Airscrew

Facts, opinions, pictures and fun

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Contents

Hi all

The great god Prangus knows how to rub the salt in the wound. The two days after the airfield closure had to be great weather for flying didn't they? Hi ho.

I'll continue to publish the newsletter each month. No doubt you are using the down time to work on models ready for when the skies are clear again. Why not take some pictures and send them to me with a description of the project?

It need not be the whole model but a clever technique you have discovered or invented. For example Keith, when repairing his Phoenix, has invented epoxy rivets. More about them another time.

Or it might be a mistake you have made. I make quite a few and always (nearly) learn from them. You all know the old phrase, 'Someone who never made a mistake never made anything'. Share them with us.

So with your help we might have 'Project of the Month' to go along with 'Genius' and 'Pillock of the Month'.

So I'll kick off with one of mine.

Here's one of my two current projects – a Tony Nuijhuis Mustang renovation. This is a basically sound build that needed some improvements and refinishing. This is how it looks at present without flaps and ailerons.

It has been patched, shaped and sanded, then finished with Eze-Kote and 24gram glass fibre. Next is the final sand and spray primer. My workshop is nearly warm enough for airbrushing. I'll try flying it in the primer before I spend a lot of time decorating it. Just in case…

Model of the month: XK X450

I am just waiting for the flame emails to flood in. However three of us in the club have ‘flown’ this delightful little beast and had a lot of fun. We are planning a new team, the Northrepps White Arrows. The model will fly as a drone, a prop hanger or a normal fixed wing model after the rotors are moved to point forwards. In the last mode it goes like the clappers under full throttle. In fixed wing mode you can get up to fifteen minutes flight time but rather less as a drone. It is gyro controlled but that can be switched off in the air to enter ‘3D mode’. No, none of us have dared try that yet. This model is made or distributed by a number of companies. Mine was from XK itself but Dave changed that to WL Toys in my hangar just so he could get the word ‘toy’ in. Hee hee.

Noble Pillock of the Month

Why noble? Because Keith was on his own when this happened and he didn’t need to fess up, though Mick was driving in. This is definitely a new version of prop hanging. Yes, it is what it looks like. Keith’s Kingfisher’s prop grabbed the windsock and started to eat it. Then it gave up and just hung there proudly. Almost looks like fly-fishing. As Keith commented, ‘Kingfisher took the bait’.

Genius: number eight – Spar mill

Assembling his Phoenix glider for the first time Keith Eldred found that one of the spars appeared to be too long. Gazing down the wing tube he saw that the foam has intruded into it. So he cut a couple of notches in the end of the spar and used it like a mill. He rotated it a few times, got the swarf out and then the spar fitted perfectly.

Bob's Tales

Australian Tales: the great Sandy Desert.

When I first arrived in Australia I had only flown in Europe and after basic training it was mainly Instrument Flight Rules with the airline. When I arrived at Port Hedland I was faced with flying over the desert using charts which at that time had large areas away from the coast marked 'Uncharted'. There were no navigation aids except the odd non-directional beacon which became unusable if there were any thunderstorms around. GPS had not been invented and radio coverage was HF as we were out of VHF range most of the time. Satellites were science fiction.

The only way to navigate was Dead Reckoning (DR), Airspeed, Magnetic Heading,Time and the Mark1 Eyeball! The only time we would fly at night was on urgent medical flights by using the headlights of a Landrover parked at each end of the strip. I had to go particularly deep into what was called The Great Sandy Desert, to a place called Kitson Field which was just a strip bulldozed through the scrub big enough to land and take off. This strip was to service West Australian Petroleum who were carrying out seismic survey work. I had to keep them supplied with fresh food and the odd replacement worker.

It was about three hours flying time from Port Hedland so for the last two hours was strictly DR navigation with no pinpoints to check position. I used go out fairly high and try to take rough visual bearings from Lake Disappointment, a large dry salt lake way to the south of the track, to try and check progress along my track. If my estimated time of arrival (ETA) came up and there was no sign of the airstrip, I carried out a Square Search. This involved flying for a set period beyond ETA and carry out a ninety degree turn and fly for the same amount of time followed by repeating ninety degree turns extending the time on each leg. So you were expanding your search in a controlled manner until you found the field.

The camp consisted of an old single deck bus used as the dining mess. The rest was tent or in the summer outside on a camp bed. I had to stay overnight sleeping on a camp bed under the Southern Cross one night. It was quite magical, However being awoken at first light by swarming flies rather spoilt the overall experience. After a steak and eggs breakfast, and refuelling the aircraft with a hand pump from 44 gallon drums, it was nice to get into the aircraft and climb up into the cooler air and head back to Port Hedland.

EASA news

Did you spot the news on March 7th, that the UK will be leaving EASA (European Aviation Safety Agency) when/if we finally leave on December 31st this year? I know this is the year of the flying pig but it could be very good news. We might now stage more of the world's model flying competitions. Everyone must come to the field when the local MP pays a visit, though that is now likely to be some time away.

New battery technologies: part two

Last month we looked at:
Lithium-ion
Zinc-Air
Aluminium-ion
Aluminium-air
Lithium-sulphur
My notes are in [ ].

Solid-state

What is it?
Solid-state batteries represent a paradigm shift in terms of technology. In modern Li-ion batteries, ions move from one electrode to another across the liquid electrolyte (also called ionic conductivity). In all-solid-state batteries, the liquid electrolyte is replaced by a solid compound which nevertheless allows lithium ions to migrate within it. This concept is far from new, but over the past 10 years – thanks to intensive worldwide research – new families of solid electrolytes have been discovered with very high ionic conductivity, similar to liquid electrolyte, allowing this particular technological barrier to be overcome.

What are its advantages?
The first huge advantage is a marked improvement in safety at cell and battery levels: solid electrolytes are non-flammable when heated, unlike their liquid counterparts. Secondly, it permits the use of innovative, high-voltage high-capacity materials, enabling denser, lighter batteries with better shelf-life as a result of reduced self-discharge. Moreover, at system level, it will bring additional advantages such as simplified mechanics as well as thermal and safety management.

As the batteries can exhibit a high power-to-weight ratio, they may be ideal for use in electric vehicles. [...and model aircraft probably.]

When can we expect it?
Several kinds of all-solid-state batteries are likely to come to market as technological progress continues. The first will be solid-state batteries with graphite-based anodes, bringing improved energy performance and safety. In time, lighter solid-state battery technologies using a metallic lithium anode should become commercially available.

Solid state lithium-ion

Solid state batteries traditionally offer stability but at the cost of electrolyte transmissions. A paper published by Toyota scientists writes about their tests of a solid state battery which uses sulphide superionic conductors.

The result is a battery that can operate at super capacitor levels to completely charge or discharge in just seven minutes - making it ideal for cars. Since it's solid state that also means it's far more stable and safer than current batteries. The solid-state unit should also be able to work in as low as minus 30 degrees Celsius and up to one hundred.

The electrolyte materials still pose challenges so don't expect to see these in cars soon, but it's a step in the right direction towards safer, faster-charging batteries.

Sodium-ion batteries

Scientists in Japan are working on new types of batteries that don't need lithium. These new batteries will use sodium, one of the most common materials on the planet rather than rare lithium – and they'll be up to seven times more efficient than conventional batteries.

Research into sodium-ion batteries has been going on since the eighties in an attempt to find a cheaper alternative to lithium. By using salt, the sixth most common element on the planet, batteries can be made much cheaper. Commercialising the batteries is expected to begin for smartphones, cars and more in the next five to 10 years.

Metal-air batteries

Metal-air batteries have a pure-metal anode and an ambient air cathode. As the cathode typically makes up most of the weight in a battery, having one made of air is a major advantage. There are many possibilities for the metal, but lithium, aluminum, zinc, sodium remain the forerunners. Most experimental work uses oxygen as the cathode to prevent the metal from reacting with CO2 in the air, because capturing enough oxygen in the ambient air is a major challenge. Furthermore, most metal-air or metal-oxygen prototypes have problems with cyclability and lifetime.

Graphene

Samsung's graphene battery

Samsung has managed to develop "graphene balls" that are capable of boosting the capacity of its current lithium-ion batteries by 45 per cent, and and recharging five times faster than current batteries. To put that into context, Samsung says its new graphene-based battery can be recharged fully in 12 minutes, compared to roughly an hour for the current unit. [Back in the air sooner Mark.]

Samsung also says it has uses beyond smartphones, saying it could be used for electric vehicles as it can withstand temperatures up to 60 degrees Celsius.

Grabat graphene batteries

Graphene batteries have the potential to be one of the most superior available. Grabat has developed graphene batteries that could offer electric cars a driving range of up to 500 miles on a charge.

Graphenano, the company behind the development, says the batteries can be charged to full in just a few minutes and can charge and discharge 33 times faster than lithium ion. Discharge is also crucial for things like cars that want vast amounts of power in order to pull away quickly. There's no word on if Grabat batteries are currently being used in any products, but the company has batteries available for cars, drones, bikes and even the home.

Sand battery

This alternative type of lithium-ion battery uses silicon to achieve three times better performance than current graphite li-ion batteries. The battery is still lithium-ion like the one found in your smartphone, but it uses silicon instead of graphite in the anodes. Scientists at the University of California Riverside have been focused on nano silicon for a while, but it's been degrading too quickly and is tough to produce in large quantities. By using sand it can be purified, powdered then ground with salt and magnesium before being heated to remove oxygen resulting in pure silicon. This is porous and three-dimensional which helps in performance and, potentially, the life-span of the batteries. We originally picked up on this research in 2014 and now it's coming to fruition. Silanano is a battery tech startup that's bringing this technique to market and has seen big investment from companies like Daimler and BMW. The company say that its solution can be dropped into existing lithium-ion battery manufacturing, so it's set for scalable deployment, promising 20 per cent battery performance boost now, or 40 per cent in the near future.

Gold nanowire batteries

Great minds over at the University of California Irvine have cracked nanowire batteries that can withstand plenty of recharging. The result could be future batteries that don't die. Nanowires, a

thousand times thinner than a human hair, pose a great possibility for future batteries. But they've always broken down when recharging. This discovery uses gold nanowires in a gel electrolyte to avoid that. In fact, these batteries were tested recharging over 200,000 times in three months and showed no degradation at all. [I think these were the ones NASA were keen on, but are currently very expensive.]

Foam batteries

Prieto believes the future of batteries is 3D. The company has managed to crack this with its battery that uses a copper foam substrate. This means these batteries will not only be safer, thanks to having no flammable electrolyte, but they will also offer longer life, faster charging, five times higher density, be cheaper to make and be smaller than current offerings.

Prieto aims to place its batteries into small items first, like wearables. But it says the batteries can be upscaled so we could see them in phones and maybe even cars in the future.

Ryden dual carbon

Power Japan Plus has already announced this new battery technology called Ryden dual carbon. Not only will it last longer and charge faster than lithium but it can be made using the same factories where lithium batteries are built. The batteries use carbon materials which mean they are more sustainable and environmentally friendly than current alternatives. It also means the batteries will charge twenty times faster than lithium ion. They will also be more durable, with the ability to last up to 3,000 charge cycles, plus they are safer with lower chance of fire or explosion.

ZapGo Carbon-ion battery

Oxford-based company ZapGo has developed and produced the first carbon-ion battery that's ready for consumer use now. A carbon-ion battery combines the superfast charging capabilities of a supercapacitor, with the performance of a Lithium-ion battery, all while being completely recyclable. The company has a powerbank charger that be fully charged in five minutes, and will then charge a smartphone up to full in two hours.

Laser-made micro supercapacitors

Scientists at Rice University have made a breakthrough in micro-supercapacitors. Currently, they are expensive to make but using lasers that could soon change.

By using lasers to burn electrode patterns into sheets of plastic manufacturing costs and effort drop massively. The result is a battery that can charge 50 times faster than current batteries and discharge even slower than current supercapacitors. They're even tough, able to work after being bent over 10,000 times in testing.

Iron-air batteries

Iron-air batteries promise a considerably higher energy density than present-day lithium-ion batteries. In addition, their main constituent – iron – is an abundant and therefore cheap material. Scientists from Forschungszentrum Jülich are among the driving forces in the renewed research into this concept, which was discovered in the 1970s. Together with American Oak Ridge National Laboratory (ORNL), they successfully observed with nanometre precision how deposits form at the iron electrode during operation. A deeper understanding of the charging and discharging reactions is viewed as the key for the further development of this

type of rechargeable battery to market maturity. The results were published in the renowned journal Nano Energy.
For reasons including insurmountable technical difficulties, research into metal-air batteries was abandoned in the 1980s for a long time. The past few years, however, have seen a rapid increase in research interest. Iron-air batteries draw their energy from a reaction of iron with oxygen. In this process, the iron oxidizes almost exactly as it would during the rusting process. The oxygen required for the reaction can be drawn from the surrounding air so that it does not need to be stored in the battery. These material savings are the reason for the high energy densities achieved by metal-air batteries.
“We consciously concentrate on research into battery types made of materials that are abundant in the Earth’s crust and produced in large quantities,” explains institute head Prof. Rüdiger-A. Eichel. “Supply shortages are thus not to be expected. The concept is also associated with a cost advantage, which can be directly applied to the battery, particularly for large-scale applications such as stationary devices for the stabilization of the electricity grid or electromobility.”
There is, however, still a long way to go until market maturity. Although isolated electrodes made of iron can be operated without major power losses for several thousand cycles in laboratory experiments, complete iron-air batteries, which use an air electrode as the opposite pole, have only lasted 20 to 30 cycles so far.

Energy and power densities

Blanks show not yet known. Wh means watt-hours.

Type	Specific energy	Energy density	Specific power	Cycles
	Wh/kg	Wh/litre	W/kg	
Lead acid	33 - 42	60 - 110	180	500 - 800
Nickel-cadmium	40 - 60	50 - 150	150	2000
Nickel metal-hydride	60 - 120	140 - 300	250 - 1000	500 - 2000
Lithium-ion	100 - 350	250 - 620	250 - 340	400 - 1200
Lithium-polymer	100 - 265	250 - 730		
Lithium sulphur	500	350		
Lithium-air	11 140	6000		
Iron-air	1200	9700		

For comparison of specific energies:

Methanol	22.7 MJ/kg
Petrol	45 MJ/kg
Nitromethane	11.3 MJ/kg (but provides oxygen for other fuels)
Lipo	0.95 MJ/kg
Lithium-air	40 MJ/kg

Of course glow fuels contain perhaps 70% methanol, 10% nitro and 20% oil so the true numbers will be lower (about 17 MJ/kg). The nitro increases power more than energy. Petrol of course contains only a tiny amount of oil.

Calculations:
1 Wh = 3600 Ws = 3600 J
The best current technology for flyers is Lipo which stores 265 Wh/kg
This gives 265 x 3600 = 954000 J/kg
This is 20 to 40 times less good than liquid fuels.
If lithium-air matures this becomes:
11140 x 3600 = 40MJ/kg

References and further reading about batteries
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https://www.saftbatteries.com/media-resources/our-stories/three-battery-technologies-could-power-future
https://www.pocket-lint.com/gadgets/news/130380-future-batteries-coming-soon-charge-in-seconds-last-months-and-power-over-the-air
https://scitechdaily.com/iron-air-batteries-promise-higher-energy-density-than-lithium-ion-batteries/
https://greentransportation.info/energy-transportation/energy-density.html

James Ward VC

In the E.D.P. for Saturday 14th March 2020 there was a long article about Jimmy Ward who flew Wellington bombers out of Feltwell in World War 2. He was awarded the VC for climbing out on to the wing of a flying and badly damaged bomber to put out a fire so that the aeroplane could limp back to safety.

What struck me was an inset picture of him with a free flight model aircraft with a description of him as ‘the gifted aero modeller [who] dreamed of flying as a youngster in his native New Zealand’. Proof, if any were needed, that people made careers in aviation after starting with modelling. Those wishing to clear us out of the skies take note.

New German word

You know how words get strung together in German? Keith was describing how he softens his cinnamon waffles by putting them on top of his mug of coffee. However the other day he left it too long and it sagged into the drink. I told him there was a German word for that. Wafflemugensteamenslumpen. Well there is now.

How to Achieve a Straight Square Sanded Edge

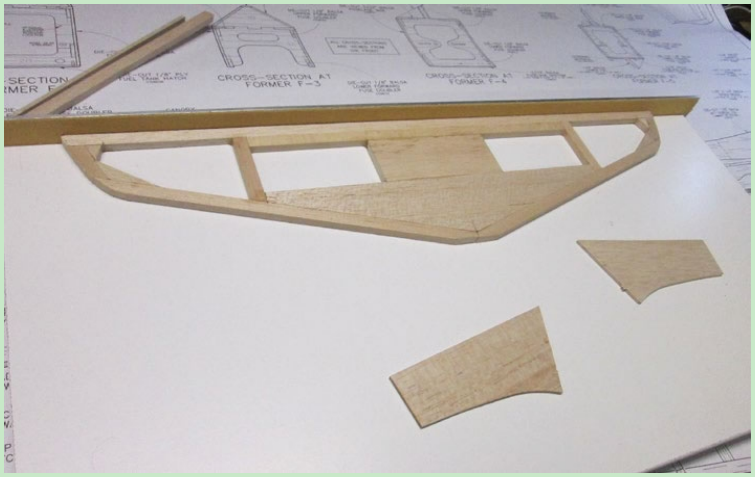
By Scott Keller
Balsa Model Aircraft Builders Association
FaceBook page, <http://tinyurl.com/y9bbg6zx>
From RCSD December 2017

Here's one of my secret weapon homemade tools to make life easy and build precisely! It's for squaring up edges, sheets, etc., anywhere you want a perfect STRAIGHT SQUARE EDGE. I have a few in different lengths and where this tool really shines is doing edges on 1/16" wing sheeting BEFORE joining. The photos should be self explanatory on how to build one. You can see the picture of the two small pieces I did. Left is squared, right isn't. It's a great easy to make tool !

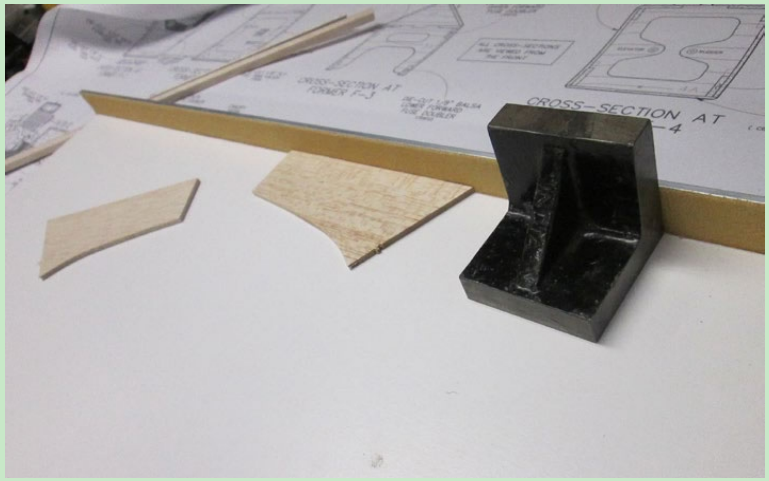
With the base on its edge, you can see how the metal sheet is attached with three screws.

The base bottom has rubber "feet" to aid in stability on the work table.

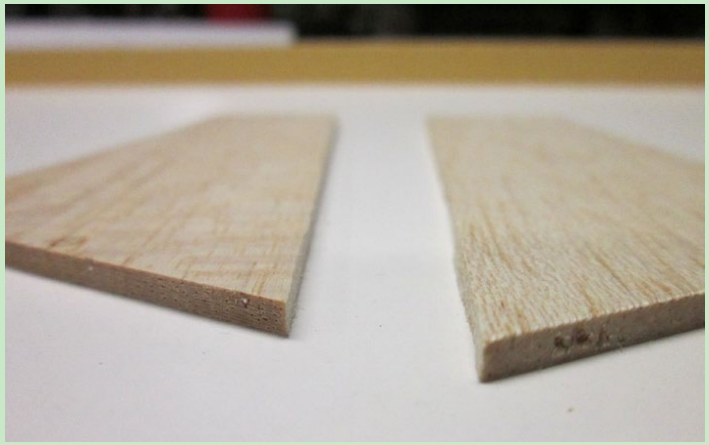
The metal edge, with sandpaper attached, is square to the base and perfectly straight.



Here you can see the metal edge is at 90 degrees to the base, making the sanding of straight square edges a breeze.



And here we see the sanded edge (L) compared to a raw cut edge (R). Quite a difference! It has a nice square and straight edge, perfect for gluing.



[Ed's comment. I am going to make one of these, though I might use angle aluminium fixed to the top of the board. I'll use the belts sold for sander files, pictured below. These are 10 mm wide and available down to 120 grit. I can also think of a variant for when doing a lot of planking. If you set the thing up with the aluminium at an angle rather than ninety degrees you can then get perfectly fitting angled edge joints to increase the glued area. At the moment I use a stripping tool with a piece of wood glued on to angle it. With my idea you can also angle the edges of the curved pieces that you get when closing up.]

Joke of the month

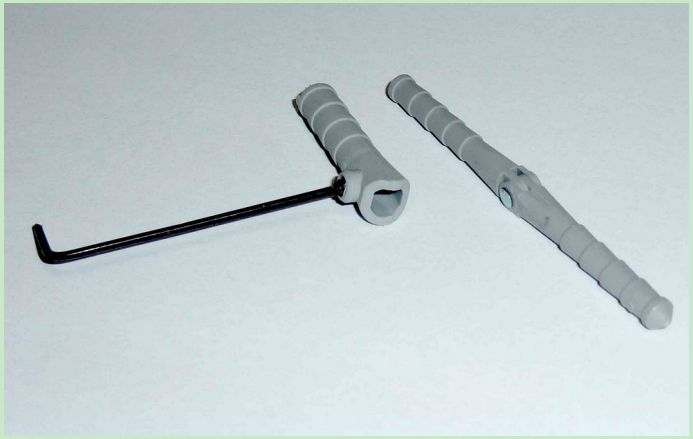
Why don't you ever see CAA officials at the beach? Because cats keep covering them with sand.

Top tip: using Robart hinge pockets

Hanging control surfaces is always a pain. I use either the flat type hinges with a steel pin or the ones with a round cross-section. Usually it is easy to glue the first part of the hinge, but the second is much more difficult. The control surface is in the way which makes it more difficult to control where the glue goes. Then it seizes or stiffens and you curse and have to take the thing apart again.

So I was pleased to come across pockets made by Robart. These have a grub screw. The hinge is pushed in and the screw

tightened. The pocket is easy to glue in and it will mean that the control surface can be removed if needed without damage. Both the hinge and the pocket can be shortened or trimmed to suit the position.



Here the hinge is inserted into the pocket

Robart's instructions are:
To assure proper alignment assemble pockets to each hinge point then tighten set screws.(NOTE: If hinge & pocket must be shortened to fit a shallow surface, cut off excess with a razor saw while assembled and tape end to keep glue out of pocket)

For Super HingePoint Pockets drill a 1/4" hole to desired length. Prime slots or holes with epoxy or whiteglue (Soap pressed into hex recess of set screw will keep glue out)

CAA again

When I was printing my CAA numbers using a Dymo I thought it would be good to print rude finger gestures at the start and finish. No rule against them. But my Dymo doesn't have suitable symbols.

Manoeuvre of the month: Four point rolls

Hesitation Rolls or Point Rolls

As usual my comments in [ ]. [This article from RCSD was written for gliders. In each case I have altered glider to model as the manoeuvres are exactly the same. Apart from that I have not altered the excellent article except to omit text that referred only to gliders.]

The Four Point (Hesitation) Roll

This maneuver is much more difficult to do well and requires a lot of airspeed. I suggest you first try this in parts doing only the first 90 degrees of the roll and then fly back to level again. Once you have mastered this, go 90 and 180 degrees; after that go to 90-180-270 degrees and then... by Jove! You've got it! Remember to do an equal hesitation at each point in the roll. The longer you hesitate, the more impressive this point roll will be and the more difficult.

There are a couple of ways to approach the four point hesitation roll depending on what type of model you are flying and how long

you wish to hesitate between the four points. A quick hesitation can be flown as follows.

The (faster) Four-Point Hesitation Roll

This maneuver is easiest with a good, snappy (crisp on the controls) model.
Gain enough airspeed, then pull up a bit past level, give full ailerons (one way or the other), and stop ailerons exactly at 90-180-270 and 360 degrees of rotation. You might need to add a little bit of down elevator when your model is inverted Try this and see how it works. Airspeed, airspeed, AIRSPEED!

The idea is to fly the whole maneuver as straight and level as you can. The tendency in flight is to start to drop the nose. If you fly slowly, the ailerons will not "bite" and will produce a slow rate of roll, which you don't want. If you arc in the middle of the maneuver, the slower you fly (low airspeed) the more the nose will drop, and the less effective the ailerons will be making it more difficult for you to complete the maneuver. That's why lots of airspeed is so important.
You might need to start the four-point roll with the model nose up and end the maneuver nosed down. However you approach it, the whole maneuver should be symmetrical, meaning it should either be executed straight and level or it should follow a barely noticeable horizontal arc. You will want to draw attention to the point roll you are doing, but you want to hide the fact that you may not be able to do it straight and level.

The difficulty of this maneuver will vary greatly from model to model. With some, the four-point roll will be quite easy, while with others this will be a very difficult maneuver to do well. As always, practice makes perfect!

Approach the four-point roll little by little, mastering parts of it at a time. As mentioned earlier, master the first 90 degree rotation first, then add the second point at the 180 degree hesitation, then add the third, and so on. You can practice the last two points in the four point roll by doing a half loop, then flying inverted and, from there, trying the 270 degree hesitation and back to level flight.

Once you have mastered this four point roll, you are ready to try another variation of this hesitation roll.

The (slower) Four Point Hesitation Roll

More difficult, but also more spectacular, is the 4-point roll with longer hesitations. The longer you hesitate, the more likely the model's nose will begin to drop. To counteract this tendency, you will need to add top rudder at the 90 and 270 degree points and down elevator at 180 degrees when inverted. [Top rudder is explained below] In order to perform this maneuver well, you will most likely need to combine and coordinate inputs of rudder, aileron, and elevator with just theright points in the roll as follows. This is going to sound complicated at first, but it's really much simpler than you might think. Now stop reading! Take a break.

That's right, put RCSD down, get up and go find your radio transmitter and let's run through this maneuver with you holding your transmitter. This will be much easier for you to understand if you are steering with the sticks. Now for some hands-on couch flying!

Are you now holding your radio in your hands? OK, ready or not, here we go! Let's run through a (long) four-point roll to the right. Pick up a lot of airspeed, bring the model to straight and level, now:

- Roll to the RIGHT (with ailerons) to the 90° position, stop the roll, and add top LEFT rudder. Notice that both sticks go out away from each other (when you roll to the RIGHT top rudder is to the left).
- Roll RIGHT (with ailerons) to the 180° inverted position, stop the roll, add down elevator if necessary to keep the nose up.
- Roll RIGHT (with ailerons) to 270° (stop the roll) and add top RIGHT rudder. Now the aileron and rudder sticks both push to the RIGHT in the same direction as your roll.
- Roll RIGHT (with ailerons) 90° back to level flight.

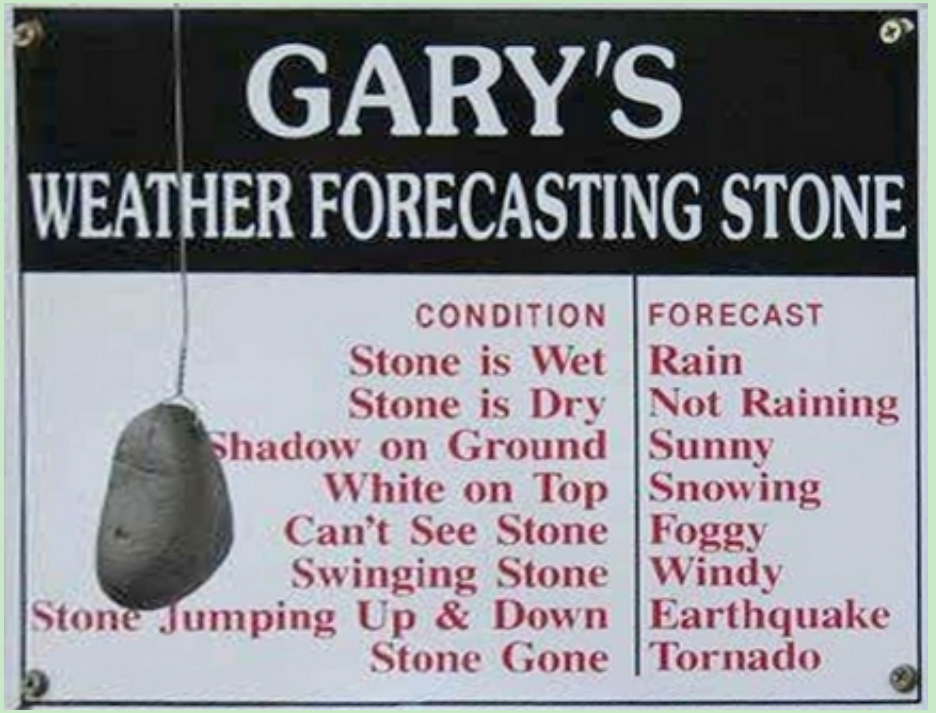
What is Top Rudder?

By now I am quite certain that you have figured out what TOP RUDDER is, but just in case it's unclear to you, let me explain.

When the airplane is flying sideways on, the rudder is in the horizontal position and it can act like an elevator to some extent. Adding rudder in such a way as to bring the tail down, will help keep the nose up. [The rudder goes to the top] Some of you have seen powered aerobatic stunt airplanes perform top rudder at air shows quite low to the ground The airplane literally flies straight and level but sideways on, held off the ground by the powerful (top) rudder. [In the UK we call this knife edge].

Now, run through the 4-point slow hesitation roll once again while holding your transmitter. [Or use a simulator – ed] And then it's off to the flying field, or better yet the slope, to try this out for real. It's really only a question of learning where and when to add (top) rudder, ailerons and (down) elevator.

Cartoon (sort of)



Caption competition

It was too good to waste, so the fly fishing also becomes this month’s caption competition. Entries to me please.

My first try: ‘Latest model airbag demonstration.’
You can do much better.

Poem of the month

I felt it was time to get poetic about the endless foul windy weather. This is the abridged King’s speech from that frivolous entertainment King Lear. Sound familiar?

Act 3 scene 2

Scene: the Blasted Heath (OK that name was from the other light-hearted comedy Macbeth - sorry - Scottish Play.)

Blow, winds, and crack your cheeks! rage! blow!
You cataracts and hurricanoes, spout
Till you have drench'd our steeples, drown'd the cocks!
You sulphurous and thought-executing fires,
Vaunt-couriers to oak-cleaving thunderbolts,
Singe my white head! And thou, all-shaking thunder,
Smite flat the thick rotundity o' the world!
I tax not you, you elements, with unkindness;
I never gave you kingdom, call'd you children,
You owe me no subscription: then let fall
Your horrible pleasure: here I stand, your slave,
A poor, infirm, weak, and despised old man

[The last line breaks rule 15 of the Aerominati]

And all his mates could suggest was to go indoors.
Fool: “He that has a house to put's head in has a good head-piece.” (see Aerominati rules 7 and 8)

Sources: SLEC

If, like me, you like to build from scratch sometimes, one problem is getting balsa and other woods of the correct weight and grain. For people who live in or near Norfolk the answer lies in the Watton company SLEC. The name comes from its origins as Sun Lane Engineering Company, set up in the 1970's by John and Kath Roper from their model shop in Sun Lane, Gravesend. The company has a tent at all the major model flying shows.

There is a small retail area (white topped building), but to choose balsa, ply, spruce and other hardwoods you go next door to the milling room (farther building) where they produce the sheets and other shapes from raw materials. Up the stairs, above the machining area, there is a huge selection of wood and you are certain to find what you want. It's useful to take a mini balance so you can match sheet weights. If you need a special size of hardwood they will cut it for you.

On one visit I enquired about the parts cutting service. For a reasonable price they will draw up the parts and laser cut any number from selected balsa or ply. I will use this service for the ribs if I build another F1a glider. Prices generally are extremely good and the staff are very knowledgeable, friendly and helpful. SLEC is also good for hardware. They make or retail all kinds of plastic and metal things of excellent quality that always seem to be how you would design them yourself.

As you enter Watton from Norwich watch out for a sign for Jewson. Turn left and you enter a small industrial estate. Turn third left and you will find SLEC at the end on the left, where you can usually park.
Units 8 - 10, Norwich Road Industrial Estate, Watton, Norfolk IP25 6DR
01953 885279
sales@slecuk.com

Entrance from main road

Both pictures from Google Earth Streetview with thanks

To get an idea of the range of things they sell click:
http://www.slecuk.com/

I make no money out of these source suggestions. They are not advertisements, just sources that I have found good. If you have any to recommend please let me know.

Sales

Please contact the owners direct. This is only for information.

Hangar9 Funtana X.

Fitted DLE20cc engine and servos. It could do with a tidy up and I have broken the fin in the shed. Hence the price £120 ono. Gotta be good at that for the engine alone.

Contact: James Leeks on 07961 719578

Rx LiPo battery packs

Maverick Power 1500mAh 7.4V brand new
Flight Power 800mAh 7.4V brand new.
One other Maverick Power but unsure of condition.
All for £5.00 - What a bargain!

Contact: Paul McLeod on 01263 722489

Don’t forget to check the General Sales page on the website as there are some more items there.