Meadow Flyer - Newsletter of Oxford M.F.C.

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A blast from the past: the Editor's 2 x FROG Widgeon, electric powered. Classic design, smooth flyer.

In This Issue

"Spring is sprung / The grass is riz / I wonder where the boidies is? / The boid is on the wing / But that's absoid / Because the wing is on the boid . . . "

The familiar old rhyme, sometimes called "*The Brooklyn National Anthem*", is right. The weather's definitely looking up, with the recent calm, warm spell heralding an exciting new outdoor flying season. Are you ready?

A Promising Start (David Thurling, Club Chairman)

The year has started well for the Club. Membership: numbers are buoyant (90 at the last count), with most of last year's members re-joining and some new members arriving. We offer them a warm welcome. An easing of the Covid situation meant that we were able to resume our monthly Begbroke meetings in February, enjoying a chance to chat, show off the latest builds, including one 3D printed RC model, and enjoy some fixed and rotary winged flying in the Hall.

You will have seen from the recently circulated *Forthcoming Club Events* (repeated below, P.22/23) that we have a full programme of activities planned for the coming months at both Begbroke and on the Meadow. These activities have been chosen largely on the basis of the responses received to a questionnaire produced by Andy Blackburn who has been co-opted on to the Committee in the role of Flying Events Co-ordinator.

At the April Begbroke meeting there will be an opportunity to try your hand at electric control line flying so, if you haven't tried it before, why not give it a go? The following month will be a Kit Scale Model Evening (*see Bill Dennis' article below*) so if you have one please bring it along to exhibit and fly but if not, there is still time to get building. Modest prizes will be awarded including ones for anyone building such a model for the first time! For the months of April to August, weather permitting, we will also enjoy some informal flying of free flight and RC models. Details of each meeting will be circulated nearer the time and starting times will be earlier on some nights to make the most of the light.

We fly at Begbroke with the agreement of the neighbouring London Oxford Airport so it is essential that we abide by the terms of that agreement, primarily that models must weigh a maximum of 500 g and be flown below 100 feet and within the confines of the playing field. A Committee Member will act as Safety Officer each evening. If you haven't yet been to a monthly meeting (Begbroke Village Hall, 3 Begbroke Lane, OX5 1RN) please give one a try.

Last year saw good use being made of our main flying site, Port Meadow, for both free flight and RC and, with the improving weather, Meadow activity is picking up. On 15 May we have an event for all members when we hope to contribute to the BMFA Centenary world record attempt for the largest number of models (of any kind!) airborne at one time. Launch will be at 12 noon and further details will follow. On 26 May, subject to City Council permission, we will be holding the Dreaming Spires Free Flight Rally. We have held free flight rallies on the Meadow for over 40 years. These are friendly occasions and everyone, novice or expert, is welcome to participate in the various flying class competitions. At 5pm on 6 August we will be holding our annual Cloud Tramp Mass Launch, along with other free flight activities.

As club members we are very privileged to be the only people allowed to fly models on the Meadow, which we have been doing for over 50 years. It is therefore very important that we operate within the *Club Rules For Flying On Port Meadow* and it is every member's responsibility to abide by these so that our permission isn't jeopardised. If you haven't yet joined the Meadow Flyers WhatsApp group and wish to do so please email our Membership Secretary, Simon Burch, (simon_burch@yahoo.co.uk) with your mobile number.

Finally, I repeat what I wrote following the AGM. The success of a club depends on active participation by its members. A number of members, not just those on the Committee, have

worked hard to plan activities and events but without your participation they will not happen. I hope that after the restrictions of Covid this will be a year to celebrate as a busy and enjoyable one for building and flying, and for getting together. David Thurling, Chairman

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A couple of emails sent in to the editor, first, this from Alan Trinder

Hi David
I'm sending the attached photo in case you need something extra for the newsletter. My second attempt at a "No-Cal" model. It flew at Berinsfield today but still needs more trimming to get a reasonable flight time.

The tissue was printed using a black and white laser printer. The idea being the print wouldn't run when the tissue was sprayed. Correct assumption but it did run, of course, when doped. Will spray and dope before printing next time. The model is, hopefully, recognisable as a Focke Wulfe 190. One might assume it is in "night fighter" livery. The truth is I used blue tissue as there was no white tissue to hand.

A problem I have when downloading from the "No-cal" website (parmodels.com) is getting the picture and plan printed to the same scale. (Lack of computer expertise). What I did was print extra copies of the wing and fuselage profile pictures and use those to build the framework on. Seemed to work reasonably well.

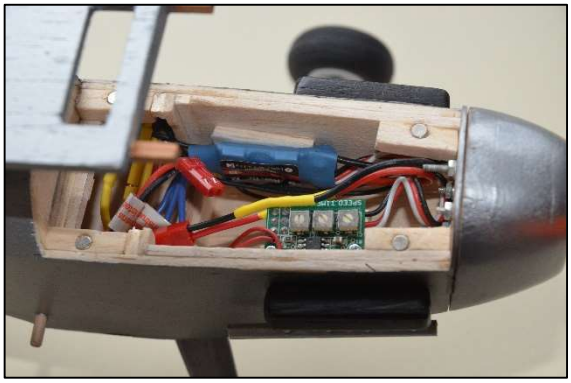
Cheers, Alan T.

And from Bob Lee . . .

It's finished! It's been the longest model build yet, my Meadowlark (AKA, x 1.5 Frog Tomtit); over a year from start to finish. There have been a few false starts and a few deviations onto other things on the way but finally it's complete, just waiting for a suitable day to go out and chuck it into the sky.

It's electric powered; the motor is an 1811 sized outrunner with a 7 x 3.5 GWS prop. It uses a 10A Electronic Speed Controller (ESC), controlled by a Derek Knight (KP Aero Products) combined timer /flight profiler, all powered by a 2S, 450mA LiPo. If that sentence doesn't make any sense to you, email me and I'll give you more details!

The electronics are all housed in the nose, under a removable hatch, retained by magnets, and the motor is hidden under a removable cowling. In order to get the correct balance point, access to the battery is by removing the lower wing, not the pain that it might seem, since it's free flight



and the motor runs are short, so I should get many flights out of one battery. In one of the pictures you can see the motor start push button switch, it's a push-to-instant-start but in order to restart you have to remove the front hatch and disconnect/reconnect the battery so there's no danger to someone picking the model up.

The flying surfaces are covered in yellow Asuka tissue over 5 micron mylar, both from Mike Woodhouse, Free Flight Supplies. The fuselage is Dilly tissue (only available in white), over mylar and then sprayed silver using a Halfords' 'rattle can'.

I did go to town a bit on the final finish. The lettering is decal (i.e. waterslide) paper, sprayed with the appropriate colour and the lettering then cut out, the cutting being done on my *Cricut* craft cutter. For the G-OMFC registration the letters are cut out individually but the ***Meadowlark*** is cut out as one piece, the letters all being connected. As you can imagine, putting the ***Meadowlark*** onto the model without it breaking up/creasing/folding in on itself/going all wonky, involved a degree of care and some swearing! G-OMFC? Obvious origin there and it seems there isn't a full size aircraft with that registration.

The dummy engine is very simple; a balsa block and some aluminium tubing, just some careful drilling involved. Having got that far, it had to have a pilot, which is a Dave Banks creation from the Vintage Model Company (VMC). I was a bit apprehensive about painting the pilot but there is a very good video tutorial on the VMC website. I bought a set of 12 tubes of acrylics from Amazon for £6 which came complete with 3 very good brushes, so that was a bargain and gave me all the colours that I needed. One good tip from the VMC demo was, when it's all painted and dry, mix up a very thin wash of black and go over it with that. It just knocks the edge off the colours and makes it look more realistic.

The final touch (not shown on the pictures) will be a pair of Lewis guns, 3D printed for me by Alan Smith. After all of that, maybe I should have built a scale model? It wouldn't have been that much more work! Actually, it wouldn't be difficult to redraw it as an SE5A, maybe another day?

All that's left is to send it skywards, so wish me luck and watch this space!

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Need help trimming your vintage rubber models? Fear not - Andrew Longhurst has the gen. If you've serious ambitions regarding comp. flying, this article is one to keep!

Trimming Vintage Duration Rubber Models
By Andrew Longhurst

Free flight rubber models are self-stabilising robots but the problem is that they have to fly at different speeds and with different torque effects, consequently, although there is logic to it, there is a black art as well.

In what follows I make some important assumptions, i.e. that you want long flights and you are using a reputable design. Furthermore, that everything is secure including locating the noseblock, prop bearing, tailplane and fin so that settings are not changing all the time.

In part one I talk about the three main trimming patterns and the usual model set up for each of those. In part two I have a shot at problem solving and in part three I illustrate the theory by using frequently asked questions sent in to the rubber column over many years.

Part 1

There are three patterns of flight. The first applies to models with freewheeler props and the second and third to those with folders. I will assume that all have normal anti-clockwise rotating props and therefore all three types will need to circle right under power to oppose the torque effect which is trying to roll the model the other way. When gliding, all freewheelers will need to continue circling right, (more on this later) but folders can glide left or right.

All trimming starts in the workshop. Time spent fettling the model and testing the systems is never wasted. Below are your basic settings. Don't bother to go out test flying until all these things are set up:

Pattern 1 – Freewheelers on right/right trim:

CG – 50% back from the wing leading edge (if tapered or swept, measure at mid span).
Thrust Line - Down thrust, 2 to 3 degrees / Right side thrust, 2 degrees
Wing Incidence - 4 degrees (5 if it has a flat bottom wing section)
Wing Warps – left rolling warp at rate of 1/32" per 1" of chord. Total for both wings.
i.e., on a 4" chord wing viewed centrally from the rear, either the left wing should be washed out 1/8". or the right wing should be washed in by 1/8", or 1/16" on both.
Tail – no tilt - no warps.
Fin – Dead straight viewed from the front.

Pattern 2 – Folders on right/right trim:

CG – 50% to 60% back from the wing leading edge with prop folded.
Thrust Line - Down thrust, 2 degrees / Right side thrust, 2 degrees
Wing Incidence 4 degrees (5 degrees if using a flat bottom wing section)
Wing Warps – left rolling warp at rate of 1/32" per 1" of chord. Total for both wings.
Tail – no tilt - no warps.

Fin – Dead straight viewed from the front
Pattern 3 – Folders on right/left trim:

Same as Pattern 2 above but:
Thrust Line - Down thrust, 1 degree / Right side thrust, 4 degrees
Wing Warps – No significant right or left rolling warp should be present but small offsets either way can be tolerated.

By the way, fins with cambered sections are total poison, never go there. If you want to build a design which features one, convert the fin to a symmetrical section of the same thickness.

Selecting the motor:

Deciding on the length of the motor is easy: make it 1.5 times the distance between the motor hooks. You will need to have a spring-loaded prop stop or to braid (pre-tension) the motor to keep it tight when it's not working.

Cross section is more difficult because a lot depends not just on the size of the model but also on its weight, prop diameter and prop pitch. There is a guide to cross section below and there is also a conservative turns table created by John Barker (mathematician and designer of the Hep Cat). It's invaluable to have a copy of this in your flight box.

TAN Super Sport made later than January 2009 is far and away the best rubber ever made for our purposes. Motor sizes written on old plans should be totally ignored. To start, get some TAN SS and make up motors as follows:

Under 20in. wing span – 4 strands of 1/8
Under 25in. wing span – 6 strands of 1/8
Under 120 sq.ins. wing area – 10 or 12 strands of 1/8
Under 150sq.ins. wing area – 8 strands of 3/16 or 12 strands of 1/8
Under 190 sq.ins wing area – 16 strands 1/8
4oz Wakes – 18 strands of 1/8 (except Lanzo Duplex which takes 20 strands of 1/8)
8oz Wakes – 12 to 14 strands 1/4 or 16 to 18 strands of 3/16

If the model fails to climb to at least thirty feet on one third full turns it's probably under powered so think about adding another loop (two strands). If, on the other hand, there is a marked drop of the nose when the power expires it is probably over powered so you can either limit the turns/torque or think about reducing the motor cross section.

Motor weight in grams	**Number of strands of 1/8th Super Sport**										
	2	3	4	5	6	8	10	12	14	16	18
3.00	1654	900	585	418	318	207	148	113	89	73	61
4.00	2205	1200	780	558	424	276	197	150	119	97	82
6.00	3308	1800	1169	837	637	413	296	225	179	146	123
10.00	5513	3001	1949	1395	1061	689	493	375	298	244	204
20.00	11025	6001	3898	2789	2122	1378	986	750	595	487	408
25.00	13782	7502	4873	3487	2652	1723	1233	938	744	609	510
30.00	16538	9002	5847	4184	3183	2067	1479	1125	893	731	613

35.00	19294	10502	6822	4881	3713	2412	1726	1313	1042	853	715
40.00	22051	12003	7796	5578	4244	2756	1972	1500	1191	975	817
50.00	27563	15004	9745	6973	5305	3445	2465	1875	1488	1218	1021
60.00	33076	18004	11694	8368	6365	4134	2958	2251	1786	1462	1225

Part 2

On the Field with Freewheelers:

I expect you will be starting with a freewheeler but I have to tell you that they are much more difficult to trim than folders because you cannot separate the power trim from the glide trim. The problem will become clear as you read on.

Hand glide in the calm or in the lee of trees. Pack up the wing or tail to get a glide. Under elevate rather than over elevate to avoid stalling. When gliding well, look for the right turn to start. As it is a freewheeler it must go right. As the fin is straight, the right thrust will help it turn right owing to the prop acting as a front fin. Add 1/16 square in ½ in. lengths to the fin T.E to get this turn. Increase or reduce as necessary to get a big circle. From a normal hand glide the model will usually have turned about 20 degrees at touch down.

Wind on one third full turns, launch into wind. If more or less correct it will climb to about house-top height. If it's not too bad try again. Check that the glide is smooth and turning right in large circles. When the glide is satisfactory increase turns to one half and start to watch the power climb. Is it a) stalling, b) stalling slightly (known as step climbing), c) is it perfect or d) is the turn tightening up (betrayed by fast flying or a wing banking over)?

If a) or d) take corrective action. If b) or c) do nothing at this stage.

Generally speaking, power stalls are cured by adding right thrust using 0.5mm ply strips to the left side of the nose block. Power spiralling is cured by reducing right thrust by adding 0.5mm ply strips to the right side of the nose block. If you are flying a diamond fuselage model, you will have to reduce or increase down and right thrust together but remember that you will always need down thrust even though in the end you might not need much right thrust.

Increase turns to two thirds, watch for the same a) – d) possibilities and correct with the minimum adjustment. Now move on more cautiously towards full turns.

What can go wrong with freewheelers

As they must be trimmed right/right, too much power can be disastrous. Far better to have a motor of too thin a cross section than the reverse, especially if you are winding without a torque meter. So, watch for instability particularly the initial loop, stall or spiral occurring in the first 10 seconds. Correction is by reducing power or by careful trimming as above. If you are sure that your model is not overpowered but it is still misbehaving under power, there are too things you can do:

1. Check or adjust the warp and/or use a different blend of down/side thrust.

Thus, if looping – add side thrust and/or reduce the differential warp. If the model is power spiralling on the other hand, you need less side thrust and more down thrust – possibly much more. Start with increasing down thrust to 4 degrees and reducing side thrust to one degree.

2. If the wing warp is correct, do not change, it but you can increase the effect by adding a 2" length of 3/32" sq. strip along the under surface of the right wing's trailing edge right on the extremity (known as a Gurney flap). Ditto on left wing to reduce the effect of the warp. Whenever making major changes to right thrust on a freewheeler you have got to go back and start from scratch because the glide turn may be seriously affected by the change in thrust line. i.e., you will have to check and re-adjust the glide turn by adding strip to either side of the fin T.E as necessary.

Freewheelers often get into a nasty cycle, for instance, where you increase right thrust to kill a power stall but then, as a result, the glide turn gets too tight. So you alter the fin tab setting left to correct the glide but it starts to power stall again. The way out of this is to use left side up tail tilt to reduce the glide turn instead as this won't affect the power turn very much but the effect on opening out the glide circle is surprising.

I have been dictatorial about the need to go right/right with freewheelers but very small models under 20ins span or slightly larger ones with small wing chords may have to go left/left. The problem is that the sectional efficiency at these sizes is so low that they have to be kept away from a power stall at all costs, otherwise they may just fall out of the sky. This is due to the risk of stalling being less going with torque rather than against it. The climb will be less steep but hopefully more reliable.

<u>On the Field with any Folder model</u>

Hand glide in the calm or in the lea of trees. Pack up wing or tail to get a glide. Under elevate rather than over elevate i.e., avoid stalling. When gliding flat, look for the turn to start. As it is a folder it can go either left or right. As you have kept the fin straight, it is the wing warps and the position of the prop when folded which will dictate the preference of the model has to turn one way or the other.

Do you know which way you want it to go? If you have ended up without a left rolling warp it will probably be better to glide left. If it has a strong natural turn why not go with the flow because forcing a model to turn against a strong natural tendency may make it prone to stall on the glide. Vintage models have short moment arms and for this reason alone, my experience tends to show they will get higher going right/left. Perhaps you can find out which way some expert flies this design? I can promise you they will always be happy to advise.

To adjust the turn add 3/32" square in 1/2" lengths to the fin T.E.. Either increase it or reduce as necessary to get a big circle. From a normal hand glide, the model will usually have turned about 20 degrees at touch down.

If you originally intended to go right but have decided after hand glides to let it go left – <u>increase the right thrust to 4 degrees now</u>. If you don't, it will stall and crash.

Wind on one third full turns and launch into wind. If more or less correct, it will climb to about house height. If not too bad try again before changing anything. Check the glide is smooth and turning in large circles. *Only when the glide is satisfactory*, increase to one half full turns and start to watch its behaviour under power. Is it a) stalling b) stalling slightly? (known as step climbing),

c) is it perfect? Or, d) is the turn tightening up? (betrayed by fast flying or the wing banking over). If a) or d) take corrective action thus:

Generally speaking, power stalls are cured by adding right thrust using 0.5mm ply strips to the left side of the noseblock. Power spiralling, on the other hand, is cured by reducing right thrust by adding 0.5mm ply strips to the right side of the noseblock. If you are flying a diamond fuselage model, you will have to reduce or increase down and right thrust together. Of course, this may or may not be helpful.

Increase turns to two thirds of the maximum, watch for the same a), b), c) or d) possibilities and correct with the minimum adjustment. Now move on more cautiously towards full turns.

What can go wrong with right/right folders

As there is no change of turn direction at the end of the power run, transition problems are unlikely but what you may notice is that the nose goes down at the end of the run. This is an inevitable consequence of the blades being open and holding the CG forward. The advantage of light prop blades is clear but you can adjust the prop stop to retain more turns at prop fold.

Observe carefully that the prop always folds neatly in the same position. If it doesn't, the effect on the glide can be very severe. You should have sorted this in the workshop before you came out but sometimes aerodynamic forces stop a blade folding.

What can go wrong with right/left folders

A well-trimmed right/left model should have virtually no portion of straight flight. When the power dies it should change direction from right to left as if a switch has been flipped over.

Straight flight is to be avoided as it encourages the model to start stalling. It follows that right/left models are better with plenty of power so that it decays quickly followed by a snappy prop fold. Indeed, a right/left set up is better suited to high power for another reason, that is, power spiralling rarely becomes unstable owing to the left rudder tab holding the nose up when banked at high speed.

High power looping or stalling in the first 10 seconds is the most likely problem. This can be cured by adding a little right thrust. Alternatively, you can try moving the C.G. back to 70% and reducing tail incidence to compensate. This right/left set up is not very sensitive to wing warps so do not look for a solution there unless your wing is more twisty than the prop.

Part 3

FAQs

Why does trimming start in the workshop?

There is nothing worse than getting all the way to the flying field and have it prang first flight – this need never happen. If you check and adjust everything first in the workshop it will at least fly safely until you can catch a good trim. Not only will you have no wrecks but stupid things won't happen either. For instance, you won't end up with so much packing under the tail that the locating blocks fail to locate. Overall, you will be able to obtain a good trim with less visits to the

park. Keep a notebook with weights and trim settings of every successful model so that if you build another one you can set it up in the workshop and it will fly near perfect first time.

Don't forget to check the pitch of your prop - forty degrees angle of attack at half radius and twenty degrees at the tip is about right.

There is one downside to all this preparation: it may fly away first flight, so first check the D/T is working before you sally forth. Yes, I have had it happen . . .twice! A radio DT is brilliant but check it works at home, check it again when you get to the flying field and have a spare battery.

How do you measure wing incidence and warps?

Lay the fuselage on its side and place one 2ft length of straight balsa strip along the fuselage to align with the tail seating. Line up another against or parallel to the wing seating. Take a child's protractor and measure the angular difference between the two. Normally four degrees will be about right but if the wing section has a pronounced Phillips entry (i.e., you have to pack up the leading edge well above the building board during construction) a little less will suffice. If the wing has a flat bottom section you will need a little more.

The warp is created by packing up with balsa shims as you water shrink the wing tissue (panel by panel) or by application of heat you are using film or polyester. After doping, check it by eye. Support the wing under both tips at least a yard away. Close one eye and view it from the rear and slightly below, aligning your eye with the centre rib – all will be revealed. Gentle twisting with heat from a craft gun used in the first 24 hours after doping will restore any distortion due to dope shrinkage. Store in a warm place and repeat in seven days. It won't move much after that unless it gets rained on.

Remember that spar-less and single bottom spar wings are always going to be in danger of changing their warp. If the covering looks nice and taught after water shrinking and you use high shrink acetate dope, thin it down well. The tightening of the tissue puts more stress on the structure than anything it suffers whilst flying.

Why must you go right/right on a freewheeler, where this is not necessarily the case on a folder?

So what happens if you try to glide a freewheeler left? Following the right turning climb, the prop is still trying to turn the model right on the glide and there is nothing you can do about it. If you try and fight it with left rudder the model does not know which way to go. You may say you will trim it until it is consistently going left but experience shows that this cannot be done because minor variations in glide speed are bound to occur. That is, at 10mph it will glide left but at 11mph it will go straight and at 12mph it will go right depending on the balance of forces. In other words, the effectiveness of rudder and prop mean they will steer differently, relative to one another, at different speeds. The result is a model that will go straight on, out of the field or, even worse, lock itself into stalls. Why does it lock into stalls? Because, to some extent, a model relies on its turn to iron out a stall. The model will often stall slightly owing to air disturbance because it picks up speed when the nose goes down. If there is no strong turn effect, the tailplane will gain command and will bring the nose up, perhaps into another stall. A strong rudder will help it turn out of the second stall by dumping lift from the inside wing and giving a smooth transition back into level flight. If the model does not know which way to turn out of the stall it may just go off endlessly stalling into the distance.

On the other hand, folders are not affected on the glide by changes in thrust line providing the prop always folds in the same position relative to airflow regardless of thrust line adjustments (as it would if the prop folded tight against the fuselage). This may not always be so. A fold stop may be incorporated into the prop hub and in this case glide turn may well be affected by thrust line adjustment because the blades take up the new angle of sidethrust even when folded. So this is another very useful trimming trick especially with single bladers. If the folded blade is steering the model the wrong way, try folding it on top or on the other side of the fuselage. It only takes a minute to move the stop screw 90 or 180 degrees.

Why do changes in right thrust affect the glide of a freewheeler but changes in down thrust do not?

The pitch stability of a model is much greater than its directional stability. Consequently, a change in side thrust has a noticeable effect whereas a change in down thrust does not. It is there however, and experiments with indoor test models using extreme thrust offsets shows that it does happen. It follows that adjustments to side thrust should be made with 0.5mm ply strip whereas adjustments to downthrust can be made with 1mm strip because it is less sensitive.

The other thing to remember about downthrust is that it works more when the model is accelerating than it does when up to speed. So if you increase it, adjust your launch angle upwards otherwise it may hug the ground until it gets going.

How can a wing warp not affect the glide?

Wing warps may or may not have an effect on glide. It all depends on the balance between lift and drag. Most times lift will win over drag but there is no set rule. Thus, your right wing normally has more incidence than the left. This is to counteract spiralling tenancies under power. Differential left rolling warps, as they are called, are very useful on the power phase for right/right trimmed models, both freewheelers and folders. With vintage rubber models, the only reason to have differential warp is to control powered flight (i.e., the model chasing its tail and not gaining height – or worse - descending). There is no reason to have differential warp for the glide but unfortunately, we are lumbered with it when the model is gliding. So what effect will it have?

Well, the right wing is both generating more lift and more drag than the left. Normally lift is boss and it will turn the model left by rolling it left in spite of the additional drag. However, these forces are self-balancing at low speed so the effect is small and often unnoticeable when the model is gliding smoothly. On a freewheeler therefore, the warp induced turn is opposing the rudder/prop induced turn but is so small that it is easily dominated in normal glide. This changes when the model increases speed either under power or when diving. It will of course dive following a stall. The nose drops, the speed picks up, the rudder/prop steering effect tries to turn it out of the stall but ***DRAT*** and ***DOUBLE DRAT***, the warp holds it straight causing the stall to lock in.

Some models are worse affected than others mainly due to air flow effects on the wing upper surface and the size of the tail etc. but basically the effect on the glide of a left rolling warp on a right turning vintage rubber model is de-stabilising. Some folk would disagree but they are usually getting confused with modern classes which have larger tail volumes and lower polar moments and hence can glide against a warp with no adverse effects and in fact may be stabilised against the glide tightening. On properly built popular vintage designs, glide spiralling is very rare whereas inconsistent glide stall is extremely common, therefore decisions to do with warp must be justified on power trim alone. So, the rule with vintage right/right trimmed models must be to use left rolling warp but in moderation.

If you have a freewheeler with no differential warp, try trimming it right/right but keep the motor long and thin, Go for a long gentle climb and this might well prove to be as effective as a warped set up. You never know.

If, however, you have a right rolling (i.e., wrong!) warp, the model will be absolutely impossible to trim for competition but might be OK for sport flying especially if you like your toy to stay close to the ground. Best to strip and re-cover the wing, but this time be patient and weight it down when water shrinking. Alternatively carve a new prop rotating the opposite way i.e. clockwise from the front . . . on second thoughts, just recover the wing! Polyester tissues which are heat shrunk can be a godsend here but they weigh slightly more and often don't stick properly to undercamber.

Why isn't a warp necessary with right/left trim?

As we have seen, a warp is mostly counterproductive on the glide. Therefore, if you don't need it for the power run, don't use it. With right/left trim there is an alternative opposition of forces between the left rudder and right thrust and you don't need a warp. In fact right/left models are very insensitive to warp on the power run so it is best avoided but small warps either way are fine and will not usually cause a problem.

My model climbs well but the glide is diabolical?

Assuming that the model is one which will glide, (very small models often have a glide more in the way of a controlled crash) there are two possible problems emanating from either the wing or a freewheel prop:

1. Firstly, the wing may not be working properly because the airflow is incorrect. On a microscopic level, the air particles closest to the wing are actually stuck to it, whilst those on the next layer move slowly, the next, a little faster and so on. It is a complex relationship in which some air particles roll over themselves as well as flow smoothly. At low energy levels (speed) the process can be regularised by bumps in the top surface that help the air behave in a predictable fashion (top spars or turbulators). At our speeds, the air is like syrup and instead of flowing smoothly, dirty great lumps of it may stick and unstick from the wing. Many vintage designs do fly slowly and do have a lack of bumps on the wing's top surface. Consequently, if the leading edge does not set up (energise) the airflow correctly there is nothing else to do it and the wing may not work properly.

On the climb it will be fine because it is moving faster and at a lower angle of attack. On the glide however, the wing will not behave consistently near the stall and you will not be able to get a trim better than a gentle dive. The worst offenders are sharp leading edges combined with smooth highly cambered top surfaces. The best wings are multi-spar with diamond leading edges. But if you keep the L.E. to about 3/32" (2mm) radius, other types are fine and hopefully you may never encounter this phenomenon. You can temporarily exchange a suspect wing with another similar one and see if it is better. On a couple of occasions, I have been amazed by the change.

2. The second possibility is of a freewheel prop which combines a low pitch with a large blade area, for instance, the Mick Farthing Freewheeler. Few people appreciate the drag of a freewheeler and its cost on glide duration - 25% would be average. The lower the pitch, the more the drag penalty. Therefore, make sure the pitch is up around the maximum say, 1.5 P/D ratio (62 degrees angle of attack at 25% radius, 44 at 50%, 32 at 75% and 25 degrees at the tip). Folders are probably better with a slightly lower PD ratio, say 1.3, but it's not that critical for them.

My model stalls violently on the climb but only sometimes?

First check that the nose block is seated firmly and that the shaft bearing has not come loose. The wobbly bearing catches everyone out sooner or later! Next, check the prop pitch. If it has an angle of attack more than 45 degrees at half radius and/or thirty degrees at the tip, the problem may be a prop stall. A prop stall often occurs in conjunction with a whole or partial wing stall. Multi-spar wings (especially) are capable of flying very near the stall, often partly stalled and yet still flying. Eventually the drag becomes too much for the prop, the air flowing over the prop stalls in sympathy and you get a characteristic back slide about a quarter into the power run. The solution is to reduce the pitch slightly and this you can do by donning thick rubber gloves and steaming your prop to a reduced angle of attack.

My model trimmed out fine but when I got it to a comp it piled straight in.

All vintage rubber models become unstable at a certain airspeed. Speed is a function of power. It follows that a torque meter is very helpful.

The first possible cause is that you have trimmed the model on 900 turns but at the comp, your enthusiasm gets the better of you and the model gets away with 999 on board. The second cause is that rubber stores and releases far more power when hot than when it is cool – perhaps as much as 15% more. Trimming is best done in the cool of morning or evening when vertical and horizontal air movements are minimal so when you are at a comp in the heat of the day, surprising things can happen.

Is a freewheeler as good as a folder?

The answer is “No”, but of course the prop is only one part of the package. Having two blades puts it at a significant advantage in the climb compared to single bladers although not of course compared to twin blade folders. The structure of the wing and the way it is stabilised will be just as important overall.

Freewheeler props undoubtedly have an adverse effect on the glide. Some freewheelers still glide pretty well – often designs which have top spar wings which tend to be superior at low wing loadings such as we use on lightweights and 4oz Wakes. Glide performance is reduced because the drag of the freewheel prop results in the model adopting a steeper angle of descent whilst maintaining a similar glide speed thus hitting the ground sooner.

That’s it! *Happy flying and do email me with any queries at* *andrewlonghurst@yahoo.com*

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REMINDERS / FREEBIES

Rubber Strip Calling all you Rubber Fetishists out there, don’t forget that Club Sec. Bob Lee has custody of the Club’s Rubber Stripper and will gladly make available supplies of *FAI SuperSport* rubber in various sizes. You’ll not buy better or cheaper . . . lee_bob2@yahoo.co.uk

Club Stickers Our man Stuart Golodetz has lots of OMFC stickers, in A4 sheets that contain lots of colours and sizes. The first sheet is FREE, so if you haven’t had yours yet, grab it now!

And if you've already had it, please buy another! Contact Stuart at sgolodetz@gmail.com

Classic Engines seeking new homes

The engines pictured are left over from the sale a few years ago of a large collection left to the Club by the late Gerry Johnson. They include two *Frog 500s*, an *ED 2.46 (Racer)* and a *Merco 35*. They look as if they may need a bit of tlc but if you are interested in any of them please let me know as soon as possible, otherwise the plan is to dispose of them. They are yours for whatever donation to club funds you think they are worth. Contact David Thurling - djthurling@gmail.com

Futaba 35 MHZ Transmitter Finally, a 6-Ch. Futaba 35MHz *Skysport* tranny is on offer, FOC, from Geoff Worrall. In good nick, it could be useful to someone, if only for spares?

If you're interested, contact Geoff at geoff.worrall77@gmail.com

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Potential problems with older models lie in wait – beware swap-meet bargains!

Unwanted/Unexpected Control Mixing

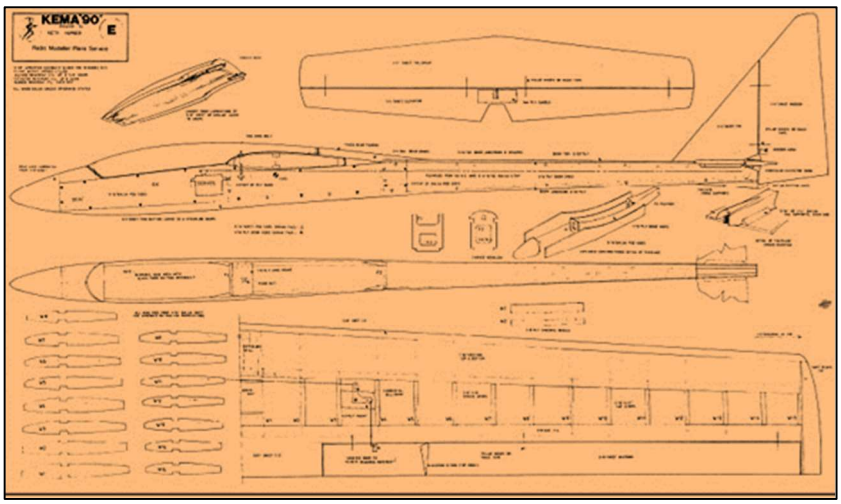
(Author's note – although this incident relates to slope soaring, the lessons apply to all RC types).

St Agnes Head in Cornwall has surely to be one of the UK's finest slope-soaring sites. It's easily accessible by car, the local fliers are welcoming, the Cornish coast and cliffs provide a dramatic backdrop, and it's useable in wind directions ranging from north-east to south west. It's not without its drawbacks; the Cornish weather is unreliable, the well-walked South-west Coastal Path

Looking south west at St. Agnes' Head

passes directly beneath the launch and overshoot path and flying over cliffs or sea can be unforgiving, should something go wrong. Nonetheless, when conditions are good, it's difficult to think of a better site. In June 2021, I was flying from St Agnes Head's south-west facing slope. Unusually, the weather was exceptionally good and I was the only flyer at the site. Of course, I was not alone; there were many walkers using the coastal path which restricted opportunities for launching and landing and, for most of the time, close-in manoeuvres such as low passes and practise go-arounds were out of the question.

I had two models with me; my *Yeti* foam wing and my old *Kema 90* glider. The *Kema 90* is a 68in span, traditional balsa-and-ply model designed by Keith Humber. It's a robustly-constructed 3-channel (aileron/elevator/rudder) aerobatic slope-soarer which looks similar to a Chris Foss *Phase 6*. It's no lightweight but it's easy to fly and very forgiving. I'd built mine in 1998 and flown it successfully for many hours with no mishaps. Within my stable of four slope-soarers it's my favourite, although the one-piece 68in span wing makes it difficult to transport to Cornwall in a holiday-packed car!



***Kema 90* plan from the prolific Keith Humber on the Isle of Wight**

Generic *Zagi* -type Soarer – a slope classic and perrenial favourite

Normally, I flew the *Kema 90* using low rates on aileron and elevator (perhaps perversely, I found that smaller control throws produce smoother, bigger and better looking aerobatics). However, inverted flight needed more down elevator than the low setting provides so, for inverted manoeuvres, I switched the elevator rate switch to 'High'. This clumsy procedure was a legacy from the pre-computerised transmitter days. I'd often considered setting an appropriate exponential on the elevator control instead; I just hadn't done it, and I decided that this flying session was the perfect time to try it out. With 30% expo set on the elevator, I test flew the model; its handling seemed to be a little more sensitive in pitch but full down elevator deflection was immediately available. Time for some aerobatic flying!

One of my favourite slope-soaring manoeuvres is a low pass along the slope face, up into a big, wide wing-over away from the slope, into another low pass in the opposite direction, and repeat. On the day in question, the seemingly endless procession of walkers using the coastal path made this impossible for most of the time. However, as lunchtime approached, the number of walkers reduced and large gaps appeared in the procession. Soon, there was sufficient time to achieve several low passes before the next group of people came within range, so I waited for my opportunity and launched. The first couple of wingover manoeuvres were acceptable but I knew I could go lower and faster; with twice the elevator throw available, it was even easier to pitch up into the vertical for wing-overs and stall turns.

The *Kema 90* was now flying really well; with each low pass my confidence, if not my skill, grew. While it couldn't match the amazing performance of the now-ubiquitous carbon *'Wunderplanes'*, it was still pretty good. Each pitch up and wing-over became more aggressive; each pass lower. With a group of walkers approaching from the south, I didn't have much time left so I commenced my final pass, which, indeed, it was . . .

Right: Waiting for a gap in the traffic! (Note walkers on the coastal path below)

As I pulled the model up towards the vertical for a stall turn to the right, I was shocked when it turned rapidly to the left. Assuming it had flown into turbulence, I applied right aileron which corrected the turn – so all was good. I pulled up again, more gently this time but, once more, the model immediately turned left. Clearly, this wasn't turbulence; something was wrong with the controls. I was able to direct the model towards a clear area but I had only limited control over its flight path. Every pitch input resulted in a turn and although this could be corrected with aileron, a crash looked to be inevitable. Fortunately, the model was more-or-less level when it made a fast arrival on the slope face. It slid rapidly uphill, through the short gorse and heather, eventually coming to halt in the middle of the rock-strewn coastal path.

The *Kema 90* wasn't going to fly again that day but, amazingly, the damage was minimal and largely cosmetic. Most of the damage had been caused by the rough surface of the path; luckily, the softer gorse and heather had cushioned the touchdown and slowed the model down, and the wing-bands (which I'd changed from the original bolt) had absorbed much of the shock to the wings – indeed, three out of four of the bands had broken. I had been very lucky. The undemanded roll to the left had taken the model towards land. If it had rolled to the right, of if the control malfunction had occurred during a pass in the opposite direction, the model would almost certainly have ended up in the sea. Thankfully, I'd been very careful with regard to the proximity of uninvolved persons and, as far as I knew, nobody else had even witnessed the incident. Fortunately, having an intact model also meant that I was able to find out what had happened, and perhaps help myself and others to avoid the pitfall. So what *had* happened?

On inspection in the field, the probable reason for the control malfunction was easy to see. The rudder and elevator servos were mounted side-by-side, on wooden bearers, in the forward section of the fuselage. The two servos were close-fitting, and the aft bearer was concealed from immediate view by the servo mountings and the forward wing-band dowel (see picture).

L.: Elevator/ rudder servo mounting (note: the rear servo bearer is obscured by the wing dowel)

Split Rear Servo Bearer (left) and the Failed Bond on the Front Servo Bearer (right)

At some stage, the aft servo bearer had split along the line of the four morning screws, which meant that almost all of the fore-and-aft load was being taken by the forward bearer. Under normal flight loads this was not a problem, but I'm fairly sure that the additional forces induced by repeated aggressive manoeuvring in pitch, together with larger control throws, had caused the forward bearer/fuselage bonds to fail.

Effectively, this had turned the servos and their mountings into a single movable unit, similar to an old-fashioned 'sliding servo' mixer – and that's exactly the effect that it had. Applying up-elevator had the effect of moving the entire servo assembly forward, which applied left rudder. The *Kema 90's* rudder is large and effective so the result of applying up elevator was an immediate left turn and vice-versa. Hence the partial loss of control.

For me, there were three key lessons from this incident:

- Firstly, and most importantly, unexpected malfunctions such as this one can happen at any time - which means that it's vital to maintain at least the minimum legal separation from people. I'd taken care to do this so, despite losing full control of the model, there was never a chance of injuring anybody. Similar separation should be applied to property and animals too.

- Secondly, I didn't pick up any control problems during my pre-flight check. I'm fairly certain that the failure occurred in-flight, so that's not surprising, but perhaps a more thorough check of the aft bearer's integrity might have revealed an impending failure. I'll never know, but I'll be sure to check more carefully in future.

- Finally, models should be built with ease of inspection in mind. It's not only servo mountings that can fail; plastic control horns and clevises especially can deteriorate and become brittle with age. Concealed control linkages are a particular problem in this regard (I have three models with this feature) but, in future, I'll make sure that I have easy access to these components.

I've now replaced the *Kema 90's* servo bearers with a strong ply tray mounting, bonded to the inner walls of the fuselage, with bearers underneath, secured with glass fibre and retained by a part-former. Fortunately, all of this is forward of the CG, so the additional weight isn't a big problem. It's ready to fly again, and I'm hoping for many more years of safe, fully-controlled flying.

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Editor's Note: Without warning, the National Trust, in concert with Natural England, recently imposed a ban on all model flying at St. Agnes' Head. Apparently the main impetus for this came from Natural England, who have concerns about the effect of slope flying on the wildlife of the area, in particular ground-nesting birds. The logic of this is obscure, since the clifftops have been forever populated by hikers and dog-walkers, in all weathers! If it is a problem, it isn't a new one!

Coming as it does after decades of problem-free use of the site by modellers, this decision has naturally been vigorously challenged. At the time of writing, the outcome of the discussions involving the local clubs, the BMFA, and the authorities has yet to be announced.

According to Andy Syme at the BMFA, the situation is "ongoing", i.e., the ban is still in place and the outcome remains uncertain.

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UK Classic Aerobatic Association by Andy Stevenson


Gangster 63 Lite, Irvine 53

A few years ago I discovered the UK Classic Aerobatic Association, UKCAA (not to be confused with the GBRCAA). The UKCAA is a group now recognised by the BMFA for the advancement of R/C aerobatics of the classic style as flown in the 1970s and 80s before the advent of the turnaround schedule, and using models of that era.The UKCAA likes to differentiate itself from the more contemporary styled GBRCAA because the cost of entry to the formula is considerably cheaper,requiring none of the expensive tech common in modern style comps and in fact ruling some of it out. Any moderately competent sport airframe could be used but most opt for a recognised design, usually one of the thoroughbred types from the heroes of yesteryear like Hanno Prettner, Wolfgang Matt or Mike Birch. Last season I flew my *Gangster 63 lite* (above) as it is well within the time-zone. Although it isn't regarded as a thoroughbred, the *Gangster* is a more than capable aerobat.

Back in June 2019 I went along to one of their meetings just to watch and gauge the level of competition to see if it was for me. This was at the Worcester club which was my old club before I moved to Oxfordshire in 89. It now uses a different site and has none of the members I remember but very friendly. The group is very laid back and puts on contests about 8 to 10 times a year. They have two different classes of competition where the pilot selects a number of manoeuvres from a menu and is scored on those. There are two classes they call *Pick 5* and *Pick 7*, denoting the number of manoeuvres to be flown which are chosen from a menu . This is unlike other contests where there's a fixed schedule. I went in at the entry level of *Pick 5* for the three meetings I attended in 2021. Unfortunately, 2020 was a bit of a bust as they only had 1 or 2 meetings that year which I didn't attend due to the obvious risks at the time.

The day is run more like a fly-in until lunch-time, when there are two rounds of the competition after which the fly-in is resumed till about 5pm.

Meadow Flyer

At the end of the first meeting at Worcester this year I had came first in my class but then I discovered all the other contestants had opted for the higher class. This was the same for the remaining two meetings I attended this year, one at Buckminster and the third back again at Worcester. This meeting was scheduled for Watford but the site has been booked all year for filming so the Worcester guys hosted another one. I will practice more and see if I can step up to *Pick 7* for 2022.


Buckminster September 2021

One thing to note with this group, as opposed to other contest groups I have experienced, is there is a total lack of elitism which makes for a really friendly atmosphere. Anyone interested in this type of flying should please look at the website http://www.ukcaa.org.uk/

Worcester, 2021

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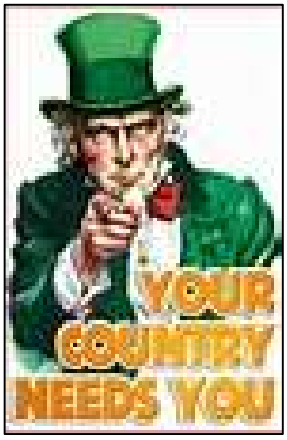
Your ~~Country~~ Club Needs *You!*



Fellow members, we urgently need someone to store the Club's BBQ. A corner of your shed or garage would be ideal, so it can be accessed easily when we need it. Of course, you would be welcome to use it yourself any time.

If you can help out, please contact the Secretary for a chat.

lee_bob2@yahoo.co.uk

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OMFC Membership Report – March 2022 (Simon Burch)

Membership

At the time of my last report (Jan 22), 74 of last year's members had renewed. Since then 8 more have renewed and we have 7 new members, taking our total membership to 89. Welcome back to Janine Baggett; welcome to Michael Ingleby, Kenny James and the Hinks Family (Tim, Thomas, Samuel and Ruben).

Currently, our membership comprises:

BMFA Members (Club Affiliated): 35
British Drone Flyers (BDF) Members (Club Affiliated): 1

BMFA Members (Other Club Affiliated): 21
BDF Members (Other Club Affiliated): 0

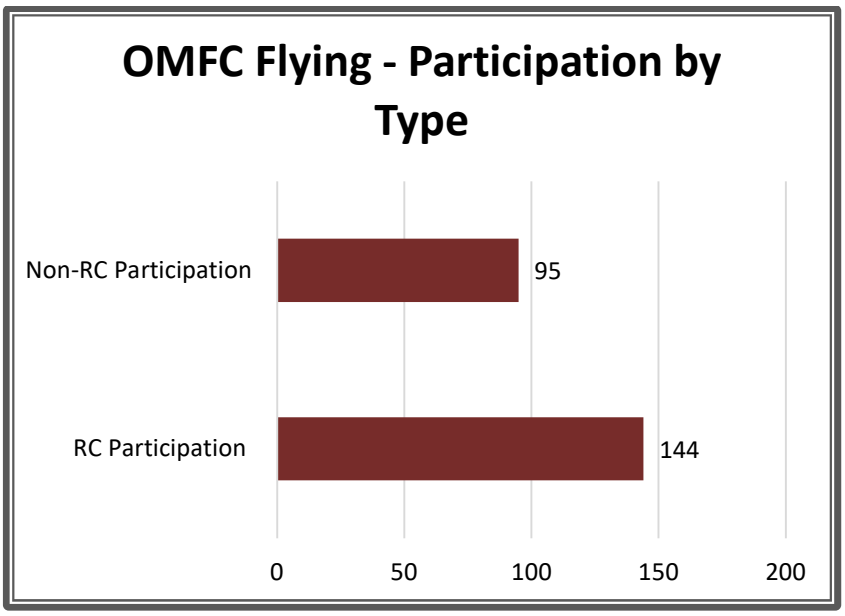
BMFA Members (Country): 27
BDF Members (Country): 4

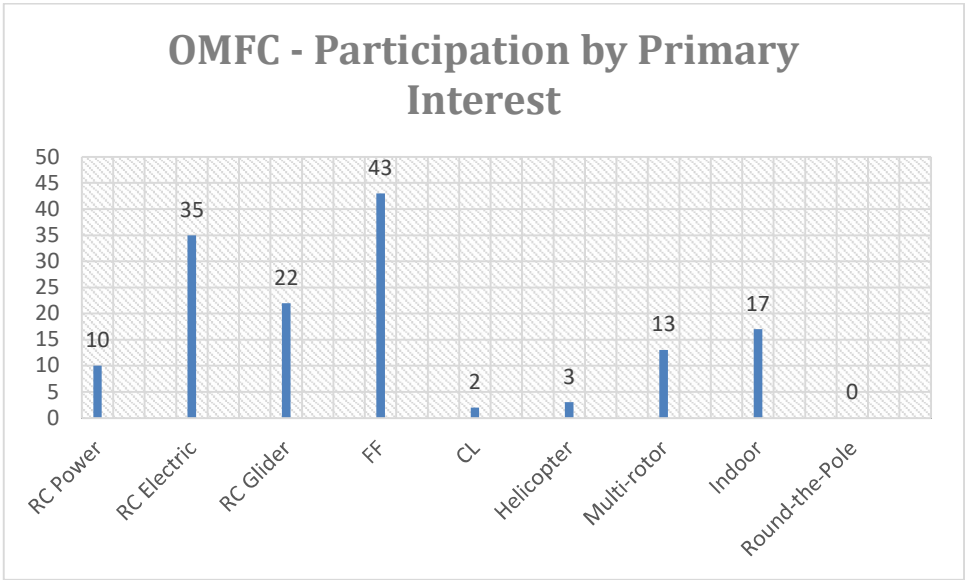
Honorary Members: 1

The average age of our membership is 59yrs; the youngest is 7 and the oldest is 88. .

Membership Statistics

Our membership has a broad spread of interests that cover most aspects of aeromodelling and non-commercial small unmanned aircraft flying. A clear majority express RC disciplines as either their Primary Interest, Active Participation or Would Like to Try; however, FF remains our most popular single Primary Activity. The Club has 27 members who hold BMFA RC Achievement Scheme Certificates.





WhatsApp Groups

We now have 3 OMFC WhatsApp groups:

1. Meadow Flyers: primarily for arranging meet-ups on the Meadow, but also general 'chat'
2. RC Training: primarily for those learning to fly RC and/or preparing to undertake BMFA Achievement Scheme Tests
3. RC Soaring: primarily for arranging slope and thermal soaring meet-ups at other locations

Anybody wishing to join one or more of these groups should contact the Membership Secretary.

RC Training

With the weather now starting to improve, I encourage all those who hold BMFA Achievement Scheme certificates to help our newcomers if at all possible. Please note that we have two Club

Trainers which are available for members to use; both have buddy-boxes. I hold the Phoenix 2000 (a foam electric glider) and Phil Kilby holds the Tyro Major (a traditional built-up high wing trained – electric power). They are ideal for taking a BMFA A(SFE) and A(FW) test respectively. If you'd like to arrange a session flying using one of these models, please don't hesitate to contact us as appropriate.

In addition, newsletter editor David Lovegrove has a *Max-Thrust Riot* which he is happy to make available to those looking for initial experience of fixed-wing flying. The *Riot* is a robust and versatile'foamy' training model, deservedly popular with several OMFC Members. It's suitable for BMFA Tests up to "B" level.

Note that all the models have buddy-box set-ups for safe dual control.

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Events Calendar, April 2022

- **Club nights** are held at *Begbroke Village Hall, Begbroke Lane, Begbroke* 7.30 p.m. - 10p.m. Club business (if any) at 8 p.m.
- *Meteors MFC* members and other guests are welcome at all meetings.
- **PLEASE NOTE THAT ALL EVENTS ARE PROVISIONAL UNTIL CONFIRMED.**

The Under 25" Vintage Cabin Postal Competition will be run during 2022 in three rounds. For full details see the Club website (https://oxfordmfc.bmfa.uk/2022-under-25-vintage-rubber-postal/)

April 20	**Club Night –Electric C/L Experience on the Begbroke Playing Field, plus Fun Flying** Suitable C/L models and basic instruction will be provided
May 15	**BMFA Centenary World Record attempt. Port Meadow, 12.00**
May 18	**Club Night – Fun flying on the Begbroke field + Kit Scale Models** Bring your Kit Scale model to show off. Prizes will be awarded . . .
May 26	**Dreaming Spires Free Flight Rally (Port Meadow)** **Set-up 8:30 – 9:30 am; Start 9:30 am** N.B.:To be confirmed. We are waiting for the necessary licence from Oxford City Council
June 15	**Club Night – Fun Flying + Bill Dean Commemoration models** Flying + Bill Dean designs "Concours d'Elegance". More prizes . . .
July 20	**Club Night – Fun Flying on the Begbroke field**
Aug. 6	**Cloud Tramp Mass Launch, Port Meadow 5pm, + Club Competition and Fun Fly** P30/Coupe d'Hiver combined duration, Kit Scale, Bill Dean designs. 4pm until dusk
Aug. 17	**Club Night – Flying on the Begbroke field**
Sept. 21	**Club Night – TBD**

Sept. 15	**Scalefest, Port Meadow, TBC. We are waiting for the necessary licence from Oxford City Council.**
Oct. 19	**Club Night - TBD**
Nov. 16	**Club AGM**
Dec. 21	**Fish & Chip Supper + Quiz**

Note: On shorter summer evenings flying may start earlier but you will be notified in advance. If the weather is unsuitable, or when the light goes, we will meet informally in the Hall. For further information please contact Bob Lee (lee_bob2@yahoo.co.uk)

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Flying times on Port Meadow

Mon. to Sat. - 10:00 hrs to 20:00 hrs or sunset* Sun. only - 13:30 hrs to 18:00 hrs or sunset*

(*whichever occurs first)

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Now how can I put this, politely? I can't - Alan Smith has what some might call a bit of an obsession . . .

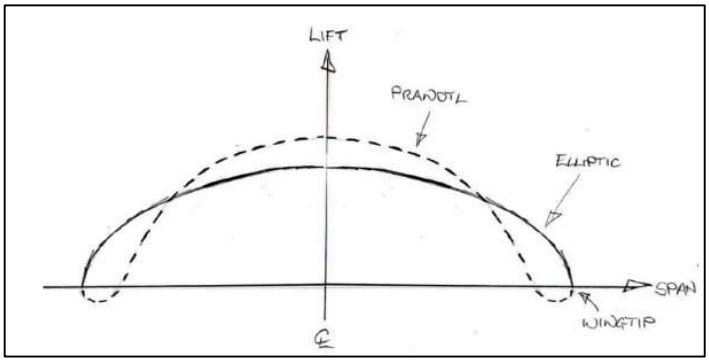
Designing, Developing and Test Flying a Prandtl Wing (Alan Smith)

How did I come to take on this project? Well, like many good things in life, it sprang from a drunken conversation with an old school mate. We were hiking across a mountain range in Albania a few years ago and I'd been prattling on about Prandtl wings all day. I think he was sick of hearing about them so asked why I didn't build one if I was so interested in them. Good idea I thought….

Who was Prandtl? Ludwig Prandtl was a German physicist and mathematician. He was active from the late 19th century through the first half of the 20th. His contributions to the nascent science of aeronautics were as hugely significant as they were varied. I'll pick just two areas that I'm particularly in awe of, but the list could so easily be much, much longer.

- *Prandtl-Meyer Expansion Fans – A theory developed with Theodor Meyer in the early part of the 20th century. An expansion fan is the alter-ego of the supersonic shock wave. Whereas the shockwave features a very rapid increase in flow pressure and temperature, the expansion fan is a slower drop in flow pressure and temperature. In the picture below, the shockwaves are invisible, but the Prandtl-Meyer Expansion Fan*

is visible because the drop in pressure and temperature has caused moisture in the air to turn into a visible vapour cloud. Lifting Line Theory - A mathematical theory jointly developed with Frederick Lanchester just after the First World War. It gives an aero engineer a robust analytical method to calculate the performance of a 3D wing given its geometry. Before the theory was available this could only be done experimentally using wind-tunnels. The theory gives rise to the classic elliptic loading that virtually all aircraft feature even to this day. The theory works by summing up the individual contributions to lift and drag produced at each spanwise location along a wing. It then optimises for maximum lift/drag and an elliptic loading is the result. An alternative Prandtl 'bell' loading comes from a similar exercise where the bending moment produced at each spanwise location is also summed up and an optimum is sought for maximum lift/drag and minimum bending moment.



Elliptic and Prandtl 'bell' lift distributions compared

What's the big deal about the Prandtl 'bell' loading then? In theory, the 'bell' distribution gives the optimum spanwise wing loading for maximum aero-efficiency and minimum wing structural weight. So, why isn't it widely used? The snag is that the classic 'elliptic' distribution remains valid across a large range of AoAs (angles of attack), whereas the 'bell' distribution can only be optimised for a small range of AoAs. And most aircraft need to fly at a variety of AoA's.

But all is not lost as the 'bell' distribution has another trick up its sleeve – the tip loading can be tickled to produce a proverse yaw characteristic. Adverse yaw will be familiar to many model pilots. It's that characteristic of an aircraft where it will tend to yaw in the opposite direction to its roll. If the pilot rolls left for instance, the aircraft will tend to yaw right and left rudder will be required as a correction. An aircraft with proverse yaw will yaw in the same direction as it rolls.

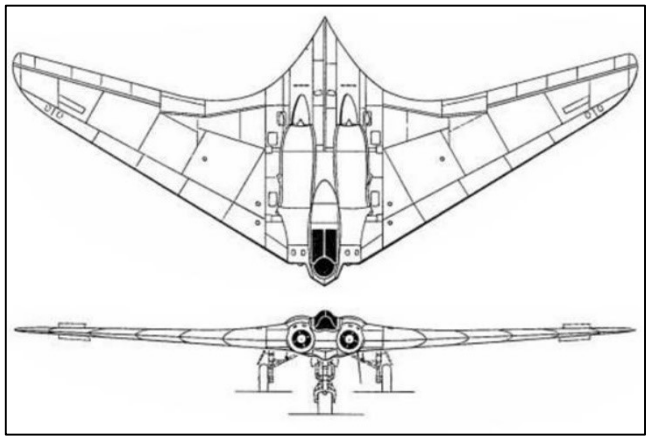
This proverse yaw characteristic is very useful on an aircraft that has no vertical tail surfaces nor any rudder. Perfect for a flying wing! Which leads neatly on to the question . . .

What is a Prandtl Wing? A Prandtl Wing is a particular type of flying wing. It features the Prandtl 'bell' shaped spanwise lift distribution and hence should demonstrate a proverse yaw characteristic.

It's possible to design a flying wing that is statically stable in roll and yaw using planform wing sweep and a normal spanwise lift distribution, but the wing will suffer from adverse yaw and it will not be possible to correct this unwanted yaw without the additional of a fin and rudder mechanism. This might not be a significant problem if the wing span is small, but when a more efficient larger span is required, the adverse yaw will become more of an issue. You'll need a Prandtl Wing!

Interestingly, the Horton brothers were contemporaries of Prandtl and there's a fair bit of Prandtl's influence in the design of the famous Horton flying wing aircraft.

However, I believe the Hortons used differential split ailerons (just visible towards the wingtips in the front view below) to provide yaw control so perhaps the proverse yaw characteristic was not as pronounced as it might have been. What an aircraft though!



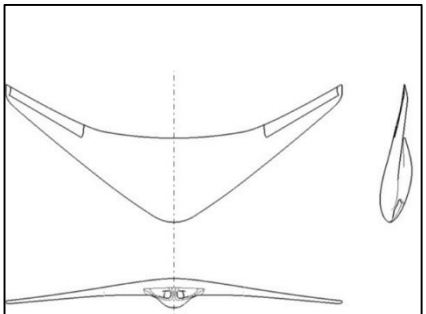
Left: The Horton Ho 229.

How was my aircraft designed? The geometry of the aircraft was defined using CATIA 3D CAD software. The key design characteristics were:-

- A bell shaped Prandtl spanwise lift distribution – for proverse yaw.
- A swept planform wing – this gives both roll and yaw static stability. It also positions the wingtips well aft of the CoG, giving the elevons a longer lever arm when acting as elevators.
- Anhedral – necessary to trade excess roll stability for more yaw stability.
- A great big fat centre section – to house LiPos and an Electric Ducted Fan.
- Elevons mounted close to the wingtips – used differentially the elevons act as ailerons for roll control and used similarly they act as elevators for pitch control.

The aerodynamic characteristics of the aircraft were analysed using a CFD (computational fluid dynamics) computer code called STAR CCM. CFD software can be thought of as a virtual alternative to a wind-tunnel.

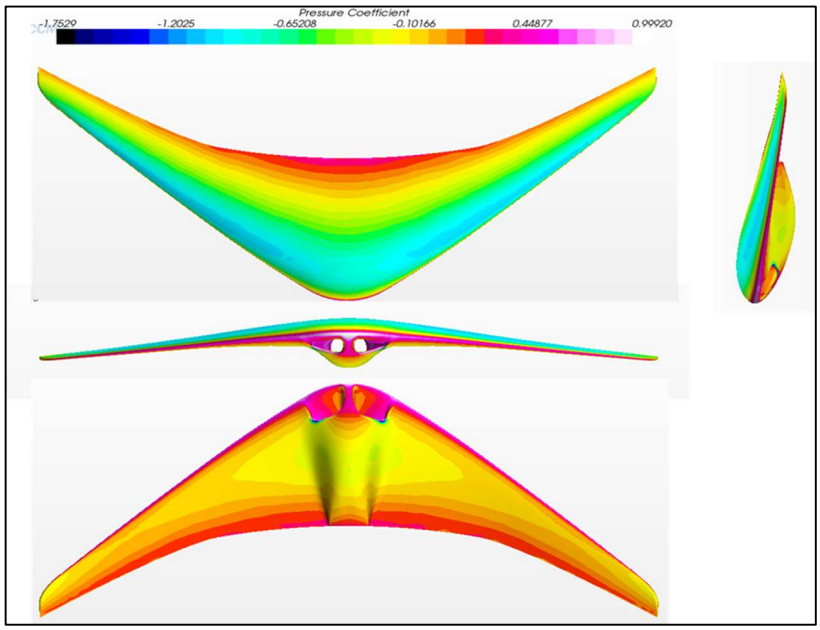
CFD allows a user to calculate the forces and moments acting on the aircraft using the 3D geometry defined in CATIA as in input. Once forces and moments have been calculated, static stability in all three axes (pitch, roll and yaw) can also be assessed. Additional analysis of the aircraft's dynamic stability was done using a nifty bit of free software from the web called XFLR5.



The Mark 3

In addition, the data can be used to calculate the location of the aerodynamic centre of an aircraft and from that, where its CoG (centre of gravity) should be positioned.

Below: Example CFD output – Static surface pressures at a low AoA



Meadow Flyer

How was my aircraft constructed? The aircraft has a span of 1.2m and splits into three parts for ease of transportation. It was sized to fit into an airline hand-luggage bag or more importantly in my case, a bicycle pannier.

The aircraft was made from a 0.2mm thick glass fibre skin (taken from 3D printed moulds), with carbon fibre tube spars and some 3D printed internal structures (like EDF mounts, EDF intake and nozzles, LiPo trays, servo mounts etc). The whole internal void was then filled with builder's expanding foam. Once cured, the structure is quite robust but a bit heavy. Further work is required to take weight out of the 3D printed parts in particular. Total flying weight is a podgy 1.5kgs.

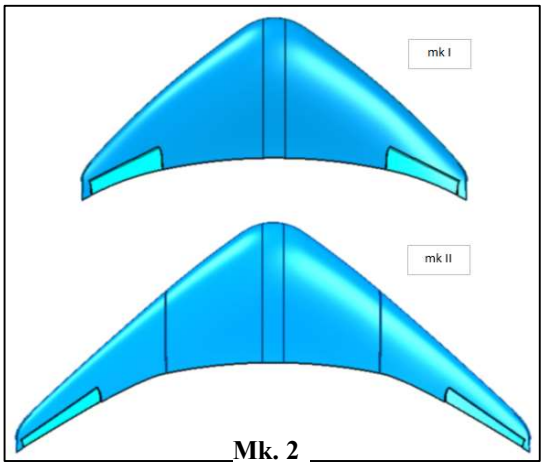
What was the aircraft powered by? Power comes from Ø70mm EDF, a 6S 1550 mAh LiPo and a YEP 100A ESC. All were sourced from Hobbyking. Thrust was measured at a healthy 1.75 kg last June, though this was on a very crude rig so should be taken with a large pinch of salt.

How did the aircraft fly? (The million dollar question…)

I'll split this up, as there have been 3 distinct iterations so far . . .

Mk I The Mk I version was absolutely bloody terrible! It was overweight and it was also clear that getting the CoG into the right position would require significant additional ballast which would further exacerbate the weight problem. A hopeless case. A Mk II was required.

Mk 2 The Mk 2 version retained the (heavy) centre section of Mk I, but featured a larger span set of (lighter weight) outer wings. It was still somewhat overweight but had a reduced wing loading compared to the Mk I, and the aerodynamic centre was in a much better location, relative to the CoG.



Mk. 2

The Mk. 2 was test flown successfully by OMFC colleague Andy Stephenson late last summer. Andy's comments (in red) after the flight were:-

- It's fast and it won't slow down! – *a result of the low drag of a flying wing and because of the excess weight and consequent high wing loading.*
- The trims were on the money and handling in pitch and roll were fine *(there is no direct yaw control)* but the aircraft felt "heavy in the air" – *this is again due to the excess weight, but also (I suspect) because the CoG is a little too far forwards.*
- The aircraft was very difficult to land. Too little drag, hence a long shallow glide when on approach *- a consequence of the aero efficiency of a flying wing*
- Too little control authority at low speed – *undersized elevons.*
- High landing speed *- again due to weight*

Interestingly, the Horton brothers were contemporaries of Prandtl and there's a fair bit of Prandtl's influence in the design of the famous Horton flying wing aircraft.

However, I believe the Hortons used differential split ailerons (just visible towards the wingtips in the front view below) to provide yaw control so perhaps the proverse yaw characteristic was not as pronounced as it might have been. What an aircraft though!


Mk. 2

Mk. 3 A Mk. 3 has been produced in an attempt to address some of the problems identified with Mk 2. The basic aerodynamic surfaces are retained, but the following tweaks were made:-

- The centre section now incorporates a split flap arrangement. (see photo below of inverted model – note split flaps)This adds a little lift, but a lot of drag so should make the landing approach steeper and easier to judge. A split flap was chosen as it could be incorporated into the existing centre section without a major redesign and also because the pitching moment change was small. The CFD data suggests that deploying the split flaps to 40° will cause a small nose down pitch change. This can be reacted by a small up elevator movement (about 3° or a couple of millimetres at the trailing edge). This has been incorporated as a Tx mix.
- The EDF intake was changed from an F16 - style chin intake, to a nostril style bifurcated intake – hopefully this will act less like a plough on landing . . .
- The centre section was remade with a greater emphasis on keeping the weight down. The enabled the split flaps to be added with no additional weight penalty.
- The elevons were scaled up by around 30% to increase the control margins at low speed.

The project then suffered a couple of depressing false starts. The modifications to the air intakes made it very difficult to physically hold onto during a hand launch. An utter lack of foresight on my part. I'm amazed that I'm allowed out to play unsupervised sometimes. A three wheeled dolly for the model to sit on for launches was knocked up from plastic electrical conduit. But that suffered in the wet, muddy December ground, and coupled with a reduction in EDF performance (I think this is down to cold or old LiPos - either way it's a noticeable drop in grunt), made getting airborne impossible. Very frustrating.

So, what next? A launching ramp (assembled from Ø40mm waste water pipe this time) with a bungee assist got the show back on the road on a beautifully sunny, but cold, afternoon in mid-January.

Four flights were conducted and Andy's comments (in red again) this time were:

- The first launch from the ramp was marginal – *The wing seemed to mush as it left the ramp and only just avoided an early touchdown. Once it had gathered a bit more speed it was okay. Subsequent flights were launched with 30% more bungee tension to give a greater launch speed which seemed fine.*

Right: Flying wing leaving the launch ramp with Andy Stephenson at the controls. Photo courtesy Andy Harris.

Pilot's comments this time:

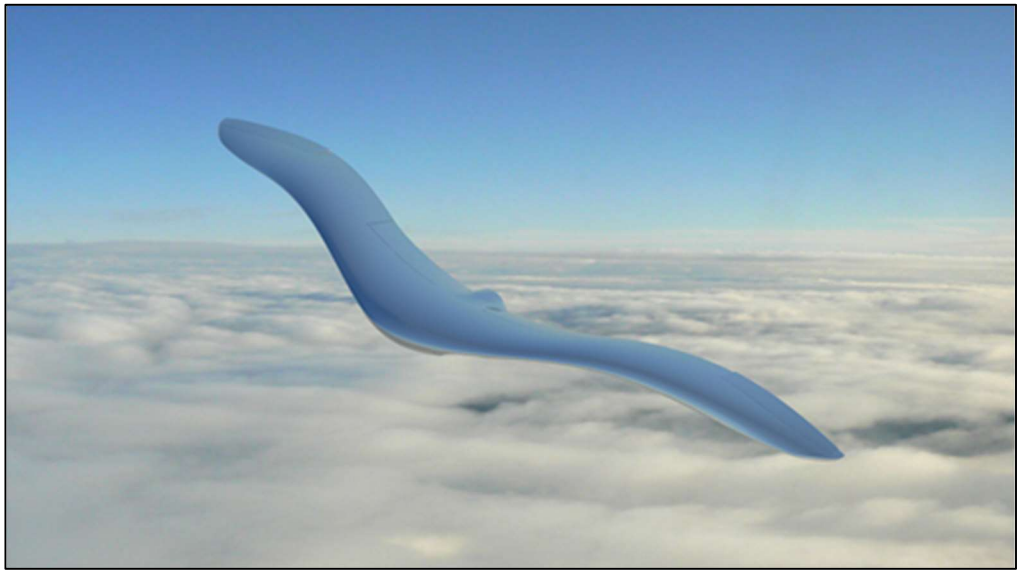
- Roll control was super sensitive – *With the benefit of hindsight, this was pretty obvious as the elevons had been increased in effectiveness by 30%. The was done to enhance pitch control, but roll control was inevitably taken along for the ride too. Easily sorted by biasing more of the elevon movement from roll to pitch control. The remaining flights were a bit calmer.*
- Once the excessive roll control sensitivity was dealt with, a few clicks of roll trim were required. – *I'm not sure if this is due to an aerodynamic asymmetry or due to a weight imbalance. The left wingtip is 3 or 4 grams heavier than the right wingtip which doesn't sound a lot*
- The wing was happy scooting along at about ½ throttle where the pitch trims were neutral – *Glad to hear it!*
- The split flap mechanism worked well. - *There was no apparent pitch change when deployed, though there was a definite small hop upwards. The landing approach was now much more manageable and all landings were damage free as a consequence. The aircraft would happily fly circuits with the flap extended though a higher throttle setting was required. A great result.*
- The wing would stall if turned hard whilst flying quite slowly - *The stall was more of a downward mush rather than a classic nose-down pitch. Recovery came quickly with a bit more throttle*.
- The experimental CoG change further aft made little difference - *Suggests that there is more to be experimented with here. Be nice to shuffle it further aft if possible. Small steps though.*
- Removing the small wingtip fins led to a rapid terminal loss of control - *The launch and climb-out was fine, but the aircraft spun out of control immediately after a turn was initiated. Fortunately, the wing pancaked into the long grass without significant damage, So, clearly, the yaw/roll stability needs to be maintained at the levels with the wing tip fins fitted and not reduced further. Good to know for the future.*

What's next? A Mk. 4 is on the drawing board. It will retain the original design criteria (a flying wing small enough to pack in a bicycle pannier etc) and build on the lessons learned so far. The new design targets will likely include:-

- Yaw and roll stability minimums as per the wingtip fin version of Mk III. A little more roll stability might be nice (a little less anhedral will also increase wingtip ground clearance which would be an additional benefit)
- Continued work to reduce weight and/or increase wing area whilst refining the glass skin, carbon spar and builder foam construction methodology.
- A small further bias from roll to pitch in terms of control authority. Try to do this aerodynamically, rather than using Tx mix.
- Split flaps were good. Adopt a large plain flap to try and extract more lift?
- Include fixings or hard points on the central underside to provide mountings for a skeg (for hand launching), fixed undercarriage, bungee hook options etc
- No hatches on upper surfaces. Move all access panels to the underside.
- Optimise the wingtip fins to reduce drag as well as increasing yaw/roll stability.
- Design to a longitudinal static margin of 15%, but allow future experimentation with moving the CoG further aft.

Thanks for help and advice. I've received great advice from several OMFC members throughout this project. I'm new to the model flying world and this advice has been crucial and has been gratefully received. In particular I'd like to thank Andy Stephenson and Andy Harris for their help, enthusiasm and patience with the test flights.

Final image below!



~~Artist's~~ Idiot's impression of Mk. 4

In a later email, Alan wrote: *"You should have seen Andy's face after the first flight. As a reaction to the lack of slow speed pitch control authority in the previous flight a few months ago, I'd increased the size of the elevons by 30%. This was great for the pitch control, but made the roll control very, very sensitive. Andy really had to work to hold onto it. We dialled down the roll sensitivity on the subsequent flights so things were a bit calmer and significantly less stressful!"*

In a similar way to Alan, I've always wondered where the inspiration for those fabulous German flying wings came from. There are examples of the principle in nature, and in an email I wrote:

Hi Alan. Since we started this exchange, it's been going through my head that Herr Doktor Prandtl's design theories were around a lot longer than he was! Google the Zanonia seed - if that's not a "Prandtl" wing then I'm a Dutchman's auntie!

A few years ago, I made a big batch of these at about 100mm wingspan), using wall insulating foam and a blob of BlueTac. They were used in a talk I gave at a Club meeting, to illustrate one of the simplest forms of flying. The merest hint of reflex on the trailing edge confers a perfectly stable, if short, glide. Picture a roomful of allegedly adult men chucking these aboriginal flying machines about . . . !

So, did the good Doktor Prandtl draw his inspiration from nature? And did Cierva & co, pinch their ideas about rotary-winged flight from Sycamore seeds? Discuss.

Alan replied*:* "Blimey! The man Prandtl's a fraud! Can I have my money back? Interestingly, along with the seed, most birds also use a Prandtl kind of wing loading in lieu of a vertical fin (it's easier to spot on something with a big span such as an Albatross). I suppose Prandtl's gift to the world was to give us the mathematical method to describe, analyse and understand it. So, his picture is staying on my wall until the poxy flying wing obsession drives me around the twist.

I wonder if Otto Lillenthal knew about the Zanonia seed? There's a nice diagram on his wikipedia page that shows the angles of a bird's feathers during flight. Suggests that he understood what was going on.

I reckon Cierva must have been sniffing glue under a sycamore tree as a youth . . .

As you'll have seen in the Programme of Events above, an exciting new Club event is proposed for the coming flying season. Freeflight Scale guru and OMFC member Bill Dennis explains the ins and outs - simplicity itself!

Kit Scale, by Bill Dennis

The Outdoor Rubber Kit Scale event was devised about six years ago to provide a 'fun' event to be run at the May Nationals, alongside the other low-key scale competitions held there. There was no similarity at all to Indoor Kit Scale, other than the requirement that the model must be from a kit design. More recently the Scale Technical Committee decided to change the name to 'Precision' and open it to any scale model. I am not aware of any groundswell of opinion in favour of this change but there we are; however this event will be to the original. Kit-themed rules. Henceforth I shall shorten the name to ORKS!

It is essentially a Bowden-type comp* with no static judging. Within a defined period, usually one hour, the aim is to make three flights, each as close as possible to 30 seconds. The winner is the person with the smallest deviation from the target. For example, if you record flights of 28, 24 and 36 seconds, your score is 2 + 6 + 6 =14. The smallest total wins.

The beauty of the rules is that, within reason, no model should have an advantage over another, provided the duration is achievable. However, there are ways to improve your chances. A stable high wing monoplane should be more consistent than low-wingers in all weathers. It all comes down to practice and knowing how many turns on the rubber motor will get you to that target.

Picking the air is also vital, although in this case you will be avoiding thermals! Many contests have been lost when a model hooks lift. Perhaps the best approach is a high-wing design with limited potential once the turns run down. Two successful designs have been the KK Auster Arrow and the Guillows Fairchild 24. By the way, DTs or any nefarious gadgets intended to drop the model out of the sky 'on time' are not permitted!

Now, can I get my Lysander to reach 30 seconds before it turns into an anvil?

Bill Dennis (The heading photo depicts the varied entry at a recent Nationals. Scaling up or down is permitted, hence the giant Veron Camel!)

** Readers will be familiar with the i/c Bowden Freeflight comp. held at the Freeflight Nationals each year. It boils down to a take-off and landing, all accomplished within a set time, with penalties for under- or over-flying times. As Bill says, there will no static judging; no points awarded or deducted for build quality, finish, etc., so it all comes down to skill, judgment and practice! And of course, it's strictly rubber-power, to any size you fancy! Ed.*

ACCESSING AND USING THE BMFA'S MEMBERSHIP PORTAL
Simon Burch, OMFC Membership Secretary

Many members have mentioned that they find the BMFA's Membership Portal confusing, difficult to access and hard to use. The aim of this short article is to help dispel that notion. As

Membership Sec, I use the site frequently and, in my opinion, it provides a valuable facility for managing membership details, records, options, achievements and qualifications. Ideally, all BMFA members should be confident with using it, if only to check that their own details are correct and up-to-date. As with all new programmes and applications, it takes a little work to become familiar with it; however, I think it's reasonably intuitive and not overly complicated.

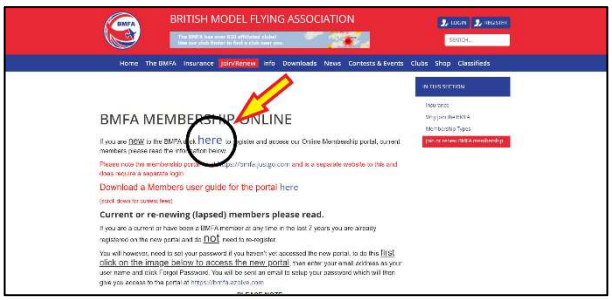
In this article, I'm going to cover accessing the site, creating an account, accessing your membership details and purchasing an item – in this case a CAA Registration.

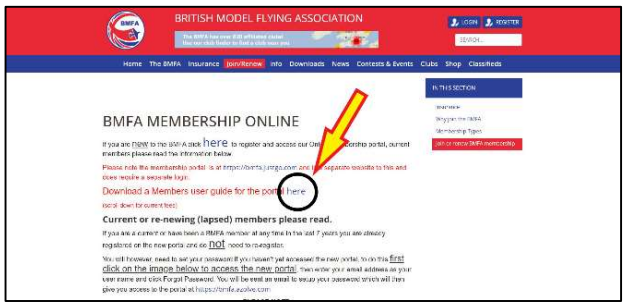
Gaining Access

Perhaps the first source of confusion about the BMFA Membership Portal is its name. Aside from the 'Membership Portal', you may see it referred to as the 'Azolve Site'; the 'Membership Site'; the 'JustGo Site'; the 'Online Membership Site' or various combinations of these terms. From this point onwards, I'm going to refer to it as the 'Membership Portal'. The second source of confusion is that it's not a part of the BMFA Website; it's an entirely separate site which requires its own log-on details. There are links to it in the BMFA website, but that's all.

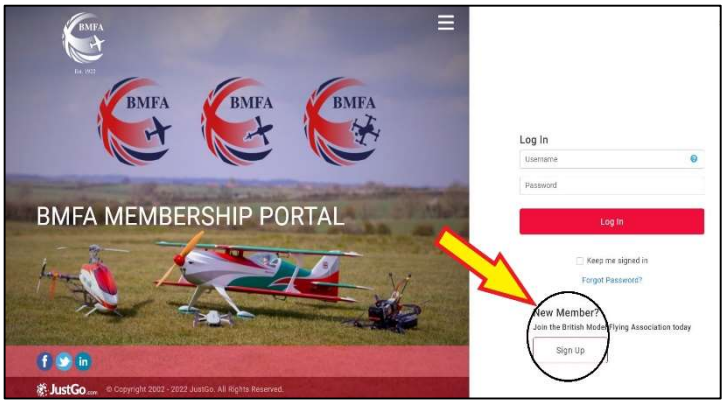
Step 1. To access the Membership Portal, you'll need to create a new account. Assuming that you have access to the BMFA Website, go to the BMFA Home Page. (R)

Step 2. Click on the 'Join/Renew' tab. At the last count there were four links to the Membership Portal on this page, but the first one (arrowed) should do the trick. Note that there is a user's guide which may be downloaded before you enter the Membership Portal (see second screenshot below).

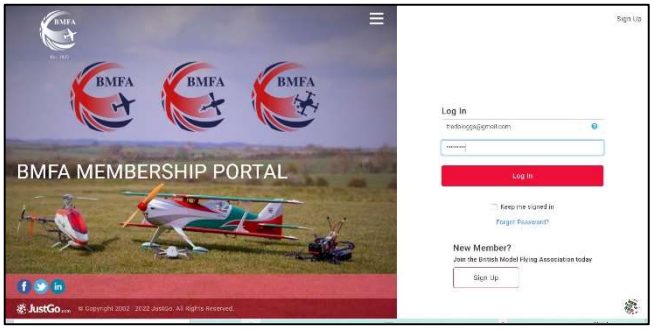


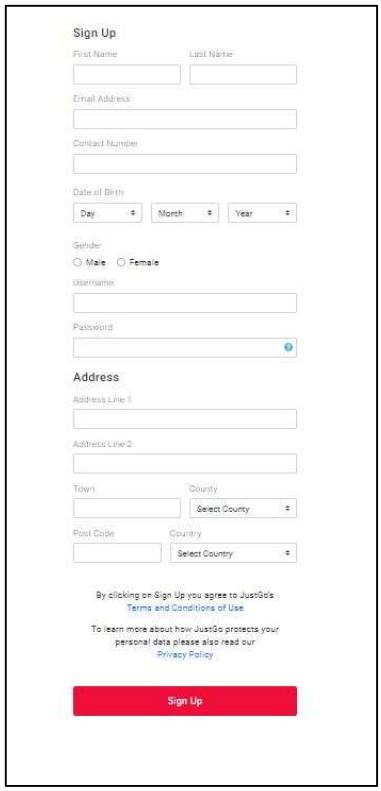


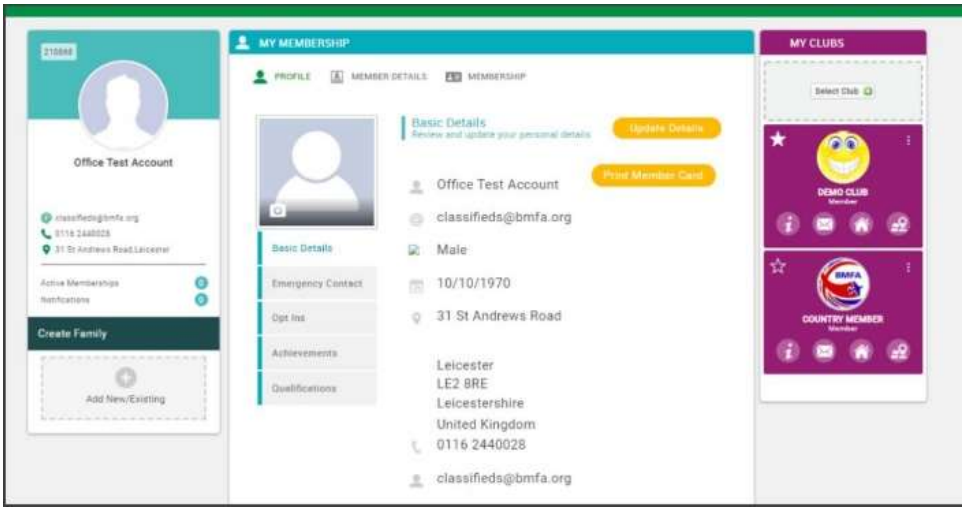
Step 3. Click 'Sign Up' (ignore the 'New Member' title arrowed in the image below left. What that means is 'new to the Membership Portal site'). You'll be taken to an on-line form (below. 2nd L.); fill in your details and click on 'Sign Up'. You'll need to choose a new password specifically for the Membership Portal.



Step 4. Log in to your new account (below R) using the password that you've chosen; note that your username is your email address. You should then see your profile (below, 2nd R)





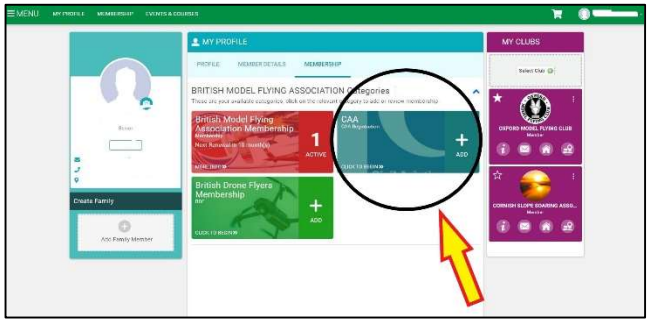


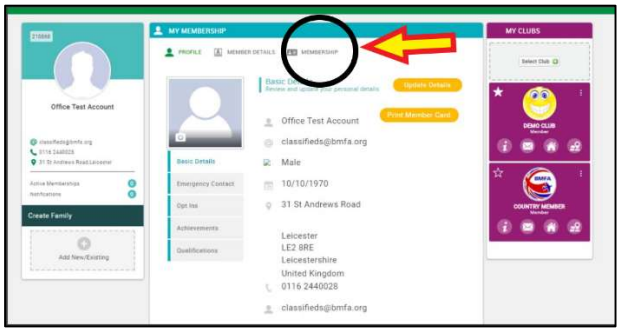
Using The Membership Portal

The Membership Portal User's Guide (see Step 2) describes how to use the Portal to access and amend your membership details, identify your club(s), and renew your BMFA membership. If you wish to do any of those things, please use this guide; it's very clear and easy to use. The Portal may also be used to purchase your CAA Operator ID. This isn't specifically covered in the User's guide, so I'm going to use this as an example of how to use it.

Purchasing a CAA Operator ID

Step 1. Log in to the Membership Portal and access your Membership Profile. Click on the 'Membership' tab. You'll see some category panels; click on 'CAA Add Registration'.





Step 2. Click finish, and select your payment method. That's it!

I hope this explanation is helpful and that you're encouraged to have a go. Simon

***

Powering Down - David Lovegrove (Editor)

I don't know how it's been for you, but my aeromodelling year so far has been very strange. Long periods of wind and rain, plus continuing uncertainty about mixing with others in confined spaces (i.e., indoor flying) have conspired to keep me largely 'confined to barracks'. Only recently have we started to see blue skies and feel some warmth in the sun - much-needed relief from the winter's gloom.

It's unsurprising then that my manky old building board has had a busy time, with a number of models leaving the BDF*. Some have had satisfactory test flights, whilst others haven't distinguished themselves at all well.

In the latter category was the 19" wing span P*ou du Ciel,* or *Flying Flea*, as it was known on this side of *La Manche*. You'll probably be aware of the full-size's troubled history! Designed by Richard Crossley back in 2008 as a true-scale competition freeflight model by, it enjoyed great success on the indoor FF comp. circuit . However, built by me for RC, it was rather less than stellar. The problems were 1) tail-heaviness 2) lack of space for the RC gear and 3) structural fragility. I was initially optimistic about my ability to get a good performance from it, but 'twas not to be. In complete contrast to this tiddler, the two other Fleas I've built in the past - respectively eighth-scale and quarter-scale - flew beautifully.

So you see, sometimes size does matter . . . Trying to establish a decent flying trim over the back lawn saw a steady accumulation of damage to the tripod wing and motor mounts, building up to the point where, for all practical purposes, the fuselage was a write-off. Reasoning that although it was just about repairable, I could make better use of the time, I gave it best and binned it. You win some, you lose some.

Elsewhere, my rendition of Gordon Whitehead's FF 24" W/S Nieuport N.11 (L), again converted to RC, has also had its first flights, more successfully this time. Although it's still a WIP it flies quite well. Nevertheless, I'm reminded that WW1 biplane scouts aren't meant to go at scale speeds approaching the speed of sound! The moral? Choose something a bit bigger next time!

* BDF = Balsa Dust Factory - an apt description of an ageing aeromodeller's workshop. It was coined, I think, by the late Dereck Woodward who, incidentally, once told me to "ditch the pipe" on my own-design *Canis* canard delta. Powered by a superb OS 32 glow motor fitted with a semi-tuned-pipe exhaust (the *"pipe"),* the model was an impressive flyer. This happened many moons ago at a meeting held on the former Pressed Steel playing field at Romanway, Cowley by the Small Models Association. I was miffed – some things you don't forget.

Summer's almost upon us; there's a full list of events at the Club and elsewhere. Enjoy!

The next issue is due in July. In the meantime, please send me lots of nice photos, emails and articles!

David

Please let me have your contributions by 30th of June for inclusion in the July, 2022 newsletter. Send them to: David Lovegrove at *david.lovegrove11@btinternet.com*

Or by post to 17 Chiltern Crescent, Wallingford, Oxon OX10 0PE. Tel. 01491 200558

If submitting photographs (which we all enjoy) it's best to send the files separately, using www.wetransfer.com. And please include a photo of yourself.

If you can't send an electronic version of your submission, I'm happy to accept hand-written copy, together with hard copies of photographs. These will be returned after scanning.