Airscrew

Facts, opinions, pictures and fun

https://northreppsmfc.com/ *November 2019*

To contact me send an email to peter@northreppsmfc.com

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CAA registration

David Phipps, CEO of the BMFA, seems to have done a good job of negotiating so far. This is my summary of its recent information email.

The CAA distinguishes between model aircraft operators (owners and managers) and pilots. These terms are meaningless to us except for under 18s who might not be able to register as operators so presumably would have to be 'supervised' by an operator. This will be clarified.

1 We must pay £9 each year (for now) to register.
2 We can 'opt-in' to do this through the BMFA. This will be done as part of membership renewal by the end of January 2020. The BMFA will only reveal our data to the CAA if we opt-in.
3 There will be no minimum age for pilots.
4 Once registered we get a 'flyer ID' which must be put on each of our models. This may be on the inside if accessible.
5 We need to prove 'competency'. This means awareness of the law not flying skill. People with an achievement certificate (A, B etc) are exempt. Those without can do the CAA's online test or one that the BMFA will shortly produce. The latter will be certificated by the BMFA.
6 The BMFA is clarifying the insurance position and will report soon.
7 It is down to the flyer to ensure that he or she is lawful. Neither the BMFA nor clubs are expected to check. In theory the police, in their copious free time, could fine or prosecute miscreants.
8 For models under 7kg the CAA exemptions will continue. The most significant for us are exemptions from the 400ft height limit and arrangements for shared use, such as at our airfield.
9 They have accepted that we fly 'model aircraft' not 'drones'.

All agree that these changes will not stop loonies and criminals. So what is the point? Here it is easy to slip into paranoia, especially as politicians, and probably rich and powerful business people, are involved. Here also we must add the ugly and ridiculous new word 'conspicuity'. This appears to mean that all flying things, except birds, must make themselves visible electronically - conspicuous. No device that can do that exists for model aircraft. Telemetry and FPV data transmitters exist but do not have sufficient range. Increasing radiated power would need additional batteries and aerials that would make small models unable to fly and would be expensive. However it is possible that the additional rules promised (threatened) next year might include visibility. I refuse to use the vile word starting with 'c'. Why does visibility matter? Well, we can be sure that Amazon won't want its drone deliveries crashing into our models, nor the flying version of uber for that matter. All of this is predicted by Scott's sixth law of politics: Anything that the rich and powerful want a government to do will be bad news for the rest of us.

Dave's questions to the BMFA

Though we don't yet have its answers Dave raised some thought-provoking questions with the BMFA, which he emailed to all club members, about the next lot of new regulations due in June 2020. He quoted a CAA document as follows: 'This exemption will be in place until 30 June 2020, when new regulations are expected. We will be working with stakeholders in 2020 to put these into place'. He asked what these new regulations willl be and who the 'stakeholders' are (see Scott's Law six above). He said that the CAA's new stuff is likely to be more draconian than EASA's. He suggested that visibilty (conspicuity) is likely to be included. As soon as Dave knows, club members will know of course and I will

put it in the next newsletter for other readers. In a very clever move Dave has applied to the CAA direct under the Freedom of Information Act to have the terms ‘new regulations’ and ‘stakeholders’ explained.

BMFA videos about the A and B fixed wing certificate tests

In the members area Dave recently mentioned that he had added, on the Training Wing page, links to BMFA videos about what you need to know and do for the certificate tests. Pre and post flight checks are covered in great detail. Whilst we always check our models for safety we need to make a big deal out of it for the test. This is similar to the training we get for a car driving test.

The practical test videos are excellent. They include video of flying taken by a ground camera and from the air using a quad drone. Not only do I highly recommend these videos to people approaching the test but any flyer can learn good ideas and habits from them. Well done BMFA! If you have any comments or ideas about the videos send them direct to the BMFA or let me know and I will pass them on.

Model of the month: Pitts Special

This is Mike Harrall’s beautiful Pitts Special. Mind you I have yet to see it fly.

Genius: Number 3: Bixler gusset

A Bixler heavy landing will sometimes cause the motor to come off due to its inertia. Keith Eldred adds a gusset to the rear of the motor mount as shown in the picture. Use any bit of foam from a damaged tailplane or fin. It weighs next to nothing and adds a good deal of strength.

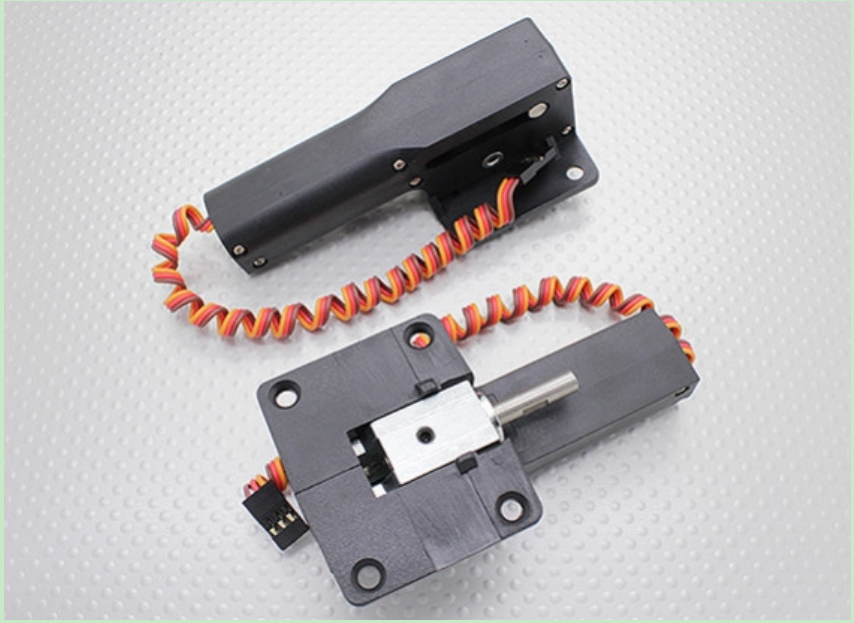
From the horse's mouth: Retracts

Mark Jordan is famed for his war birds. They all feature retractable undercarriage. Mark is excellent at landing but the wear and tear on the retracts from the grass runway means that he frequently has to service and repair them. Who better, then, to ask about the problems he experiences, their solutions and his experience of good suppliers? So we had a chat about the retracts. Obviously we didn't talk about the mountings as they vary from model to model.

Mark said, 'The two big problems are grub screws and breaking the mechanisms. I have found that Eflite retract mechanisms work flawlessly but they are expensive at about £100. I usually use the retract mechanisms from Hobby King. For my Mustang I fitted the heavy duty ones specified for up to 10 to 12kg models (225000020). They only cost about £23 for two. For lighter foam models I use one of the ones specified up to 5kg (225000018). They are about half the price.'

Its not unusual for Mark to have to straighten the legs. He says that sprung trailing arms and large wheels give the best protection from damage. The legs are usually aluminium so can, after a while, be difficult to repair. The biggest problem is with the grub screws that are used to lock the legs in position. They are small, and even good quality allen keys soon wear and become useless. It is difficult to get enough leverage to make a firm lock as the keys are springy. If you have to replace a grub screw make sure you use one with a flat end. The pointed ones wear quickly, so take off the point with a grinder or file. In the end though the threads in the aluminium fail so the leg must be replaced.

The 12kg version



The other frequent breakages are the pins that project from the mechanism and go into the legs. However Mark says in some ways this is good as they provide a weak link and prevent worse damage elsewhere. They are easily replaced.

Mark is always happy to give you help and advice on retracts so don't be afraid to ask.

Pillock of the month: Learning the hard way (nearly)

Unlike politicians, wise people learn from their own and others' mistakes. In this column I'd like people who have done something foolish to share it, so we won't do the same. And I start with another of mine. See Dave, I said I would fess up.

I had taken a few days to prepare my shiny new Wot4. I started with the wings, and decided to use metal servo arms, bolted on ball joints and metal clevises held on with grub screws. Having got them fitted and checked for neutral I completed the rest of the model and was ready for a maiden flight. 12 kph breeze straight down the runway. What could be better?

I installed the battery and carried out the pre-flight checks. I gave the servos a hammering then noticed one aileron a little out of position. I zeroed it with offset and was about to do a first flight. I wellied the servos again. Odd – the aileron was out of position again. Then the penny dropped. Had I locked up the bolted and screwed joints? Aaaargh! No.

At one time I taught programming. I told my students, 'Always finish.' I explained that it doesn't matter how much you have done but you must always complete the job before leaving it for another session. If you don't you'll forget you didn't complete it and then disaster will strike later. And of course I had forgotten my own rule.

So I took the model back home. Sure enough none of the servo arm screws, arm locking bolts, ball joint nuts and clevis grub screws were locked. Some were quite loose. Phew! I locked everything down with medium thread locker and checked the rest

of the model, just in case. And of course there's another lesson here too. If something seems even slightly odd, don't fly. Find out.

Please let me have your confessions.

Peter

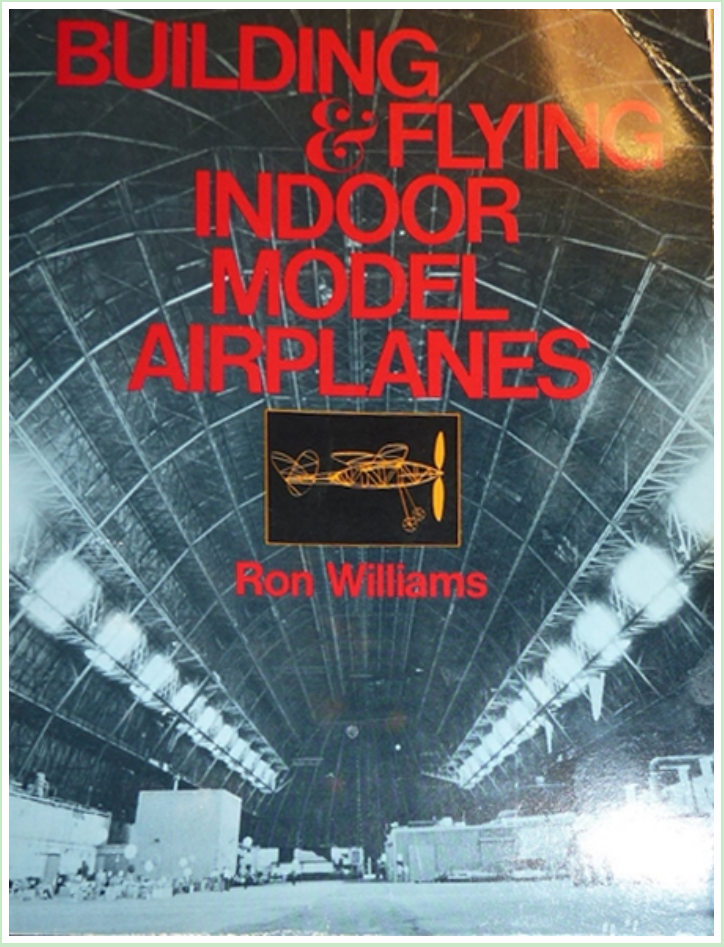
Books

Indoor free-flight flying is well worth a try. Building the delicate models develops your manual skills and you learn a lot about flight when you trim the models to fly and circle within a hall. Here are two excellent books to get you started. Indoor sessions are held at Stalham Sports Centre monthly. The details are on our website under The Club/Events. You can see some pictures on my website at peterscott.website under Flying/Indoor flying. For an amazing indoor powered glider take a look at https://www.youtube.com/watch?v=bWFaHDK54hU

Building and Flying Indoor Model Airplanes by Ron Williams

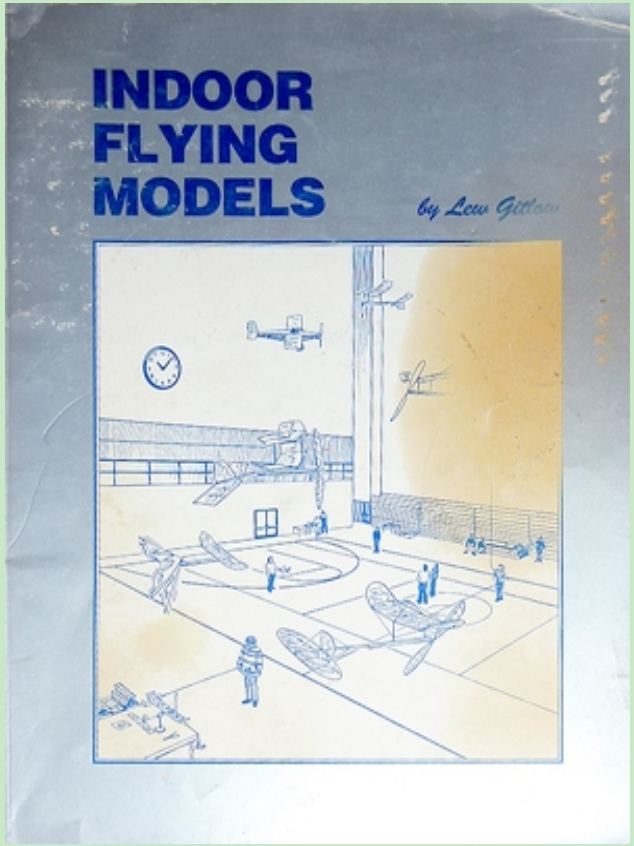
Whether you are, like me, a relative starter at indoor flying, or are someone who has done a lot but wants to build better models, this is a great book. It describes how to do everything with clear diagrams and simple language. It is filled with practical hints and tips from a flyer who has done it successfully. The models range from folded paper chuck gliders to the most esoteric ultra-lightweight competition models covered in dope-based microfilm. There are many plans that you can scale up and use for building. It even covers designs for boxes for carrying the fragile models.

Until recently the problem was that it was out of print. I imported a copy through Abebooks from Vagabond Books in the USA. The carriage wasn't cheap but it arrived in only four days. The book was well worth the money. However at the Sams Models stand at one Freeflight Nationals I found that it has been reprinted and can be bought for £29.95 in the UK at www.samsmodels.com.



Indoor Flying Models by Lew Gitlow

This superb book covers a huge range, including tools, materials and both basic and advanced skills. It has plans and sketches for all types of indoor models from simple penny planes and chuck gliders, through scale models to the most arcane FAI microfilm models. It was last published in 1993 so you will have to find a second-hand copy as I think it is out of print. I tracked one down on eBay but as you see the cover is stained.



Cartoon: Launch on the gun

Does this remind you of the Climb and Glide? No of course not. Our smarties go to the higher top end of the runway to gain an extra metre or two of altitude.

With thanks to Radio Control Soaring Digest

High Flyers

HIGH FLYERS by Topical Twists

Perhaps those who campaigned so energetically to get model flying recognised as a sport should have been a little more careful what they wished for. While the lottery grants and corporate sponsorships we were promised seem to be stuck somewhere the pipeline, the darker side of sporting status is very much upon us, for a while ago I heard that international team members are now asked to sign an anti-doping declaration.

Of course, I was outraged; I mean, I know it makes the house a bit whiffy, but it's bad enough with the flyers looking all saggy and wrinkly without their tissue being likewise. Fortunately it turned out to be more do with 'performance enhancing substances', which are hardly a problem in the genteel world of aeromodelling... or are they? Without regard for personal safety, Topical Twists went deep undercover to track down a retired aeromodeller prepared to blow the whistle.

"Have you witnessed British flyers using performance enhancing substances?"

"All the time. The Bowden Trophy's the worst. They're all at it - Werther's Originals, Vick's vapour rub, you name it. Why do you think they're burned out by their mid-nineties? I can't speak for the FAI crowd, they probably get some fancy Russian lozenges made out of beetroot or such like by cottage industries in Ukraine".

"Shocking. Surely indoor flying must be cleaner?"

"Worse if anything. How d'you think the F1D lot keep up that pace all day? Ovaltine, that's how. I know one guy who's so strung out on cocoa that he can sit through a whole episode of Loose Women without kicking the screen in."

Aeromodeller January 2017

Notice no mention of caramel waffles or kafferrep. [Ed]

Propeller geometry

Two things sparked my wish to know more about propellers.

For my indoor lightweights I make prop blades that plug into a tissue-tube hub. This means that they are easily replaced but it is tricky to get both props equally set. This means the model sometimes vibrates and I am sure that I could get longer flight times with a bigger pitch. So I wanted to know how to design a jig.

The second was chatting to a club member who flies 3D behemoths with enormous props. He was talking about fitting an even larger prop than the twenty-something inch one on the model. I think he told me that the pitch would be 18 inches (sorry about mediaevalism). I wondered why the pitch was so large.

How props work

First the principles. Thrust is generated because the prop pushes on the air to accelerate it and the air pushes back on the prop (Newton's Third Law). Props are rotating wings. They have two main dimensions – diameter and pitch. Pitch is the theoretical distance the prop moves forward in one revolution.

A prop blade has an aerofoil. You can see it if you look at a broken blade. Not got one? Borrow one of mine. As it turns it cuts the air.

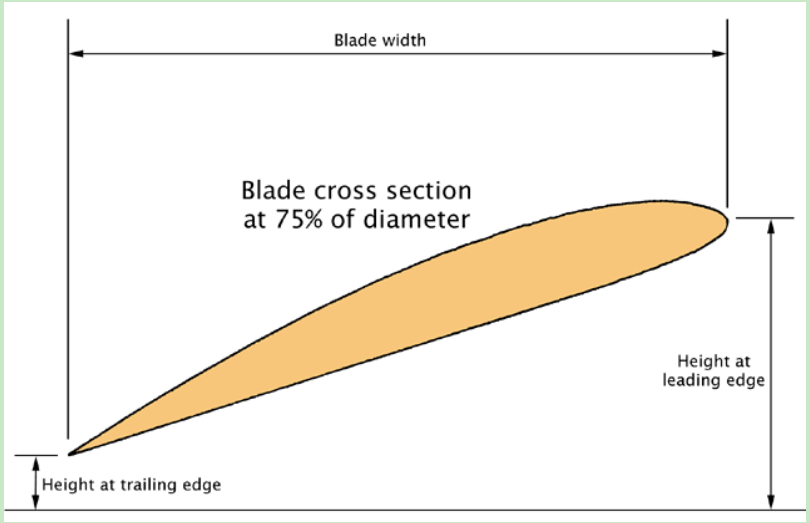
When static the angle of incidence is effectively the angle of the prop blade, which is about 12°, so it is stalled and very inefficient. When moving through the air the prop's angle to the air will drop almost to zero. In theory then, if you measure the angle of the blade, simple geometry should tell you the pitch. For each revolution the tip of the propeller travels in a spiral through the air a distance equal to the circumference of its circle. Apparently a good propeller has about 85% energy efficiency.

Maths

At radius r on the prop the following measurements are made:
Width of the blade W
Difference in height of leading edge h1 and trailing edge h2, measured from a flat surface.
So the tangent T of the angle of attack is (h1 – h2) / W
The circumference of the path of the measurement point is found:
Circumference = 2 x ? x r
Pitch = Circumference x T
Pitch = 2 ? r (h1 – h2) / W

"The reason we measure pitch at 75% of the diameter is two-fold. Generally, the pitch of a propeller is not completely constant, varying somewhat from hub to tip to optimize it for the different linear speeds at each point along the blade. The pitch at 75% corresponds roughly to the average effective pitch of the propeller. Secondly, the propeller is sufficiently wide at 75% to allow one to get reasonably accurate measurements of blade width and height."

The angle of a blade changes as you move outwards because the outer parts of the prop are travelling further (circumference) so must have a lower angle to give the same pitch. "To put it another way, propeller blades are twisted to change the blade angle in proportion to the differences in speed of rotation along the length of the propeller and thereby keep thrust more nearly equalized along this length. If the blades had the same geometric pitch throughout their lengths, at cruise speed the portions near the hub could have negative angles of attack while the propeller tips would be stalled." Put yet another way, "Propellers operate most efficiently when the aoa [angle of attack] at each blade station is consistent (and, for propeller efficiency, that giving the best lift drag ratio) over most of the blade, so a twist is built into the blades to achieve a more or less uniform aoa."



I gave the maths a practical test. I used a fairly large prop to make measurement easier.
I covered the markings so I couldn't know the answer.
I marked the 75% point out from the centre. Here the diameter was 380mm.
I held the prop firmly down on a flat surface.
I measured the heights of the centres of the leading and trailing edges.
Rear 4.5 mm Front 12.5 mm Difference 8 mm
The blade width viewed from above = 36 mm
So the tangent of the blade angle is 8/36 = 0.22
The pitch should be circumference x 0.22
Circumference = ? x d = 3.142 x 380 = 1194 mm
Therefore pitch = 1194 x 0.22 = 265 mm
In mediaeval units this is 10.5"
And what was the marked pitch? 10".
Considering the systematic errors in measurements (+/- 0.5mm) this is pretty good.
QED.

So what are the answers to what started all this?

To build a jig I must decide on a prop diameter. Then I must decide on a pitch. Then I settle on a prop width at 75% radius. Then I calculate the angle needed. Then I make a card jig. Done!

Why was the pitch so big on the big prop? Because as the diameter goes up a prop with the same angles will automatically give a larger pitch because the circumference is bigger. A given geometry will give a 200mm pitch on a 300mm prop and a 400mm pitch on a 600mm one. The performance will be the same. So if you have a small and a large prop with exactly the same angles of attack the larger one will have a larger pitch.

This article included quotations, which I enclosed in quote marks, from the following sites.
http://avstop.com/ac/flighttrainghandbook/basicpropellerprinciples.html
http://www.pilotfriend.com/training/flight_training/fxd_wing/props.htm
http://www.stefanv.com/rcstuff/qf200203.html

On one site I had asymmetric blade factor explained. This occurs during takeoff. The propeller disk is tilted so the top is further back. This means that as it starts to move forward, until the tail lifts the downward moving blade has a larger angle of attack and produces greater force. With conventional rotation this means the aircraft will turn to the left. For an explanation of the various upsetting forces due to the engine and prop (torque reaction from engine and propeller, corkscrewing effect of the slipstream, gyroscopic action of the propeller, asymmetric loading of the propeller (P factor)) go to:
http://www.free-online-private-pilot-ground-school.com/propeller-aerodynamics.htm

Peter

Manoeuvre of the month:

The Stall Turn or Hammerhead: a turnaround maneuver

From RCSD March 1998 with thanks

The stall turn is very pretty, quite easy to do and serves nicely as a turn-around maneuver. You start going in one direction (to the right, for instance), and you end up heading in the opposite direction (to the left for example).

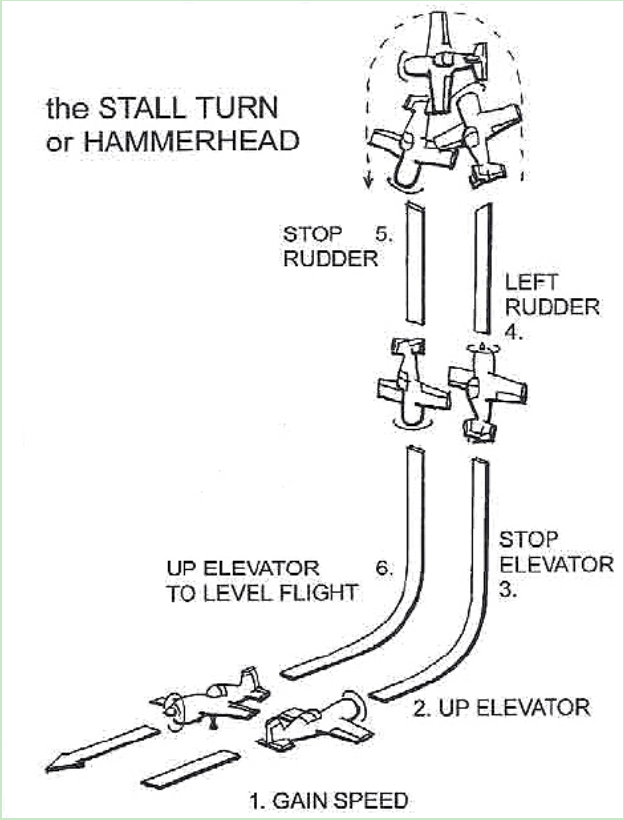
Properly done, the stall turn is very gentle and puts little or no strain on the airframe.

According to the AMA [Academy of Model Aeronautics] rule book, “Stall turns consist of lines and partial loops...
The following criteria apply to all maneuvers containing stall turns:
1, Lines must have exactly vertical and horizontal flight paths,
2, Entry and exit must consist ot partial loops with equal radii.
3. The length of the vertical line is not a criterion.
4. The maximum pivot radius is the wing span. A pivot radius of more than I wing span should be considered a major defect
5. If the model shows a pendulum movement after the pivot, the maneuver is also defective.”
(All of the above used by permission of the AMA)

This is how to do it: Pick up airspeed, fly straight and level with your wings level, pull up elevator until the model is going exactly vertical Once vertical, neutralize the elevator and turn full rudder one way or the other. The model should start to turn and, as it slows down, rotate 180 and then come back down, with its nose pointed straight at the ground, The wing tip should rotate around itself as the model points its nose back down to the ground. Once pointed straight down, give up elevator in approximately the same position you entered the stall turn, and fly straight and level.

The stall turn is a very dandy maneuver! It's a great turnaround maneuver and it's a heck of a lot of fun to watch and perform. Best of all. it shouldn't take you very long to master and it will come in handy no matter where you fly.

Ed’s comment: One clever variation is a half roll on the way down then pull out in the same direction as you started. Thanks to Tom Edgecombe for that one.



Christmas 2019 gift ideas: part 1 of 2

Either buy it and wrap it for yourself, or include it as part of your list to Santa.
Gas soldering iron (once you've used one you won't use anything else for heavier work) £20
Connector jig/heatsink for soldering £7
Helping hands to hold wire in place in the connector jig £6
Set of diamond hole cutters – 6 to 50 mm diameter £8.50
Propellor balancer (the SLEC one is good) £12.46
Mini scales for weighing components, wood or two-part epoxy £5
(Prices from eBay October 2019 except SLEC)

Spot the fault: Glider

A flyer has renovated an old 3m glider, which flew from a slope and bungee with great success on elevator and rudder. The work involved putting in an electric motor and fitting the wings with ailerons. The model was originally built from a kit and the ailerons were made to be the same size as shown on the plan. The centre of gravity was correct to the plan. The wings slot on to two 8swg steel rods.

The first two flights were hair-raising. The model flew well in a straight line but when the pilot tried to turn it slewed in the sky and refused to turn, eventually starting to stall. The pilot was able to get the model safely onto the ground by use of rudder. What is wrong and what needs to be done to fix it?

Last month's answer

Reason
The resolution of the signals to the servos will probably be 1023 steps. By reducing the throws on the transmitter only part of that range of steps is used, perhaps a quarter. When expo was added the resolution near the neutral point was reduced even further so individual steps could be seen.

Cure
Change the throws by moving the pushrods not by altering transmitter settings. In this case move the rod to a hole nearer the centre on the servo arm, or to a horn hole further away from the control surface, or both if necessary. That way you get full resolution over the more limited throw. Even with expo the steps will no longer be seen.

Caption competition

Thanks to RCSD for picture

My first go: 'I think I can feel the head!'

Your suggestions to me at peter@northreppsmfc.com

Engineer jokes

Some people say that the glass is half full. Others say that it is half empty. An engineer will say, ‘It’s twice as big as it needs to be’.

How do you tell what sort of engineer a person is? An aeronautical engineer will use a torque wrench to tighten the nut. Then half an hour later will torque it again. An automobile engineer will use a big pair of pliers and turn till the pliers slip. A civil engineer will put the nut on with fingers and let it rust tight.

Yet another health warning: grinding cyanoacrylate

In a word, **DON’T!**

I was making a proper repair to my Foam-e Acrowot’s undercarriage. I needed to remove quite a lot of CA glue that had built up, having been used to get the model back in the air at the field. I thought a grinder or disk on my Dremel would do the trick. So I put on a face mask and started grinding. A terrible smell came off the glue and my eyes started to water. Despite the mask there was a burning in my nose so I immediately stopped, opened the window and left the room. I have no idea what the noxious gas was but I don’t want to repeat it. So I reverted to chopping the glue out with big side cutters and a screwdriver, and then slicing the remainder away with a strong craft knife.

Scandi lines

Just when you thought it was safe to look at a biscuit again, a new threat hits town. This time the stuff is run over from Sweden. Here it is. See how the packaging tempts you by sounding harmless and fun. Don’t be deceived. This the nature of the primrose path. You can buy a big box of these, allegedly flavoured only with ginger, from IKEA for under three pounds. It won’t last. Once we are all hooked the price will shoot up. You have been warned. Just say, ‘No’.

Sources

If you have read the recent 2019 Special Issue of Radio Control Models & Electronics you will have seen an attempt to get people to try building models rather than always buying ready-to-fly. They listed several suppliers but I think two stand out – Tony Nijhuis and Sarik Hobbies. Both sell materials for scale models in several forms. You can buy just a plan or can go on to a set of laser and router cut parts, a complete set of additional wood, hardware such as props, mouldings, spinners and retracts, or all of the electrical devices like motors and ESCs.

For my 1/9 scale Mosquito I bought the complete set from Tony Nijhuis. The quality was very good, from the plan to the choice of wood. I found one or two mistakes in the plan and parts but nothing serious. I have been told that his designs tend to be tail heavy so I am building the tail end differently. Sarik does a similar service but I have not tried it, apart from their excellent metal spinners mentioned in a previous newsletter. Tony Nijhuis will also scale his plans up or down to almost any size for about £100.

Addresses:

http://www.tonynijhuisdesigns.co.uk/

https://www.sarikhobbies.com/

Sales

Don’t forget, if you have modelling items for sale let either Dave or me have the details. They will get a listing here and go on the website in the public area under ‘The Shop’. And don’t forget, if there is something you need why not put a message under **The Shop/Wanted?**Who knows, there might be one in someone’s workshop just waiting for you. Dave has removed the page for now but he would no doubt replace it if needed.

Currently on offer:

Paul McLeod has a SIG Hog Bipe for £75

Terry Godfrey has an ASK14 glider for £35

Ivan Rodger has two models: a Rave trainer for £45 and a large, part-fibreglass Boa for £80.