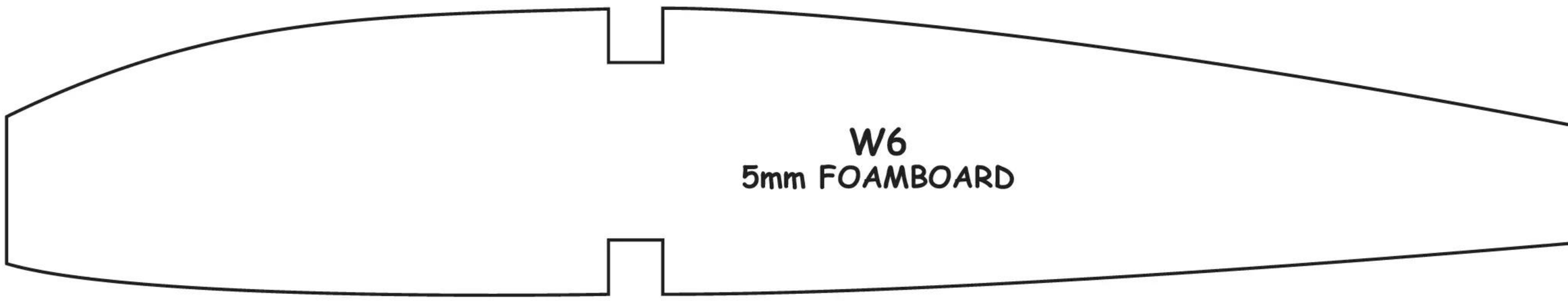












SCALE
MM

200

100

100

FRONT U/
Ø3.5mm W

00 300 400

Ø3.5mm WIRE

FRONT U/C LEG
Ø3.5mm WIRE

6.4mm x 5mm
SOFT BALSA
OUTLINE

5mm FO
FIN

CUTOUT TO CL
& ELEVATO

400

500

CHAMFER
BOTH SIDES

12.5mm x 5mm
FIN T.E. &
RUDDER L.E.

6.4mm x 5mm
SOFT BALSA
OUTLINE

5mm FOAMBOARD
RUDDER CORE

AMBOARD
CORE

EAR TAILPLANE
OR JOINER

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600
700