Airscrew

Facts, opinions, pictures and fun

November 2020

https://northreppsmfc.com/

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Chairmans Chatter

Another month gone by and we are hurtling towards the end of a very weird year. Despite this we managed, with thanks to Peter, to get the competitions in for the year, albeit with reduced rounds and assorted date shuffles.The final results have been posted on the website. [And appear below - Ed]

The Covid-19 track & trace that we have, i.e. our booking in and out book and the NHS App registration seems to be working well and visitors have approved of and used it to good effect. Remember it is down to us to show and advise visitors what we require of them and to sign them in/out when they come to see us otherwise we cannot continue to fly under the current Covid regulations.

In the last couple of weeks we have concentrated on installing mains electric to our end of the field. This will never be a system capable of heavy load useage due to the length of cable we have had to install (260m), but this was never the intended idea behind it. We owe a big thank you to Mike Whiting here as he came along with his digger to do the main graft and as a bonus he also brought his Whacker along, no calm down Ethel, (That's one for the older members ;)) and at the same time we have dropped 3 tonnes of hard core along the drive as a temporary repair to the pot-hole problem we have. Once the electrical installation is completed, with thanks to Kevin for all his work and assistance to help us get it all sorted we will link into the Airfield network. This will enable a Wi-Fi Internet connection from our end of the field with a more localised CCTV camera. This will give us the facility to see who is flying which I hope to be able to use on the website as it will be a good advertising platform. It will also help to improve the general security of the Airfield. As an aside it will also cover us if the hairbrained schemes of the CAA/Government reach fruition and we require an Internet link for conspicuity. We will also connect the mains to our outside storage box which will then give us the facility to charge larger model batteries. The existing solar panel system will remain in use.

Please don't forget the online meetings we have booked using Skype. If you cannot get to the field or are concerned because of Covid, there are still the meetings to help you keep in touch. They are listed on the Events page of the website and start around 8pm. They are light-hearted general chat with a laugh and joke here and there. All you have to do is make sure you have Skype on your machine and ensure it is the latest version before logging in. We have made it as simple as possible to join a meeting, go to the members area of the website and in the bottom left corner of the opening page you will see 'Skype Meeting'. Click on this and it should take you to the meeting.

A gentle reminder please, as the ground is starting to get a bit on the wetter side it is important please that you stay on the driveway to the very end, no early excursions onto the grass please, and ensure the ground will support your vehicles before driving onto the grass parking area. If you get stuck you will be expected to make good any ground damage caused. Our main rule - Common sense?

Finally, the airfield gate. A lot of you have not been to the field for some time. If you turn up and cannot recall the gate code and forgot to check before you set out you can phone me on my mobile and I can let you in. Please use my mobile number as opposed to bothering others from the Airfield. My number will be added to the website by the time you read this. Thank you.

We have all worked hard to bring the Club a little closer to the 21st Century, we hope you all approve.

Model of the month: Steen Super Skybolt

On 21 September Brian brought to the field one of the most beautiful models around. Its a Seagull Models Skybolt. It is powered by a three cylinder Saito engine. Surprisingly the model proved to be underpowered but it flew, and looked superb in the air. Brian says he is going to experiment with different props to see if he can extract more thrust from the Saito.

Bob's Tales: India Nine Nine for the Met

By the mid seventies Woomera began to wind down and our contract was finished and the aircraft sold off. I believe my beloved DC3 went to the the East and was eventually scrapped. I was told by an Aussie pilot that I met back in England that it ended up as Café Diner beside the road up north on the road to Darwin. I really wanted to stay in Australia but the airlines only wanted young lads under twenty-six years old to train as F/Os and I was too old. They were not offering positions for Captains and the only other job at the time was flying Bell47s in Timor and New Guinea, six weeks away and two weeks home.

So it was pack up and back to Blighty, to see what was available in the UK. I'd heard there were jobs available, particularly for helicopter pilots at that time. Eventually I got a job with Helicopter Hire at Southend where we went back to. They had a police contract to fly an Enstrom single piston engine helicopter over London for about five hours a day, five days a week. The Metropolitan Police were looking at getting their own helicopters but for the first couple of years they hired a helicopter and a pilot to do the job they anticipated doing when they got their own.

I wasn't actually in the Police Force but under contract to them. That found me flying over London, based at Elstree Aerodrome in north London. I had police officers who had been trained to act as Observers,who maintained radio contact with Information Room at Scotland Yard with a VERY large valve set weighing a ton, and with a big heavy policeman I struggled to get airborne sometimes. Taking off at about nine in the morning and flying for a couple of hours, landing at Battersea heliport on the Thames, refuelling and a cup of coffee and up again till lunch-time, then back to Elstree for lunch. In the afternoon doing much the same.

We would patrol and listen out for calls to crimes being carried out in the Met area. We were basically there to cover building society robberies, which were quite prevalent at that time. The object was for us to get there as quickly as possible, probably before any police car, and follow the get-away car to the change over point. Invariably these people would use a stolen car, do the bank or building society job, drive maybe as little as three or four hundred yards then change vehicles. By abandoning that vehicle and probably running through a narrow alleyway that the police car that

might be following couldn't get through. At the end of that alleyway there'd be another car which they would then dash off in and the police on the ground wouldn't know about. The idea was that the helicopter would spot the change over.

We had a couple which were quite successful during that year that I did it. The rest of the time we were free to respond to anything that we thought the helicopter would be useful at. Of course we took just about anything that was going. We would listen out on the radio and I was also monitoring the police frequency as well as air traffic. I had to maintain contact with London as we had to go into the London Control Zone on some of the calls. Suspects on premises were the favourite ones. We didn't have any cameras or infrared or any of that junk that they carry now that you see on the TV.

We had the call sign of India Nine Nine which you'll notice on watching any of those programmes. The call sign is always India Nine Nine. They kept that, but the helicopters are now twin engine. They are full of gizmos, electronics, cameras and infrared and so on and they tend to stay up a thousand feet and just use the cameras. We used to go down to about two hundred feet and we had to eyeball everything. We didn't have any assistance in that way. It was case of going down low level. We had a dispensation to go below five hundred feet, even below fifteen hundred feet over a built-up area. It was at the discretion of the pilot to do it in as safe a way as possible. We navigated over London using the A to Z Street Map book. We got very good at finding individual houses when called to suspected housebreaking in progress.

As the police cars were called to the front of the house we would invariably catch the guys coming out of the back of the house, and then direct the police to where the suspects were trying to escape. However, we always wanted to join in and we would actually go down and chase these people. Meanwhile the observer would give the police cars a running commentary as to where the suspects were and I'd be chasing them. On one occasion I remember going across – it was either a small playground or tennis courts which was surrounded by this high wire fence. Three of the suspects were very agile people. They just vaulted over this fence but the fourth one couldn't make it and I just hovered in front of him and he just stood against the fence waiting for the police officers to come and arrest him. We just hovered in front of him. He didn't even attempt to get away. The Observer saw the other three run into a nearby tower block so we keep circling the block to keep them contained inside. They were also arrested.

We also on occasion, were asked to carry out observation of vehicles. We would pick up a vehicle and let the police pull back, using civilian cars and motorbikes, so they weren't aware they were being followed. We would stay fairly high at about eight hundred feet and follow the car, or truck normally with contraband on, all the way through the city wherever they went. If they went to the Kent side of the Thames they went through the Dartford Tunnel. We would watch them go into the tunnel and come out the other side and track them to wherever they were going.

One particular day we followed a truck the whole day. We picked him up originally at the Watford Services on the M1 and followed him all round the city. Then he went through the Dartford Tunnel. Then back again. We had to go and refuel so the police Q cars and motorcycles would then close up and follow him keeping at a discreet distance. We would return from refuelling and take over again. They liked it because we could follow right through busy areas and not be detected by the drivers This particular job kept us going until seven o'clock at night and he ended up on the Isle of Dogs, which hadn't then been converted into the City Airport. It was

just warehouses and factories. I can remember they went into a warehouse to unload.

That's when we called in the ground CID. They went and raided the place. One chap got away over the wall and we actually chased him with the helicopter just a few feet above him all the way along the towpath that goes round that big loop that you see at the start of East Enders which comes on with that big loop in the river. We chased him along there until he gave up because he knew he couldn't get away from us. We hovered just over the top of him until he was arrested.

This all took place in 1976 when we had record temperatures for most of the summer. My memory is not so good but I believe this was the first year that the Notting Hill Carnival was staged. I was having a Sunday rest day when I received a callout, late in afternoon to plck up a Police Inspector at Battersea Heliport. He told me that a riot was in progress in Notting Hill. We were soon airborne and over the police radio we heard shouting and screaming from the police officers and women officers in the police buses entering the area.

Within a few minutes I was circling low over the streets and could not believe I was in the UK. It was like Beirut!! The crowds had gone crazy. Cars had been overturned and set fire to. They were breaking the police bus windows,trying to tip them over and set fire to them. Over the police radio they were becoming more and more hysterical and in fear of their lives.

The Inspector called Scotland Yard on the radio and requested that the SPG (Special Patrol Group) be sent in to suppress the rioters and get the besieged officers to safety. The SPG were known for their tough approach and went in with truncheons and started cracking a few heads. Eventually it started to calm down and I was looking at our full state, so we withdrew from the scene. It was a very scary scenario but the next day papers played down the extent of the violence, no doubt due to political pressure and the desire for racial harmony and to prevent further unrest in that community.

On the lighter side,being the hottest summer on record, the helicopter crew got the opportunity, when things were quiet, to fly over the police section houses (accommodation for single officers) and spy on the off duty police women sunbathing topless on the flat roof! Every job has its perks.

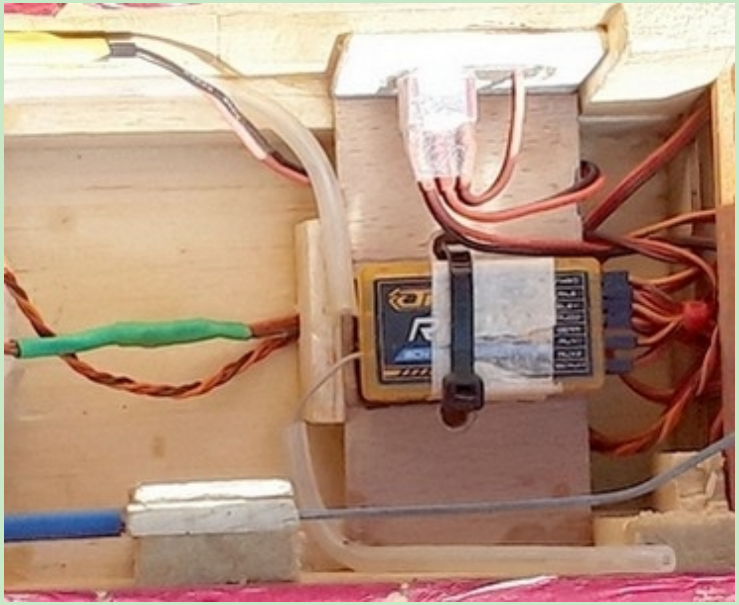
Refuelling the Enstrom at Battersea Heliport on the Thames.

Down among the weeds chasing the bad guys in the Enstrom police helicopter. Me in the lefthand seat.

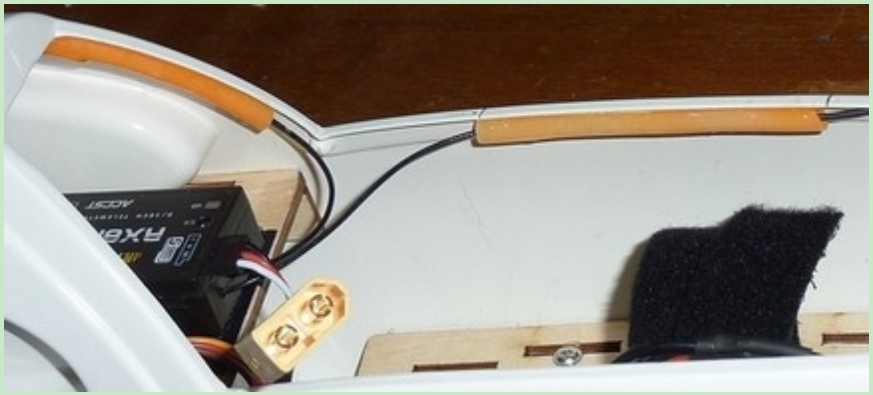
Genius number fourteen: **aerial tubes**

Ray came up with a neat idea for receivers with aerials that are wires. Some receivers, such as older FrSky ones, have more complicated circuit board aerials so this idea is not suitable for them.

To see how it works in Ray's model, look at the orange receiver in the picture below. Two grey wires come out of the left end. These are the aerials. Ray has glued two in pieces of fuel tube into which the wires can be pushed. This saves fixing them inside the fuselage and eases removal of the receiver. It's a very neat idea.



And here is an example of where I have used it in a model. This is an installation of a FrSky RX8R receiver in a Phoenix fuselage. This new, higher range receiver has wire aerials instead of the circuit boards. I'll be reviewing it at some point. You can see the orange tubes glued in with epoxy with the black aerial wires inserted. So thanks for the genius suggestion Ray.



Plug Place: Optimize Your Fuel System part one

Ray found an excellent website with advice on how to set up fuel systems for IC engines. It is a long and information-packed article so I have split it into two parts. Part two next month.

With thanks to Flyrc at https://www.flyrc.com/optimize-your-fuel-system-for-best-performance/

The author appears to have a passionate hatred for apostrophes so I have added them, for example, lets and dont. Thanks to Libre Office for find and replace. I'll set Lynne Truss onto him. I bet I have missed one or two.

Optimize Your Fuel System For Best Performance

Nitro Secrets You Must Know!

The fuel system is one of the most important parts of your airplane, but how much do you really know about it? Do you understand the theory behind how it works? Did you know that there are several different types of fuel system architectures and do you know which one is best for your specific application? The more you understand about this part of your airplane, the better off you'll be. We are going to look at the glow engine fuel system in detail. A lot of this may apply to gas powered models as well, but in all fairness they should be discussed separately. Alright, class is in session. There won't be a test until you get to the field next weekend!

FUEL SYSTEM REQUIREMENTS

What do you expect from your fuel system? In practical terms, the fuel system affects engine performance, so that's really what you're concerned about. You want the engine to start easily, idle smoothly and reliably without loading up and you expect it to run the same whether the airplane is upright, inverted, climbing or diving. Is this what you get out of all of your airplanes? I bet most of them run pretty well. But maybe a few, particularly those with large carburettors or inverted engines, might cause problems for you. This is because either the fuel system type is not correct for the particular application, or something was overlooked during the installation. Since we know what we want, let's find out the best way to get it.

FUEL TANK CONFIGURATIONS

Before we get buried in theory, let's look at some basics. There are essentially two types of fuel-system arrangements in use today. Either one of these may be used in a pumped or non-pumped environment. First let's look at the fuel tank itself. In RC models we normally use a rigid or semi-flexible fuel tank. The control-line guys use bladders, but we RCers don't. We will focus on the more common rigid and semi-flexible tanks in most RC models today. That being said, let's look at how the fuel tank is built and what determines the way it will operate in your model under different conditions.

CONVENTIONAL SYSTEM DESCRIPTION

Figure 1: This conventional 2-line pressurized system is used on most models. Note that a pressure line carries exhaust pressure from the muffler to the air pocket in the top of the tank. A pressure differential between that applied to the pressure line versus the feed line leading to the carburettor varies as the amount of fuel decreases and as the aircraft changes attitudes or goes inverted. The Uniflow system eliminates this variance.

The first type I'm sure everyone has seen. It's used on almost every ARF airplane and is shown in the instructions included with fuel tanks from nearly every supplier. I call it the conventional tank system. It usually has two lines: The feed or pickup line and the vent/overflow/pressure line. The feed line attaches to a weighted fuel pickup inside the tank called the clunk. This line connects to the carburettor inlet and feeds the engine with fuel. The clunk assures that the pickup is always submerged in fuel regardless of the airplanes attitude. The second line is a rigid piece of tubing (usually brass or aluminum) and it runs to the top of the tank (when the airplane is sitting upright). It attaches to the muffler pressure line or it may simply be left open, exposed to the atmosphere. As long as air may enter the vent line, fuel shall be allowed to flow out of the feed line. It is important to understand this principle, otherwise youll have a hard time understanding how the fuel system works. To fill the tank with fuel, you remove the feed line from the carburettor and pump fuel into the tank until it runs out of the overflow line. To empty the tank, you pump fuel out of the feed line. Air enters the tank through the vent line because it is exposed to the atmosphere. If it didn't, you wouldnt be able to pump the fuel out because youd start to create a vacuum in the tank.

There is also a variation of the conventional tank system known as a three-line system. In the conventional three-line system there are two clunks. One is used as a feed line, but the other is only used to drain and fill the tank. It does not affect the operation of the fuel system except during refueling operations, because it is not connected to anything in the fuel system. When would you need a three-line tank? How about with a fully cowled engine where you don't have access to the carburettor feed line? In this case, the third line would go to a plug. This allows you to fill and drain the tank by removing the plug and attaching your flight box fuel pump. This type of three-line tank works the same as the more common two-line system as far as the pressure inside the tank is concerned. So far so good. But wait, there's more.

UNIFLOW SYSTEM DESCRIPTION

The second type of fuel system is not very common in R/C airplanes. It's popular on 3D helicopters, but it was actually invented back in the early days of control-line modeling. It is called the Uniflow system. The Uniflow fuel tank always has three lines. It's actually assembled the same as the conventional three-line tank. So what makes it so special? It's not how it's built but rather how it's plumbed. It's a little more complicated than the

conventional system, but in some installations it works much better. Ill explain why later. For now, just make sure you understand how to attach all of the lines and what their purpose is. First you must attach one of the clunk lines to the carburettor. This is now the feed line.

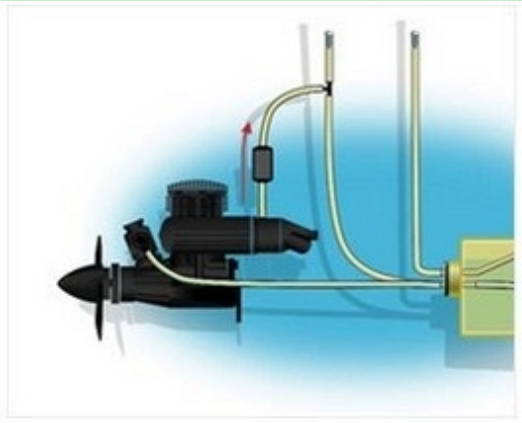


Figure 2: This is the Uniflow 3-line pressurized system. Note the check valve above the muffler. It permits pressurized gas to flow in only one directioninto the fuel tank. Note that the pressure line carrying exhaust has a clunk that is next to the feed line clunk. Both clunks are in the same relative position with respect to the mass of fuel. This takes the pressure differential noted in the first illustration out of the equation.

The rigid line that goes to the top of the tank is no longer going to be a vent/pressure line. It will only be used during refueling as the overflow line. Since it goes to the top of the tank, it will let you know when the tank is full because fuel will run out. Once you're finished filling the tank, you need to plug this line. Very important! You can use a plug or a fuel dot.

Now what is the third line for? Well, what did we forget? That's right, the muffler pressure line. Here's where it gets complicated. You can of course just connect the line directly to the muffler. If the muffler or carburettor is easily accessible, that might work. Keep in mind you need to remove either the carburettor/ feed line or the muffler/pressure line to fill or drain the tank. I also like to install a check valve in the muffler line to improve the effectiveness of the muffler pressure and to eliminate the possibility of fuel entering the muffler under certain flight conditions.

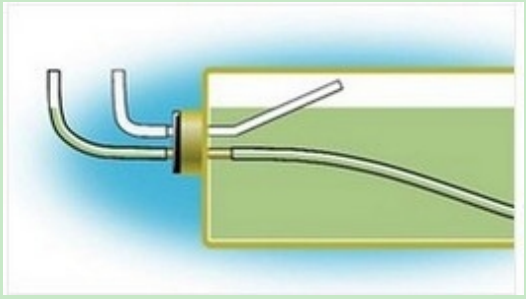


Figure 3: This conventional 2-line system is shown in a static condition with the pressure line disconnected (making it a vent line) and the engine off. There is atmospheric pressure on both the vent line and the fueling line, but the mass of fuel has overcome that to rise to it's own level in the feed line.

CONVENTIONAL TANK THEORY

Even though the conventional tank setup is one of the most widely used, I find that most people don't fully understand how it works. When you understand how it works, you will also understand why it doesn't work the way you expect it to sometimes. Remember, you can build a conventional tank setup with either a two-line or a three-line fuel tank. The plumbing is what determines how the system behaves. Since a picture is worth a thousand words, please look at the illustrations while you try to make sense of my explanation.
First, let's take a look at whats going on inside the tank when the engine isn't running. There appears to be no pressure in the tank at this point, but actually there is. First, there is always

atmospheric pressure present at any point in the system. I shouldn't need to remind you that the fuel in the tank is a liquid. Try to remember that in any liquid, the pressure at any point in the system is equal to the pressure at any other point in the system at the same level. The level is important because the mass of the fuel affects the pressure in the feed line or, more importantly, the pressure seen at the carburettor inlet.

Since atmospheric pressure is everywhere (on the vent line and at the carburettor inlet) it basically cancels itself out of the pressure equation at this point. OK, take a minute to think about this and look at the illustrations. Now for the extra credit question: How do we determine exactly what that pressure is? Just keep in mind that at any point in the system that is lower than the fuel level, there is enough pressure to push the fuel up to the highest level even when no additional pressure is applied to the system. It's easy to see how installing a motor where the carburettor inlet is lower than the fuel level could cause problems now isn't it? Because of this, most model airplanes are usually designed so the tank is positioned where the fuel level will be below the carburettor fuel inlet. This is good. When the engine isn't running, no fuel will flow into the carburettor because it doesn't have enough of this unseen pressure to allow it to do so. It only has enough pressure to reach the same level as the fuel in the tank (which is lower than the carburettor fuel inlet).

PRESSURE DIFFERENTIAL

But wait, this is no good. How will the engine run if the fuel doesn't get into the carburettor? What can we do? Well, in order to make the fuel flow, we need to create a pressure differential. A pressure differential is achieved when two points in the system have different amounts of pressure. Sounds like an easy concept to understand, but how do we create something like that in the fuel system. That's easy. Flip the prop with the carburettor just above idle speed. This creates a vacuum at the carburettor inlet (needle valve). A vacuum may be defined (in our case) as any pressure less than atmospheric pressure. Since pressure is always seeking a happy state of equilibrium, fuel will flow into the carburettor because the pressure in the tank is higher than the pressure at the carburettor. The engine will run.

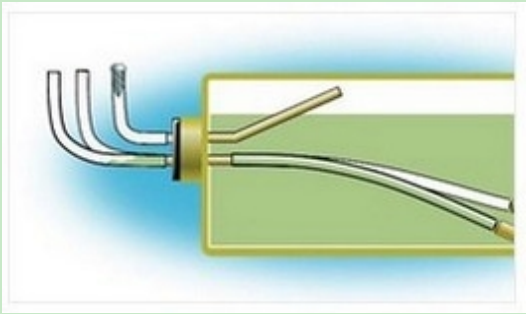


Figure 4: This is a Uniflow 3-line system with a plugged vent line and equal pressures at the clunks at the end of the pressure and feed lines. For this reason, the fuel does not seek it's own level in the feed line and pressure must be applied to the tank via the pressure line to deliver fuel to the carb.

So why do we need to pressurize the tank with muffler pressure anyway? The correct answer is we don't. If the carburettor creates a substantial amount of vacuum at its inlet, there will be enough differential pressure to allow the fuel to flow toward the carburettor even if it is higher than the fuel level in the tank. Some people say the engine sucks the fuel out of the tank. While this may be their way of understanding it, in scientific terms it is not correct. In science, everything blows, nothing sucks.

Now, when you apply muffler pressure to the vent/pressure line, the muffler pressure helps create a higher pressure differential than what can be achieved by venting the tank to the

atmosphere and relying on the carburettor vacuum alone. This is especially important when the airplane is in a vertical climb and the tank is much lower than the carburettor. As we should remember, the mass of the fuel affects the potential of the fuel to flow out of the tank. When the tank is much lower than the carburettor inlet, the mass of the fuel actually reduces the pressure seen at the carburettor and this makes it much harder for the fuel to leave the tank. that's why we use muffler pressure. This creates a large enough pressure differential to allow fuel to reach the carburettor inlet regardless of the airplanes attitude.

To prove this, start the motor, set the needle valve slightly rich, then hold the nose of the airplane up. I bet the motor leaned out slightly didn't it? Try it again with the muffler pressure line disconnected from the tank (temporarily plug the pressure tap on the muffler). You'll need to reset your needle valve to allow for the lower pressure differential caused by removing the muffler pressure source. The motor should lean out quite a bit when you raise the nose of the airplane now.

So this all works well enough to supply the engine with fuel under all conditions. What could cause problems? Remember, even when the engine was not running, fuel tried to leave the tank. The only thing that stopped it was the fact that the pressure differential wasn't high enough to push it uphill into the carburettor. Now imagine if the carburettor was lower than the level of fuel in the tank. Fuel would run out of the tank until the level of fuel in the tank is at the same height as the carburettor.

This is the dreaded siphon effect that plagues inverted motor installations. Anyone who has siphoned gas out of an automobile has seen this firsthand. The only way to stop it with a conventional tank setup is to install the tank lower in the airplane or pinch off one of the fuel lines when the engine isn't running. Yes, you can pinch the vent line and it will stop the fuel from flowing. If air can't get into the tank, fuel can't get out.

FUEL MASS

The other thing that happens is not so obvious. Since the mass of the fuel affects the pressure in the feed line, what happens as the fuel level in the tank gets lower during flight? Obviously this affects the pressure seen at the carburettor inlet it decreases as the mass of fuel decreases. Just like your eardrums feel being underwater at the bottom of a shallow pool compared to a deep pool. This is why you set your high-speed needle valve a little bit on the rich side, yet still end up landing the plane with a slightly lean condition.
Why does the motor start to slowly lean out? Sure, the prop unloads, but that happens quickly. The amount of fuel in the tank significantly affects the fuel mixture. Under severe conditions, the engine may actually run so lean that it quits. This usually happens on final approach. How many unexplained dead-stick landings have you seen? Science is wonderful.

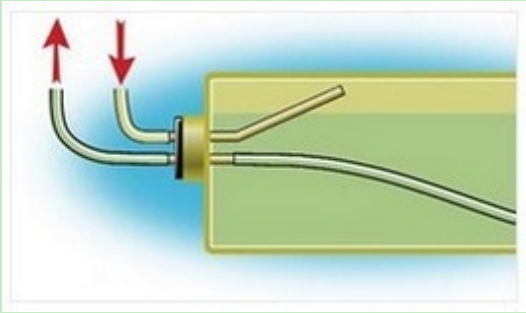


Figure 5: Air pressure greater than one atmosphere enters this conventional 2-line system via the pressure line to push fuel up the feed line into the carburettor.

Part two next month

Christmas present ideas part one

Bixler 1.1 V2
Some new 3S 2200 mAh lipos
Set of allen keys (your old ones will now be worn out)

BMFA A certificate

I had a very useful session with Ray the other day. I did a trial A and Ray told me the things that I was doing wrong. One in particular was that the circles on the figure eight were not the same size and also not big enough. I explained that I felt awkward getting close to main runway, so we have decided that for the test only we will move the pilot box north up the runway. The crossover point can then give more room for the southerly circle. Do have a chat with Ray if you thinking of doing the A. Don't forget that the BMFA has an excellent video on the A test on its website. https://achievements.bmfa.uk/videos

Radio Control Soaring Digest (RCSD) archive

You will have read many articles in the newsletter from RCSD with permission from Bill and Bunny (bsquared). They also have an excellent archive at https://www.rcsoaringdigest.com/

Techie corner: The decibel scale

Essential equipment: A bag full of ice cubes to go on your head.
Risk assessment: Move away from any surface that you might want to bang your head on.

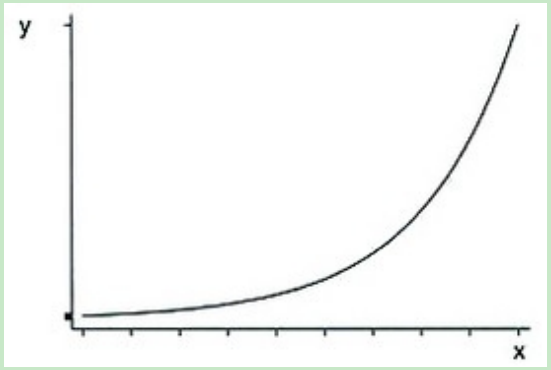
The decibel scale is much misunderstood. It is used in a variety of circumstances involving power. Amongst those relevant to us are transmitter power and engine noise. There are two topics that I have always found difficult to explain simply. The first is how jpeg image compression works (Fourier analysis) and the second is the decibel scale. Oh yes, I forgot. How the Wimshurst Machine works.

Belt up, and up we go! Oh, that's rather good, isn't it? Belt up.

Bels

In fact the scale is the bel, which is divided into ten decibels. It is so-called in honour of Alexander Graham Bell. It is a numeric scale but it doesn't usually have a zero value. It compares one value with another. It is a ratio so does not have a unit like watt or volt.

An electrical power example might make it clearer. We all know what a watt is. One watt is one watt. Always. Except perhaps on social media or twatter. However suppose we want to compare two different powers, say 1 W and 10 W. On the bel scale the 10 W is 1 bel larger than the 1 W. If we compare 1 W and 100 W these are 2 bel different. Each time you up by one bel you increase the power ten times. 1 W and 1000 W is 3 bel and so on. The number of bels is the number of zeroes after the 1. This is called a logarithmic scale (also called 'exponential') and looks something like the diagram below. It is non-linear, meaning not a straight line. The same curve describes how covid-19 increases if R is greater than one. It's another abused word as people have taken to using 'exponential' to mean 'very rapid' rather than just an increasing rate which might well be slow to rise (like compound interest on savings at present).



If the second quantity is less that the first then the number of bels is negative. For example if the first is 10 W and the second is 1 W you get -1 bel.

Decibels

The bel is divided into ten parts called decibels (dB). Power ratios are usually given in decibels rather than bels.

This table shows how it works:

Power	dB	(in bels)
1	0	0
10	10	1
100	20	2
1000	30	3
10000	40	4
100000	50	5
1000000	60	6
etc		

To make things worse the decibel jumps are not equal in size either. They are logarithmic too. A dB at the high end of the bel will be a bigger increase than one at the bottom. Here are some approximate values:

dB	Ratio
0	1 (same value)
1	1.3
2	1.6
3	2
4	2.5
5	3.2
6	4
7	5
8	6.3
9	8
10	10

Sometimes we pretend that one quantity is not being compared with another. We talk about 30 dB of electrical power or 82 dB of sound power as though it is a real value. In fact we are comparing the measured quantity with a zero that we have made up - an arbitrary zero. In reality there is a true zero an all scales. For sound it would be when all air molecules have stopped moving. That, of course, is absolute zero (-273 ºC). However this is such a low temperature that it is impracticable, as your ears would crumble and drop off. Electric power is easier as it would simply be zero current.

Another bag of ice needed (you can skip this and jump to practical examples)

And now the final complication. If we are using the dB scale for electricity or sound we need to look at what causes the power. In electricity it is the voltage or current and in sound it is the size (intensity or amplitude) of the vibration. In both cases power goes

up with the square of these. I guess the reason for the square relationship with sound is that the vibration amplitude moves a two-dimensional area.

Using electricity as the example, power = V^2 / R

This means that if we take the ratio of the voltages, the power ratio will be the square of the voltage ratio and so the dB will be doubled. Thus a 3 dB voltage rise will give a 6 dB power rise.

Two practical examples of power dB ratios

Engine noise

This is measured on the dB(A) scale, at least it is for BMFA purposes. Most sound meters use that scale too. It is even more complicated than simple(!) decibels as it measures the sound in a way that roughly equates to our hearing. It gives more weight to the frequencies between 2 and 4 kHz that our ears are most sensitive to and hence damaged by. The invented zero on this scale is 2×10^{-5} pascal or twenty micropascal where one pascal is one newton per square metre. The specified 82 dB for acceptable engine noise is a little over a hundred million times more than the zero, or 2×10^{3} Pascal. You could work out what the actual force on an eardrum will be from the pressure times the area of the drum. No?

OK I give in. Abandon all hope, ye who enter here! Decibels are the tenth level of hell. Sorry Dante.

I'll put on my ice pack and calculate it. Force is pressure times area. The ear drum is about 5×10^{-5} square metres. Taking the 2×10^{3} pascal value for 80 dB pressure this gives a force of 10×10^{-2} or 10^{-1} newton. One newton is about the weight of an apple. So this is the weight of a tenth of an apple, roughly the core. That's more than I expected. And all bashing your eardrum. And no I won't do it in Roman imperial units, though you are welcome to. I can lend you a Roman wax tablet and scriber to do your working on and will mark it QED when finished successfully.

Transmitter power and range check

When we do a range check on 2.4 GHz we divide the radiated power by about 30. This lies between -1 bel and -2 bel (10 times and 100 times less). Unsurprisingly it turns out out to be about -14.8 dB. It is minus because the full power value is more than the reduced range check value. A useful decibel calculator can be found on https://net-comber.com/decibel.html though there are many others.

Damage to hearing from engines

When it comes to damaging levels of sound, the magic number is 85 dBA. Researchers agree that extended or repeated exposure to sounds of 85 decibels or above can cause permanent hearing loss or other damage. Many musicians, including acoustic orchestral players, suffer severe hearing loss due to the sound levels in live concerts. At heavy metal or reggae concerts some people like to sit almost inside the bass speakers. Some suffer bleeding from their ears.

Three main factors influence the severity of hearing damage:

- Sound level (how loud the sound is)
- Proximity (how close you are to the sound)
- Time (how long you are exposed to it)

The louder the sound, the less time it takes for the damage to take place. You now know that for every 10 decibels, the power of the sound goes up 10 times. At 85 decibels, the maximum

recommended exposure time is 8 hours. But by 100 decibels, the exposure limit drops to 15 minutes, and at 10 decibels more (110 dB), the exposure time plummets to just one minute. Exposure to such sounds any longer than that could result in permanent hearing loss or tinnitus. [Part of the damage section was from: https://www.miracle-ear.com/blog-news/what-is-loud-decibel-chart]

And that is also why technicians who are working on un-silenced Formula 1 engines, or who are near to jet engines, always wear ear protection.

Adding decibels

If you had a 70 dB sound and a 60 dB sound, what is the power of the two combined? It isn't 70 + 60. On the web there are calculators such http://www.muzique.com/schem/deci.htm. Using that I found that the combined sound power is 70.4 dB. Rather surprising but true it seems.

Caravan project

Dave has already, on his page, given his thanks to Kevin and the others who have helped us out in the project. On October 19th Mike Whiting, Dave Wilcox and I set about running the cable along the hedge and across the road to the air traffic control hut. The worst part was pulling the cable through the hawthorn and briar hedge. We were on hands and knees plunging into the hedge so got a load of arm lacerations. Mike did an excellent and skillful job with his digger, cutting and refilling the trench. By the time we can fly again the grass will have grown and the trench all but disappeared.

Finally we filled in the holes in the gravel road and flattened them with a whacker. So give a smooth and silent thanks when you drive along the newly flattened road.

Dave looking for his crock of gold

Mike digging the last metre to Air Traffic Control

The road crossing before whacking

Talking of crocks of gold reminded me about the Golden Turd. Do you remember the golden hare that had people buying a book then trying to dig up the valuable gold hare from the clues in the book? And then of course Pokémon. Recently a comedian suggested launching a rumour about a dog turd somewhere in the country with a camera trained on it. The first person to step on it gets a million pounds. So many wonderful images are conjured up by that. People stepping on dog turds all over the country and looking round to see if it's the right one.

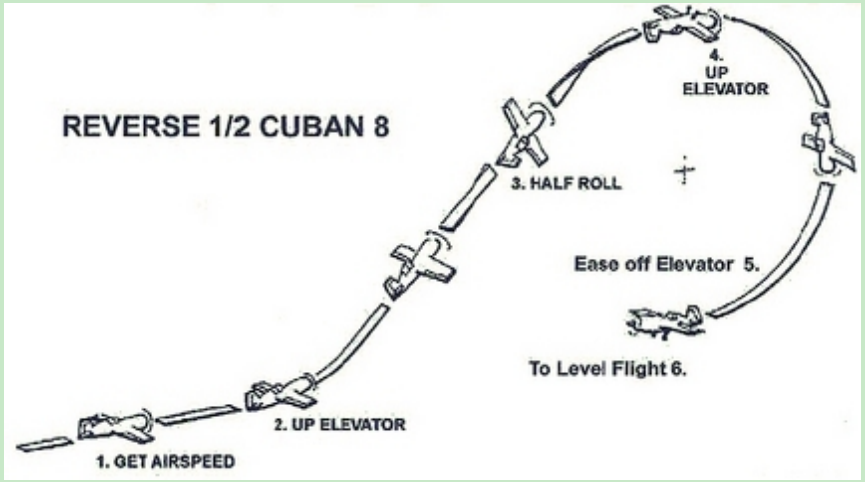
Manoeuvre of the month:The Reverse Half Cuban Eight

A turnaround maneuver RCSD March 1998

Remember my mentioning that many maneuvers are similar? Well, here is a perfect example. If you already know the Cuban 8, then this is certainly variations on the same theme.

The glider gains speed then "pulls up and executes, one eighth (1/8) of an inside loop to 45 degrees, hesitates, does a one-half (1/2) roll, hesitates, then performs a five-eighth (5/8) of an inside loop back to level flight in the opposite direction." (Printed by permission from the AMA rule book,)

As you've heard many times now, the whole secret is airspeed. Be sure to start this maneuver with enough *AIRSPEED* to carry the glider up and over the top. Once you start down, you're home free. When you start your 45 degree climb, hesitate and do the half roll to inverted. Be sure to keep your hesitations very brief, or you'll find yourself quickly running out of airspeed and won't be able to complete the Half Reverse Cuban gracefully.



Visual acuity

20 / 20 or Where Did That Airplane Go? by Jim Smith
RCSD December 1994

I have been considering writing an article on sailplane visibility for some time.

What is good vision, anyway? On the familiar Snellen eye chart, the one your doctor uses to check your eye sight, 20/ 20 vision equates to the ability to identify letters that fill a visual angle of 5 minutes (.08 degrees) of arc. Of course, your sailplane is not a letter of the alphabet. When it is ‘specked out’, you only have to see the speck. You don't have to be able to identify it as a ‘T’ shape (conventional airplane) or a ‘V’ shape (flying wing), you just have to see something.

A 1966 study by Lockheed says, in part, ‘The smallest image that can be perceived at the fovea (the spot on the retina where vision is most acute) ranges from 0.5 to 1.0 minutes of arc, with a mean value of 0.7 minutes of arc.’ That's roughly .01 degrees. However, the same study revealed that when the target moves as little as 20 degrees from straight ahead, the minimum detection angle rises to 10 minutes of angle. That's more than a ten fold increase.

In recent years, the National Transportation Safety Board (NTSO) [US] has come to the more reasonable conclusion that the probability of sighting other aircraft (in a potential airborne collision situation) is about 12 minutes *(2* degrees).

How does this relate to flying your model? Obviously, the wing's the thing. From our vantage point, the stabilizer and fuselage will disappear before the wing. So, let's consider the wing alone. A two meter wing will reach the 0.7 minute size at a distance of about 34,000 feet. But wait a second. We must consider the wing chord, not the span. A telephone line stretches for miles, but we can not see it beyond a certain distance because it has a very small ‘chord’.

Okay then, let us consider the 10 inch chord on that two meter plane. That dimension reaches the 0.7 minute size at 4200 feet. And don't forget that's straight ahead. If you look aside the 20 degrees noted above, you could lose sight of your plane at less than 300 feet. Of course, at that altitude it still appears quite large, and easy to find. At higher altitudes, as the airplane becomes smaller, it is much more difficult to re-acquire if you look away momentarily.

So at about 4000 feet, it is virtually impossible to see a model with a ten inch chord, unless you're Chuck Yeager, who states in his autobiography in reference to on coming Luftwaffe fighters, ‘Andy (Clarence L. ‘Bud’ Anderson) and I were the first to see them coming; at fifty miles or more…’

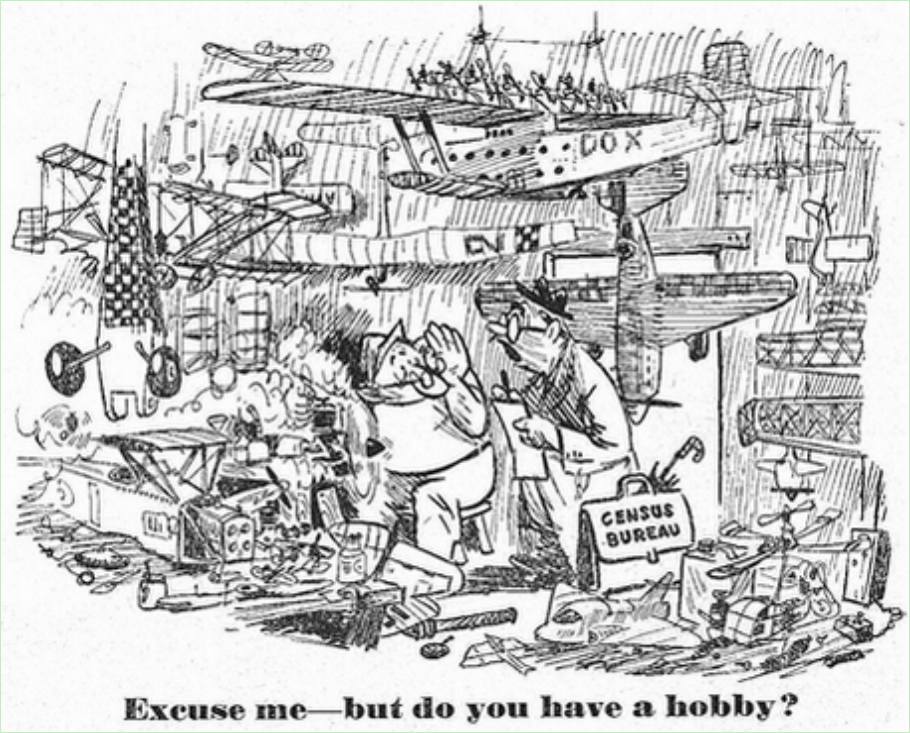
Referring back to the Snellen chart, have you ever had your eyes checked on a chart having colored letters? Certainly not. Because maximum contrast gives the best results. The same holds for sailplanes. Colors may have some relevance for power flyers, who operate up close to their planes, but glider guiders need contrast. Give me black wing bottoms every time. You can't get more contrast with clouds or bright sky than you can with black. Since I've been flying with ‘blue blocker’ sunglasses, I use dark blue under surfaces which look black through the orange lenses.

Paint 'em or cover 'em as you wish on the top, but I think dark below is a must. This from a fellow who has had two brightly colored transparent covered two meter airplanes go ‘out-of- sight’.

[Ed: Not just me then. The above shows why, if you take your eyes off a completely visible model, you can't pick it up again when you look back. So bring your model close before you look around. Sad face about Bixler.]

Cartoon

Remind you of anything Dave?



Excuse me—but do you have a hobby?

Top tip: 12 V mains power supply

At the field, until Santa brings me a mains charger for plugging into the caravan, I use a 120 Ah leisure battery to recharge flight lipos. At home of course I always want to recharge using mains. Mains power supply units that produce high currents at 12 V are quite expensive if you buy from model suppliers. However you can make your own. This is one that I made years ago for a different project.

You need a two part case and a ready made power supply unit (PSU), both of which you can buy through eBay. There is a huge variety of PSUs. I chose one that had three 11 A outputs each of which is capable of driving a large lipo charger. I used standard 4 mm sockets, a 3 A fuse and a mains switch. That was one I had in stock but unfortunately it is ON in the illogical upper position that is used in the US. Not that it matters really but I have to be careful not to leave it on and waste energy. I suppose I should have fitted a light. The PSU must be in a case as the mains terminals are exposed and hence dangerous. The case must have ventilation slots as the PSU gets warm.
It is important to buy the PSU first and measure it.The wires must not be bent sharply when coming off the terminals so you need a box a fair bit longer than the dimensions given in the PSU description on eBay. As you see I could have done with another 10 mm.

To avoid the wires coming loose from the screw terminals I soldered on crimp terminals and used heat shrink to insulate.

Ventilated case

Crimp soldered and heat shrunk on mains neutral

Mains wires in position

PSU example
https://www.ebay.co.uk/itm/DC-12V-30A-AC-DC-Regulated-Switch-Power-Supply-for-LED-CCTV-PSU-Fast-Delivery/114315248377?hash=item1a9db842f9:g:Df0AAOSwKeBfFs5O
£13.50

Case
The case will depend on the size of the PSU but should not cost more than about £15.00.

Rest of the bits
The other bits (switch, sockets, fuseholder, light, grommet, feet) should be less than a fiver and you will probably already have the wire.

Covid news

All we can do is keep our fingers crossed that North Norfolk will remain ‘medium’ or tier one. Cases in North Norfolk are rising but we are still low in comparison with the whole UK. Anyway a medium should be able to tell us in advance. Strange that they never win the lottery.

Competition corner

The competitions for the year are now over. Here are final results. Many congratulations to those who gained a place and thanks to all who took part with such a great spirit of fun. The accuracy in the last Spot Landing was remarkable. Best yet.

Climb and Glide

Mike Whiting	170
Dave Wilcox	110
Mark Jordan	90

Climb and Glide Handicap (for the greatest improvers)

Dave Fines	37
Keith Eldred	36
Mark Jordan	29

Spot Landing

Mark Jordan	115
Mike Whiting	65
Doug Stone	30

The first session of 2021 will be Climb and Glide on Sunday January 3rd at 11:00.

Jokes of the month

Comedian Sindhu Vee's mother about visitors: 'People should cry when you leave, not when you arrive.'

Ken Dodd, when asked about re-incarnation, said: 'I can't see the point in coming back as a tin of milk.'

And one I missed out on. I had to take my cat to the vet. On the door it said, 'We will take your temperature at the door.' I had planned to say, 'Do I have to bend over.' And I forgot!

Back numbers of the newsletter

For club members these are available on the club website. Non-members need to go to my website at peterscott.website/flying.

Sources: very fine pins and boots

Pins

I also make extremely light models to fly indoors at the Insiders at Stalham Sports Centre. It means using strips of balsa 1 mm square or less and mylar film down to 0.5 micron. Yes, that's half a thousandth of a millimetre.

Pinning such models down on a board is difficult. In the last BMFA News Mike Woodhouse, the BMFA free flight head honcho, mentioned that you can get very fine pins that are used to pin down biological specimens like flies, beetles and butterflies. Dead of course, unless you are Tom Lehrer (see below). https://www.freeflightsupplies.co.uk/

So I took a look on eBay and sure enough the pins are available in sizes from 00 to 5, which are 0.27 to 0.71 mm. You can buy a hundred for about £4. https://www.ebay.co.uk/itm/100Pcs-Insect-Pins-Specimen-Needle-Stainless-Steel-for-Scol-Lab-Entomology-FOYB/193545919524?ssPageName=STRK%3AMEBIDX%3AIT&var=493770458996&_trksid=p2057872.m2749.l2649. You might find another use for them. Acupuncture? Dolls house kebab skewer? N-gauge railway fence post?

Boots

You'll need to act quickly on this one. After my spooky experience with the boot bat, I took an honest look at the boots. The bat was in better condition than the boots. So I was delighted to find some boots in Lidl and in my size. Only £14.99. The colour even goes well with my shorts, though perhaps not style (what do I care?), though you can get black as well.

While you are at Lidl take a look in the hardware section. For very little money (can't remember how much) they are selling boxes of loads of crocodile clips with insulating sleeves. They are the kind that can be pushed onto 4 mm banana plugs to make clip leads.

Tom Lehrer

Tom's songs were a major influence on my sense of humour back in the nineteen-fifties and -sixties. He loved to quote a reviewer in the New York Times who said, 'Mr Lehrer's muse is not constrained by such considerations as taste.' The good news is that he has put the lyrics and sheet music on the internet. For the next four years they can be downloaded free (not 'for free' – yuk!).
https://tomlehrersongs.com/

Songs I like best? Too many to mention, but 'We Will All Go Together When We Go' is a grim reminder of the impending fireballs of the 50's and 60's. 'Poisoning Pigeons In The Park' was what I had in mind above, 'We murdered them all amid laughter and merriment. Except for the ones we took home to experiment.' Vatican Rag, Lobachevsky, I Wanna Go Back to Dixie (KKK being described as Dixie Pixies), New Math, National Brotherhood Week, Oedipus Rex, Wernher von Braun are especially good, but I could go on.

Reading the words is nothing like as good as listening to his dulcet baritone and clever piano playing. If you find that you like his humour I suggest you listen to his albums. On some he introduces the songs with a narrative that is as funny as the songs. If you have never heard him do try. There was not a dry seat in the house at his shows. Start with 'We Will All…' If Rocket Man really gets his

fiery toys working we might have to start worrying about that again. ‘Sing out a te deum, when you see that ICBM...’

Sales

Silent auction

This time we have a used airworthy Seagull Arising Star high wing trainer. This has been donated to the club by an ex-member. It is complete with servos, flight pack, tank and is fitted with an SC46 IC 2 stroke engine. So all you need is to add a Rx, charge the flight pack and take to the air. There is a reserve on this model. All proceeds go into Club funds.
We shall start the bidding at: £30 Email Dave Wilcox with your bids.

If anyone would like to offer £100 as a buy it now we will consider the Auction closed. BIDS CLOSE MIDNIGHT 5th NOVEMBER 2020

Ed: There are other items on the General Sales page on the club website.

Lights out!

I am cheating this month. There has to be a benefit from editing this newsletter. I have just changed the four wall lights in my living room and I now offer the original ones for sale here.

Square glass wall lights

They work perfectly and take the compact fluorescent bulbs with the square bases. These can’t be dimmed and I wanted some that could, which is why they had to go. They are bright, the four being enough to light a room 7 x 4.5 metres. Each has a pull cord to switch off individual lights. The fronts are curved frosted glass 280 mm high x 230 mm wide and they are undamaged. I bought them from the Lighting Centre in Longwater, Norwich. I think they were about £30 each but I am only asking £10 each. I’ll bring one to the field if you want to take a look.