Airscrew

Facts, opinions, pictures and fun

July 2020

https://northreppsmfc.com/

To contact me, or to join the newsletter mailing list, send an email to peter@northreppsmfc.com

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Chairman’s chat

Hi all, a bit of a turbulent month overall I am sure you will agree. As we come out of lockdown we are still getting enquiries for new memberships which has to be a good sign, the full size boys and girls have been let out to play so we have a steady build up of airfield life again, but it is not yet all sunshine and roses, we all need to continue to be careful and keep our distancing etc. As always common sense, what our Club thrives on.

To keep you all up to date from behind the scenes, we have had to make arrangements for a second signatory for the Bank, apparently this is something that is deemed necessary. Once this is done we have it in hand to move more towards online banking which should help Mike out enormously I hope. We are also continuing with the plan of replacing our caravan.

The enquiries I passed to local Clubs to see if they would be interested in sharing the burden of bulk buying of nitro based fuel has had no replies surprisingly. I thank those at the other clubs that took the time to circulate to your members it is much appreciated. Seems us nitro heads are perhaps a dying breed. I will work on other ways to try to sort this out and will email the decision in due course, as I believe £15 a gallon instead of £28 is again common sense and Westons Fuels are a proven product as far as we are concerned. Sorry we have no similar arrangements for those that have electrified ;).

This year we will be cancelling the attendance stats recording which is always a bit of a laugh. We will reintroduce the sign in/out sheet again in due course as there are other reasons for this, being on an active airfield.

The online meetings have proven to be a great success with those that took part, and the vote was unanimous to keep them going so we are working on progressing these to the next level. The next meeting will be on the 26th June at 8pm so check your emails for the invite or go to the Members Area mainpage, bottom left and click the link at the appointed time.

This month we have managed to get our local Member of Parliament, Duncan Baker, to attend the field to have a chat and see what this model flying thing is all about. We tried before the lock-down but schedules and weather were always prohibitive. Hopefully now he better understands the woes of the model flying fraternity and that we are not just complaining for the sake of change. He has asked for a letter he can forward to his seniors so that he can act as a voice on our behalf in our fight with the CAA and DfT. We shall have to see but as they say, every little helps. Most importantly we hope he enjoyed his visit to the Airfield as a whole, it was a busy day. He did manage to have a buddy box flight with a Bixler 2 glider which he seemed to really enjoy and get to grips with.

I think that is about it, all that remains to say is keep on getting to the field, flying 'em as if you stole 'em, chatting and keeping safe.

Dave

Competitions 2020

It now seems safe to run the competitions again, starting in July. We have found that separation is easy to achieve so even a mass launch for for Climb and Glide can be done safely. We can get in another four sessions – July, August, September and October. The July dates will be 5th for the Climb and Glide and 19th for the Spot Landing, both starting at 15:00. Those of you who are new to the club can see the rules on the club website. If there is a second wave of covid and the shutdown rules are tightened again we might have to cancel again. Just a reminder that the competitions are open only to Bixler 1, 2 or 3 models.

The good news is that, when I looked on the 27th, Bixler 1s and 2s were both back in stock in the UK warehouse, though not 3s as yet.

Model of the month: Goldberg Ultimate 300S

This is a model with a story. It's a Goldberg Ultimate 300S and looks every bit as good in the flesh as it does in the picture. It belongs to Mark Wrighton but he told me that it was the model that got him into flying when he saw Nick Kirk flying it about thirty years ago. He really wanted one like it. Then he visited Cromer Model Shop more recently and the owner, Clint Butler, asked him if was interested in a secondhand biplane. He was and, to his surprise, when Clint brought it from his house it turned out to be the very model that he so wanted all those years ago. He had a minor mishap at Muckleburgh when he hit a mole hill whilst landing. The slanted undercarriage leaves the lower wings very close to the ground. The only damage was to the starboard lower wing. Building a new one became a covid lock-down project and now the model looks superb. It is also a lesson in how to silence engines. Despite having a 91 up front the large pipe reduces the noise dramatically.

Bob's Tales

The emu

While I was at Port Hedland I did a lot of trips to the mining camps and when I went to the camps I got to know a lot of the people there. I had a dog in Port Hedland. It was a stray and she had ten pups. So whenever I went to one of the mining camps I'd have a box with a couple of puppies alongside me and when I got to the camp they would be fighting to get these puppies.

One of the airstrips was called Woody Woody and there was a survey team there that needed the camp moving to a place called Skull Springs. I arrived and looked at all their gear and knew that I would have to make two or possibly three trips. So I did what all us bush pilots did in those circumstances and took all the seats out except mine and we just shoved everybody in with their gear until I could just about shut the door. I did two trips and when I got back for the third one there was just the cook left and one other chap with some more gear. Cook had a pet emu about the size of a full grown Heron and he wouldn't go without his pet. I said no it could not go but on reflection, realised I would get strung up to the nearest tree by the rest of the guys if I left their cook behind.

So, I relented in the end and I said, 'You keep that emu and keep this rope round its neck and you go right to the back of the aircraft and you stay there the whole of the flight and you hang on to that emu for all you're worth'. We put all the other gear in and then the other chap got in and laid on the gear and I took off. Half-way down the strip, which wasn't very long and it was a hot day, I am concentrating on getting this thing off the ground. Suddenly I have a baby emu on the back of the seat and its flapping all over the place. Not particularly to get at me but it's flapping at the front end of the cab where I'm sitting. So I'm trying to take off with this emu having a go at the back of my neck. Fortunately we got airborne, not one of my best take offs I will admit, and arrived safely at Skull Springs wondering whether, while this emu was actually airborne, did the aircraft weight less. There's a little thing for people to think about at the flying club.

[Ed: I have a joke about that. I used to set it as a puzzle for Physics students. "A man is driving along behind a van. Every so often the driver gets out and bangs the side of the van, then gets back in and drives off. The next time the man gets out and asks the driver why. 'I have a two ton van and three tons of canaries. I have to keep them flying.' As they say in academic circles, 'Discuss.' Answer next month.]

The smoke-filled cockpit

I did a couple of years out in Australia doing bush flying and medical flights and enjoyed every minute of it. However, things back in the UK were picking up and the airlines were recruiting again and I came back to join a company called Channel Airways based at Southend, which had been my original base. I did not know at that time that I was destined to go back and spend many more years in Aussie but at the Woomera Rocket Range in South Australia this time.

I joined Channel Airways to fly the DC3 Dakota. I had to be checked out on the DC3 as I hadn't flown it before. The Chief Pilot was a chap name Sid Walsh, an ex-Fleet Air Arm pilot, who used to fly torpedo-carrying Albacores during the war from carriers. He was real old navy, to the extent that the uniforms we wore were very similar to naval officers, the navy blue serge with gold rings, white shirts and so on. At that time the navy went into white cap covers at the end of March to the beginning of October, then they took them off and went back to blue caps for the winter.

Sid decided he wanted us to wear white cap covers at the same time as the navy so we had to wear these white cap covers during the summer same as the Royal Navy. Later on there were some funny incidents because we looked like naval officers and we had to be in Portsmouth to operate the DC3, daily to the Channel Islands, from the old grass field that was Portsmouth's own airfield which is now a housing estate. When we were going to and from our hotel in Portsmouth we were constantly being saluted by service personal so we would give them a nice snappy salute back. What they made of our Air Hostess in her green uniform God only knows.

So back to my introduction to the DC3. The Chief Pilot, Sid Walsh, was to carry out my training. I had been studying the Flight Manual and spent many hours sitting in the cockpit getting familiar with all the knobs and dials. Come the day of reckoning Sid grabs me from the crew room and we march out to the Dakota and do the external inspection. As we got into the aircraft he said, "OK. Get into the left-hand seat, lad." He called me lad because I was only mid-twenties and he was an old fellah.

He sat in the co-pilot’s seat and proceeded to light his Sherlock Holmes pipe which filled the cockpit with smoke. Mind you I was a pipe-smoker at the time but I wouldn’t dare to smoke with him there. Chief pilots were God in those days. He took out the Daily Telegraph and started to do the cross-word, which he did every day. He said, "Get on with it.” So I started the engines, and got everything ready and I said, "OK sir? Ready to go.”

He said, "OK. Let’s taxi out.” He watched me while I taxied and stopped at the end of the runway. I did the power checks once the temperatures were up. He said, "OK then let’s go.” I got clearance to line up and take off. The next thing is the pipe is relit, the cockpit’s full of smoke and I am peering through the smoke trying to line up on the runway.

I started to run down the runway, opening the throttles gradually and putting on plenty of rudder to stop the swing. I managed to keep it reasonably straight, then he took over the throttles and racked them up to full take off power. We used hand signals in those days because we had terrible headsets. They were the ordinary radio operator’s type headsets with no sound insulation on them. With two Pratt and Whitneys roaring away it was hand signals. Palm of the hand up to bring the undercarriage up. He’s puffing away on his Sherlock Holmes pipe. You did one finger for first reduction of power, two fingers for the second reduction, three for the third climb power.

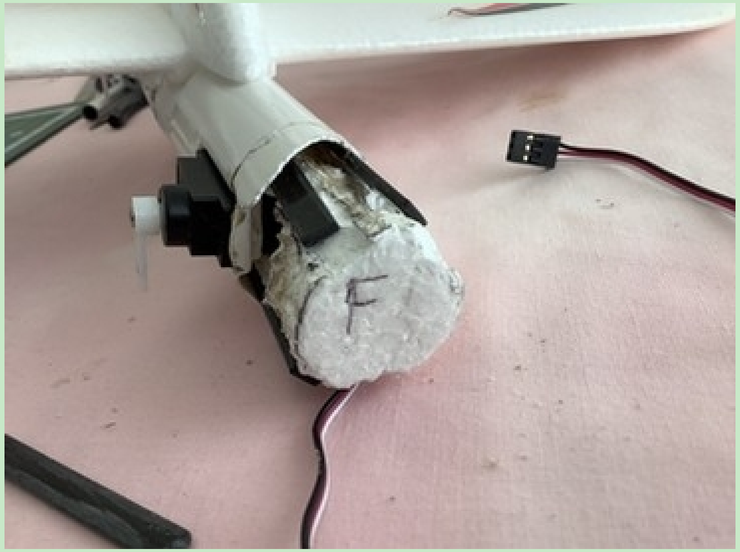
We flew a few circuits with touch and go landings while he sat there puffing his pipe and went back to doing his crossword, only looking up when it came time to lower the undercarriage and give me flaps and any other checklist items that I asked then left me to it. It would be wrong to believe that he was not actually watching me like a hawk all the time but I thought that was a very good way of making a rather nervous new pilot at ease. He was a real old-school chap.

We taxied back in and he said, "Yes. That was fine. Let’s pop over to the bar and have a G and T”, as we were finished flying for the day. Sid left us and went to Africa to become Chief Pilot of Ghana Airways. We were all very sad to hear that he died in Ghana of a heart attack whilst on the golf course, where I am sure he would have wanted to be when his time came.

Genius number eleven: Boom, boom Mr Keith!

Moulded plastic fuselages are light and look good but they are fragile. Keith’s Phoenix took a knock and the fus snapped at the rear where the servo holes produce stress raisers (the subject of a future article). His work fixing it produced some surprises and some clever ideas. The original plan was to use a foam plug core to press carbon fibre reinforcements against the fuselage inside whilst the epoxy set. The repair looked very good, then Keith flew the Phoenix again and the repair failed.

Now over to his words and pictures.



“Examination of the remains of the repair I made previously shows that the epoxy I used to fix the carbon reinforcements in place reacted with that packing foam support piece and dissolved it sufficiently to no longer keep them snugly in place. Consequently three of the four did not remain in close enough contact to give the strength needed and degraded the epoxy into a soft mess. Hence, [as I flew] increasing the amount of up-elevator needed until I ran out of stick movement. Unfortunately I didn’t quite land it before the tail separated and crashed.” [Or maybe fortunately that you weren’t at soaring height!]

[When Keith and I chatted over the shrinkage we wondered whether it was in fact the heat generated rather than a chemical reaction. Five minute epoxy can get very warm, especially as it was pressed against a heat insulator. This seems most likely as I have never seen a case of epoxy reacting with foam.]

“The single carbon piece which remained attached to the inside of the tail end of the fuze gave me an idea. As the shaped foam piece’s function was only to support the carbon reinforcements and that one resisted all efforts to remove it, why not fix them one at a time so that I could prepare each one with the certain knowledge that it was getting all the right attention to cleanliness and that it had glue in all the right places. So that’s what I’ve done. Now I have the tail with four 3” [75 mm ☺] pieces of carbon spar very firmly in place. I am convinced they must be considerably stronger than the original fuze. Without the supporting former in the way I can get the servo wiring through unimpeded.”

“With the four carbon splints cemented into the tail, the alignment and fit is near perfect when the two parts are offered up to one another. The four splints are very firmly bonded to the inside of the back end of the fuze and I think I would have to do damage in order to get them out now. The epoxy is not brittle, rather like a strong hard elastomer. So I have confidence that it will perform the function required.”

[And I suggested to Keith that any surplus epoxy that gets squeezed out can be cleaned off with methylated spirit if done before it starts to gel.]

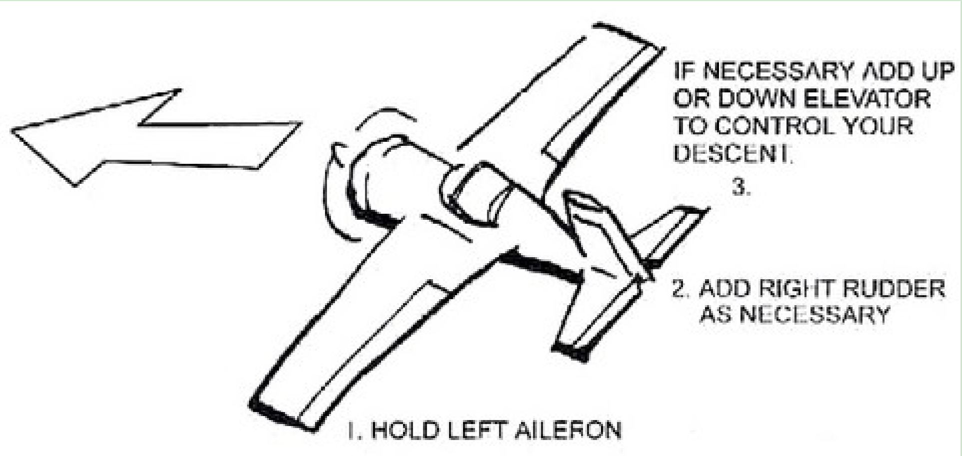
Manoeuvre of the month: Sideslip

The sideslip is a very handy maneuver that can get you safely out of trouble. Let's *say* that you're coming in for a landing and Ooops! You're too high, but you’re too low [with a glider] to do a 360 and make another approach; your only option is to dive or to do a sideslip. Sometimes when you point the nose down you pick up a lot of speed, which can cause you to miss your landing strip. What to do? The sideslip, of course!

With a gentle sideslip you can lose height without gaining a lot of speed and safely land your model. If your model is a real floater, you will find the sideslip to be a very gentle and manageable maneuver. If on the other hand your model flies rather on the fast side, the sideslip might be a bit more difficult. In either case, the sideslip will sooner or later come in very handy.

Most of the time the sideslip is used when you're coming in for a landing, so let's run through it as though you are on a landing approach. Let’s say are doing a left hand circuit and have just lined up on the runway with your left wing tilted down (and your right wing up). You’ve not yet leveled out from your turn. At this point, add right rudder, and hold left ailerons so that the wings stay tilted (as much as 45°).

Each model will require a different proportion of ailerons and rudder to hold the wings at a stationary tilt in the sideslip. It takes just the right combination of ailerons and opposite rudder to hold the wings steady.



When sideslipping, some models point their noses up and some pitch down; consequently you will need to add either up or down elevator as necessary in older to maintain a nice gentle descent. If you're lucky enough to have a model which will sideslip with no elevator input, you will find this a very easy maneuver and you will be able to make very controlled and steep descents with ease. If it turns out your model requires a combination of aileron and opposite rudder with either up or down elevator, the sideslip will take a bit more practice to perfect.

I doubt that you have seen many model airplane sideslip. This is very probably because almost nobody ever attempts this maneuver. Hopefully, this introduction will change all that! With just a little bit of practice you should be able to achieve an excellent and spectacular sideslip. And once you get to know this maneuver you will wonder how you ever landed without it! You will be able to slip your sailplane til just above the ground, then level off and grease it in.

Kinetic theory and lift

On page 63 in the February 2017 Aeromodeller I found an article by Stuart ‘Supercool’ Sherlock’s about Isaac Newton and aerodynamics, under the heading ‘Fluid or Molecules’. It was very thought-provoking. Those who listen to Cabin Pressure on BBC radio will remember, in the first episode, the hapless Arthur telling the crew that no-one really knows how planes can fly. They all tell him he’s wrong but don’t explain why. In the end Arthur is given the classic explanation involving air speeding up over the longer upper surface causing a pressure drop and hence lift. He then says ‘So ‘planes can’t fly up-side-down then?’. Let’s try to answer Arthur’s question.

Kinetic theory of gases and impulse

For those who are not familiar with these here is a brief summary. All gases are made up of tiny molecules, which we call particles. At sea level the volume of the particles is about one thousandth of the volume of the gas. They move at random, on average at the speed of sound. They bounce off each other and solid objects. The hotter the gas the faster the particles move. Gases store heat energy in the form of this kinetic energy which increases with the square of their speeds. The particles do not stick to each other but adhere a little to a solid surface. Hence the boundary layer on a wing. They bounce perfectly elastically, so no energy is lost that way.

Lift is a force. Stuart’s idea was to analyse lift in terms of molecular motion as Isaac Newton apparently did. I started to wonder if this would help us understand lift better. Newton was fond of particles. He also said that light was particles, which made everyone fall about laughing until the discovery of photons.

Newton showed that force is the result of change in momentum. Momentum is mass times velocity mv. Velocity is a vector quantity. This means that both speed and direction are changes that count. When a particle bounces off a solid boundary it changes direction and imposes an impulse on it. An impulse, according to Newton, is a change in momentum and is equal to force times the time of contact. Newton’s equation therefore is impulse Ft = mv. Divide through by t. As v/t is acceleration we get to the modern version of Newton’s Second Law which is F = ma. Forces, like all vectors, can be resolved into two (or three) components at right angles to each other.

The atmosphere

We are at the bottom of a roughly 20 km deep sea of air. At sea level the forces from the air particles are high, though our bodies are adapted to it so we don’t notice it. A cubic metre of air has a mass of about 1 kg. So a one square metre column of air 20 km high has a mass of 10 000 kg assuming the density steadily drops to zero. So each square metre has a pressure of about 100 000 pascals on it due to this air piled up on top of it. Each pascal is a newton per square metre. A newton (N) is the weight of a 100 g medium apple (nice!). A kilogram weighs ten newtons. So each square metre has 100 000 apples on it or 10 000 kg as suggested above. You can see that you only need a small change in this to create a large force. To generate a lift force of 1kg (10N) on a surface area of one square metre you only need a pressure difference between the upper and lower surfaces of 10/100 000 or a hundredth of one percent. A 5 kg model with a wing area of 0.5 m^2 will only need a 0.1% difference.

Yes, I had to check the calculation for that percentage figure several times. As another check I tried again in archaic units where atmospheric pressure is 14 lb/square inch. There are 1550 square inches in a square metre. So there are 1550 x 14 or about 22 000 lb force. There are 2.2 lb in a kg so the answer is again about 10 000 kg and 100 000 N. Phew! Or as the mathematicians say Quod Erat Demonstrandum QED.

It's all particles

From now on we will only think in terms of particles not pressure. Does this help our understanding? Each wing surface has a force on it from the sum of the particle impulses. Some particles hit vertically but most bounce at an angle. In this case a proportion of the force acts vertically on the surface, called a component. When stationary the upward and downward forces are the same so there is no lift. If there is to be lift the sum of these components acting down must be less than those acting up. This can be both from the number and the size of the impulses.

Particles in a hotter gas move faster. They can be speeded up by being hit by a surface moving towards them so increasing their speeds. That is how a diesel engine works. The rising piston hits and speeds up the particles. This heats the gas until it reaches the ignition temperature for the fuel. As the hot gas pushes the piston down the piston surface moving away means the particles bounce back more slowly. This lowers the gas temperature and and the piston absorbs the kinetic energy. It is also why the skin of a fast moving aircraft heats up.

Of course a wing has a thin stationary boundary layer attached to it. However it would seem logical to treat this layer as the surface of the wing as any impulses will be passed on at the speed of sound. This is similar to the fact that a surface that feels hard is actually mostly empty space made to feel hard by the repulsion between the outer layers of electrons on the surface and the finger pushing down on it.

Impulses on the wing

Let us look at the impulses on the lower surface. When it moves forward with an angle of attack there will be a small rise in the size of the force from the impulses. The particles will crash into the lower surface harder as the wing hits them. For an incidence angle of say four degrees the upward component will be about 7% of the force (sin 4°). For a surface with a drooping trailing edge the effect will be larger. Flaps will make it larger still. We notice that when we lower flaps and the model's nose starts to rise. If it didn't also slow this would be fine. In fact we have to lower the nose to keep up airspeed as the horizontal components of the impulses increase drag. There must also be a similar effect on the upward curve on the underside of the leading edge. Remember we only need a tiny change to generate lift.

What about the top surface? Classic theory from Bernoulli says that when a fluid, in this case air, is speeded up its pressure drops. Using kinetic theory this true fact can be viewed differently. The upper surface is longer. Therefore the particles are more spaced out. Therefore the impulses per unit area will be fewer and so will be the force per unit area, also known as pressure. Are there other effects at play? As a gas expands it cools. That is why you get condensation mist when you pop the cork from a champagne bottle. Perhaps the air above the wing is cooler than that below? The particles would then move more slowly and produce smaller impulses.

What about symmetrical aerofoils? Here clearly we have no lift due to the longer upper surface. All lift must be the result of angle of attack as described above. Extremely thin wings must rely on a modest angle of attack coupled with high forward speed. No doubt the air is heated below the wing as well which will increase lift.

Gliders sometimes use turbulators in the form of a thread just in front of the leading edge, or shapes sticking out of the wing surface. These cause controlled turbulence over the whole surface instead of only behind the point where laminar flow breaks up. Does turbulence reduce impulses? It is neither more nor less random than normal flow. Perhaps the only advantage of induced turbulence is that it is predictable so the glider can be trimmed to fly closer to stall without unpleasant surprises if its flight is disturbed. I can't get my head round this so maybe someone else can suggest ideas based on kinetic theory?

Conclusion

So after thinking about kinetic theory it seems that lift is not caused by a single pressure effect. It is the result of many different effects. The proportion of each in the total lift will depend on airspeed, wing cross-section including camber and leading edge, angle of attack and possibly even temperature changes. But all are the result of the frequency and magnitude of the vertical components of the many particle impulses.

And the answer to Arthur's question (which isn't in the radio programme) is that when an aerofoil is inverted it loses the effect of the curvature of the upper surface. In fact there will be some negative lift from that effect. The changed angle of attack and the forward speed produce higher impulses on the new under surface which more than compensate for this.

Bob's quips part 2

Some actual maintenance complaints submitted by US Air Force pilots, and the replies from the maintenance crews.

Problem: Target Radar hums
Solution: Reprogrammed Target Radar with the lyrics

Problem: "Left inside main tire almost needs replacement."
Solution: "Almost replaced left inside main tire."

Problem: "Test flight OK, except autoland very rough."
Solution: "Autoland not installed on this aircraft.'

Problem: "Evidence of hydraulic leak on right main landing gear."
Solution: "Evidence removed."

Problem: "DME *[distance measuring equipment]* volume unbelievably loud."
Solution: "Volume set to more believable level."

Problem: "Dead bugs on windshield."
Solution: "Live bugs on order."

Problem: #2 Propeller seeping prop fluid
Solution: #2 Propeller seepage normal - #1 #3 and #4 propellers lack normal seepage

Problem: "Autopilot in altitude hold mode produces a 200 fpm descent."
Solution: "Cannot reproduce problem on ground."

Problem: "IFF *[identification friend or foe]* inoperative."
Solution: "IFF always inoperative in OFF mode."

Problem: "Friction locks cause throttle levers to stick."
Solution: "That's what they're there for."

Problem: "Number three engine missing."

Solution: "Engine found on right wing after brief search."

Problem: Aircraft handles funny
Solution: Aircraft warned to straighten up, "fly right" and be serious

First club skype meeting

We held this on Friday 26th. It went very well and it appeared that people had fewer problems, particularly first-time participants and those using portable devices. It proved easy to connect using the link that Dave put on the website or in the email. At the moment it is free to use and we get unlimited time so for now we will be using skype.

Covid newsletter

Now the airfield café is open once more for takeaway I saw this perfect safety sign on the wall. Oh and the bacon butties are still just as good!

Joke of the month

This is another true story about aviation, this time about software. As you will know modern aircraft are flown by computers. The pilot tells the software where he or she wants the aircraft to go and the software moves the surfaces. At a software engineering conference one speaker said that he had thought of a new test for the quality of a software team. He said, "Would you fly on an aircraft that was controlled by software written by your team?"

Cartoon

Spot the fault: Grinding noise

Problem

Once again this is a much-used Acrowot foam-e. The motor was replaced with a new Propdrive 3542. This gave plenty of power without significant loss of flight time. It allowed a quick take off followed by vertical climb of the kind disapproved of by the IC flyers. The one downside was the noise, best described as a grinding, rattling noise at high throttle settings. It was so unlike the almost silent flight using the original motor. The propellor from that motor was the one being used. What was the most likely cause?

Servos: analogue, digital and coreless

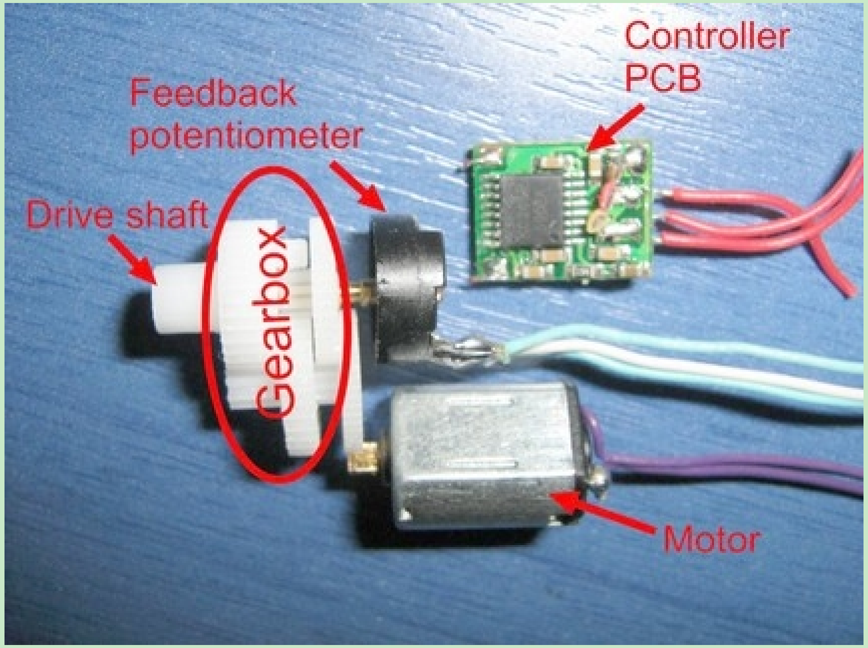
All rotary model aircraft servos work the same way. Unless coreless, the only difference between analogue and digital ones is one small piece of electronics.

Servos use pulse width modulation (PWM) and feedback.The receiver (Rx) splits each second into fifty ‘windows’ of 20 thousandths of a second (milliseconds ms) each. Inside each window the Rx sends a pulse of voltage, between 3.3 and 5 V, down the signal wire (yellow or white) to each servo, evenly spaced out. These pulses are nearly rectangular in shape and vary in length between 1.0 and 2.0 ms. The length is determined by the position of the transmitter stick, rotary/slider control or switch position for that channel. So full up elevator might be 1.0 ms and full down 2.0. Neutral will be 1.5, with small changes to it being set by trim or offset. A two-position switch will change the width from one extreme to another. A three-position switch will add a 1.5 ms mid-point. Transmitter-based adjustments to throw or weight will increase the 1 ms or reduce the 2 ms pulses. Most servos don’t use all of their possible movement so you can send signals outside the normal range and get more movement. However this is risky as you don’t know how much more is safe for a particular servo. Taranis users have to be careful as the amount of movement can be set in at least three ways and they multiply. A good head for arithmetic is needed or a stock of spare servos.

That explains the words **pulse** and **width**. **Modulation** means a change that carries information, in this case a move from 0 to 5 V that starts the pulse or 5 to 0 V that ends it.

Inside the servo case there are four things – a motor, some gears, some electronics and a variable resistor called a feedback potentiometer (pot). I don’t need to explain what the motor does. The gears do two things. They slow down the rotation and they increase its turning force (torque). Torque is measured as a force times a distance. For servos the measurement unit is usually kg cm. A 10 kg cm servo can make a force of 10 kg at the end of a 1 cm arm, 2 kg at the end of a 5cm one and so on. The pot is turned by the final drive from the gears. Because it is a variable resistor, as it turns it produces a varying voltage, so the position of the servo output shaft is turned into a voltage that can be read by the electronics.

The servo electronics controller printed circuit board (PCB) measures the control pulse from the receiver and turns it into a desired position for the servo. It reads the voltage from the pot. If the pot voltage shows that the servo is already in that position it does not send a voltage to the motor. It the servo is out of position it sends a voltage to move it one way or the other until it is in the right position. This is known as **feedback. It** means that the servo can only move once every 20 ms. Rapid small movements of the stick can get confused. The effect can be that the response feels sluggish or weak.



Picture: pcbheaven.com

What's different about digital?

The electronics is where digital servos are different. The PWM pulses from the Rx are the same. However digital electronics 'remembers' the pulse size and produces voltage pulses at a greater rate than fifty per second, in fact three hundred or more, so they are effectively continuous. This means that the motor starts sooner and produces more torque. It also means that the servo responds instantly to any external force on the control surface that moves it from the correct position. If you push the working servo it feels 'solid' rather than mushy. I am not clear why such servos are called 'digital'. They are no more so than analogue ones, but I suppose it sounds modern and there is no better alternative. High-speed or high-pulse-rate could be misleading.

Analogue servos switch off when they get no signal so can be moved by external forces. Some digital servos hold their last position and firmly lock it. The only downside to digital is that the servos use more power so you must use a bigger capacity battery to drive them.

One last word to explain is 'deadband'. Its true meaning is the amount of signal change needed before a servo reacts. For example in a car it is how far you need to move the wheel before the steering takes effect. However it is used loosely in RC servo descriptions to mean sluggishness.

When I started using digital servos I noticed that some buzzed slightly. Being used to analogue servos this worried me, as buzzing often indicates a fault, meaning that I wouldn't fly. I was assured that slight buzzing is normal with some digital servos.

Coreless digital servos

If you watch a highly aerobatic model the speed of the control surface movement is impressive. It can be less than 0.1 second to 60° servo arm deflection. To achieve this, coreless servos have very light moving parts. There is no moving iron core, hence the name, just a light wire cage of windings shown copper-red in the picture.


Picture: rchelicopterfun.com

A conventional servo motor has an iron core armature wrapped in wire that spins inside magnet. In a coreless servo, the armature is a cylindrical thin wire mesh that spins round outside a magnet. Ordinary servo motors have three or five magnets. When the coil is between two of these the force drops. There are no gaps in a coreless motor magnet, so they are smoother, more constant, and stronger.

Current consumption

A word of warning. Digital servos use more current than analogue ones, because they are working all the time. If they also produce a lot of torque, and are high speed coreless types, they might need more current than your receiver channel can provide, especially if there are two on a Y-lead. For digital servos above say 10 kg cm torque, try to find out what current it uses and what your receiver can provide. The manufacturers don't tell you. To be safe (and I broke a receiver finding this out) use a power distribution board. I will be trying out a new servo tester soon that measures current draw.

Good and bad points of digital servos

Good
Fast reaction to control and deflection
Smaller deadband
Probably lock in position rather than switch off

Bad
Use much more energy so use larger, or twin, batteries or replace them regularly as you do flight batteries
Likely to need a power distribution board

For further information and some excellent pictures by Jan see
https://www.pololu.com/blog/17/servo-control-interface-in-detail

New test instrument

On AliExpress I have discovered what looks like a good servo tester and analyser. Called the ToolkitRC ST8, it has a screen that can display speeds and, most important, current draw. It hasn't arrived yet but I hope to have a review ready for the August issue.

Health warning: Ticks

This is a repeat of the article from September last year. However as we are surrounded by fields and woods I thought I should include it again for newcomers and those who might have missed it before.

I hope you all remember that I put some yellow, plastic tick removers in the caravan first aid box. The growth of nature conservation areas and deer populations has resulted in a rise in ticks and the Lyme Disease infections which some ticks carry. I discovered that the ticks are not like the large ones I prise out of my cat. They are dark and very small – about the size of a poppy seed. They climb onto you when you go through tallish vegetation, and then hide in body creases, dig their teeth in and suck your blood. They can also cling to your clothes and get onto to your skin later. Lyme disease is horrible if you don't treat it straight away. Only a quarter of people get the rash so it is easy to confuse the early symptoms with mild flu or even perhaps mild covid-19. Luckily for us most of the possibly 8000 cases a year are in Scotland followed by the south west and south central.

The second from the left is the most dangerous. We are not at risk on the grass areas beautifully mown by Dave. We might be when we go off into long grass or woodland bracken to collect a strayed model or bits. I imagine that the insecticide sprays on the crops ensure there are no ticks there. I normally wear shorts and Fitflops, so I now have trousers and shoes in my car to change into for retrievals, with trousers tucked into socks.

Sources

I thought I might fit a scalish three blade prop to my Seagull Extra 360, if the motor proves to have enough power to lose a little. Spinners are a pain to cut so I looked for a supplier. On eBay I found one in China called okey100c. They sold me a 70 mm aluminium spinner for £11 but there was a £5 carriage charge. Even so this was a very good total price. It arrived about a week later but with the bolts missing. After an email they speedily sent another complete spinner with bolts. As you see from the picture, the finish is superb and it fits perfectly around a Master Airscrew 16 x 10 three bladed prop.

Talking of Chinese sources, I am now moving most of my buying to AliExpress. I am not sure why, but Banggood has reduced its range of RC supplies down to the 'useless' level, code red.

Sales

No new ones this month. Don't forget to look in Sales on the club website.