

November 2014

Newsletter

Bonfire Night at the Field



Now that's what you call a bonfire!

To all of you who made that evening, well done - it was a great and exciting event.



Scott brought his helicopter bedecked in LCD's and put on a typical brilliant display. It was windy and yet he made that helicopter perform so smoothly - he got a richly deserved round of applause from the 'gallery'. The model looked quite spectacular with all those LED's lit up.

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Jason blazing the trail with one of the fireworks producing lurid fire from a wingtip firework. He was flying his WOT 4 XL - it looked quite spectacular. He flew to music.

It is the first time I had seen night flying and in my opinion, it was just as good as everyone had told me that it would be. The fireworks were great and it was Mark Conlin who again, was responsible for setting off those fireworks.

The whole evening must have taken a lot of effort by various members (and wives) - that bonfire was huge - well done to you all. That was an evening never to forget.



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Droning On

Article by John Higgins

Unless you have been living on another planet for the past year or two you can't help but have heard of quadcopters, hexicopters, and octicopters... or, in other words, drones. These devices are technological marvels in their own right; they have stabilisation and GPS systems which give them capabilities that, only a short time ago, we would all have thought to be the stuff of science fiction. The technologies developed for the mobile phone industry are transferable technologies and have found a comfortable home in these wondrous devices.

As a camera/video platform the quadcopter (and all its siblings) reigns supreme; steady as a rock, able to fly to specific GPS coordinates and to return automatically to base. Add a stabilised and damped gimbal, on which to mount your video camera, and you have a formidable tool at your disposal. Many of you will have seen clips from the internet of footage, shot from a quadcopter, featuring happy holidaymakers on a seaside promenade blissfully unaware as the device zoomed over them, of more holidaymakers, at the top of Blackpool tower, being videoed as the drone flies alongside (Blackpool tower is 512 ft high!). This same bit of video then gets really exciting as the drone flies in and out of one of the resort's famous rollercoasters. Those of you who follow international football on the telly (when you would be better off in your modelling room working on your latest project), must have been impressed with the antics of a quadcopter at the recent Serbia/Albania match. This device, dangling a provocative flag over the supporters, provoked the best riot the locals have seen in years! Commercial applications are obvious; drones are much more cost-effective than helicopters and are now seen at many public events – the winter Olympics and some of this year's model shows are good examples. There is even a "follow me" application where the drone will follow a subject at a set height and distance – ideal if you want to be videoed as you hurtle down the Cresta Run. (It could even follow you to the ambulance!)

There is, however, a darker side to the rise of the quadcopter. How would you feel if you drew your bedroom curtains one fine morning and saw a quadcopter hovering outside? In America, where they take personal privacy to, perhaps, higher levels than we stoical British, the reaction to quadcopters has been, in some cases, shall we say,



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Droning On continued/.....

a little more forceful. "Fly a drone in town, and we'll shoot it down". They would too! As an aside, an American has developed a toughened-up drone. This quadcopter can fly through a plate-glass window, endure fire and survive a shotgun blast whilst suffering little or no damage. Perhaps those concerned cousins of ours will have to install a ground-to-air missile system! The military, as always, have not been slow to embrace quadcopters and they are now in use with armed forces across the world. A soldier need no longer break cover to have a look around. Some quadcopters are even being weaponised with small arms. One amateur experimenter in Europe has been developing a multicopter able to lift a 100 Kg payload; he pointed out, with more than a hint of a twinkle in his eye, that he only weighed 70 Kg. The personal "jet-pack" is here! At the other end of the scale I believe that a drone, the size of a mosquito, has been developed, with full sound and video capabilities, which can stick undetected to clothing and thus be transferred inside buildings. The little beast is even capable of taking DNA samples or depositing a chemical marker. Scary stuff!

Model flying in this country is regulated but it is regulation with a light touch and the guidelines, under which we fly, are, in most cases, little more than common sense. Drones, with the capabilities they possess, might well re-address this situation to the detriment of the wider model-flying community. People have already been prosecuted for allowing camera-equipped quadcopters to encroach on military-sensitive areas, and fears have been expressed over their capabilities to ferry items over prison walls. It does not take a genius to imagine what other sort of things a quadcopter could deliver to a precise location – and I don't mean that small item which you ordered from Amazon!

So, where should we go from here? The genie is out of the bottle, quadcopters are here: they are cheap, readily available and anyone can buy one. They are excellent camera platforms and, in the heavily regulated and precisely controlled commercial environment, they are undoubtedly a good thing, but are they model aeroplanes?

Should we, in our own interests, distance ourselves from them?

John Higgins



Speed Controllers

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Article by Brian Holdsworth

An electronic speed controller (ESC) generates the rotating magnetic field required to drive a brushless electric motor. The motor windings are implemented as three coils in a delta format connected to the three wires emerging from the motor case. If one wire is connected by the ESC to the positive supply and another to the negative supply, current passes through the associated winding, generating a magnetic field; if connected with opposite polarity, the magnetic field is generated in the opposite sense. By attracting or repelling the magnets, a torque is produced rotating the motor shaft. After the motor shaft has rotated a suitable distance, the supply is disconnected from that pair of wires and connected to another pair so producing the required rotating magnetic field. The ESC switches the supply on and off many times during the connection period, reducing the average magnitude of the magnetic field and hence the rotational rate. The throttle lead provides the controlling signal to control this rate as for an engine controlled via a separate servo.

2 Field Effect Transistors (FET's) are used for each motor wire with one switching positive and the other negative supply. For high currents, several FET's are used in parallel; for example, if each FET is rated at 10 amps, a 10 amp ESC would have 6 FET's, a 30 amp ESC 18 FET's and a 100 amp ESC 60 FET's. The voltage rating is particularly important and ESC's are typically rated at 2-4, 2-6 and 6-12 cells; spectacular failure may be expected if these limits are not observed! Some ESC's save costs by under-specifying these FET's with consequential early failure - many ESC's supplied with RTF's show this!

As the motor rotates, a voltage is generated in the windings and is used to determine the shaft position so that the magnetic field can be generated with the required phasing. This complexity is implemented in the controlling chipset, together with shutdown in the event of its overheating. Most of the heat is generated in the FET's and their overheating is not directly protected against, although implied by some datasheets. To handle this heat, a heat sink is included which, in most cases, consists only of a thin metal sheet about 2cm square. The ESC is encased in a heat shrink sleeve which is a good insulator; almost invariably, a sticky label is attached over the heat sink (the only flat area) increasing this insulation! This flat area needs cooling air which means that the



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opposite side of the ESC is where the mounting velcro etc. should be fixed even though it may seem illogical to use this uneven surface.

On power up, the ESC verifies its functionality and determines some motor parameters; this may be seen as "kicks" of the propeller. Unlike the earlier brushed ESC's, the motor cannot run uncommanded in the event of hardware failures. If an error is detected, a sequence of beeps defined in its datasheet will be generated using the motor coils as a crude loudspeaker. If full throttle is detected, the ESC will enter programming mode with a defined beep sequence and inhibiting motor operation. Other than low throttle on startup is an error with appropriate beeps and does not start the motor. If satisfactory, the startup beeps include the number of cells detected and possibly Brake status. Since LiPo faults may result in one (or more) cells registering near-zero volts, these beeps should be checked for the correct sequence. While specific checks each time are unreasonable, a difference may be noticed and repeating the power up and checking for the expected cell count might avoid possible problems (crashes!). Limited protection is incorporated to shutdown in the event of the propeller being unable to rotate but the throttle should always be closed in such cases.

Where several FET's are used in parallel, which will generally be the case, one FET can fail resulting in the remaining FET's carrying an increased share of the current; the resultant greater voltage drop unbalances the motor voltages sensed by the ESC and can cause erratic running or shutdown - in some cases, the motor starts and runs normally to about half throttle before making squealing noises or stopping, perhaps resetting and repeating the startup beeps when the throttle is closed.

A voltage regulator supplies the circuitry which is very vulnerable to supply noise, so considerable filtering is implemented in the form of capacitors generally visible as cylindrical components at one end of the ESC. The length of the supply leads is critical and should not be extended otherwise erratic operation will result with significant heat generation and resultant shutdown or failure. Due to the complexities involved in determining the shaft position, the motor lead length is also critical but may be extended, if necessary, with short wires of at least



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equivalent thickness to the leads from the ESC (not the generally thinner motor leads). An indication of this sensitivity can be seen in the ESC implementation since the leads are short with the supply leads thicker than those for the motor although they carry the same currents.

An independent voltage regulator (BEC) is generally included to supply the receiver and servos via the throttle lead. The heat generated by this regulator can be significant and is a limiting usage factor. The lower current ESC's (up to ~40 amps) have a linear regulator which is only adequate for 4 micro analogue servos with no more than 3 cells. Other ESC's have switching regulators which generate less heat and should be adequate for 4/5 standard servos with up to 6 cells. More servos or more than 6 cells should use a separate UBEC from the LiPo (for up to 6 cells) or a separate supply. Where such a supply is used, it is essential that the ESC supply is disconnected from the throttle lead by cutting the positive wire or by sliding its pin out of the plug, with insulation to avoid possible short-circuits.

Burst current is specified and is generally irrelevant though it looks impressive! Due to the complex nature of the motor current, the value indicated on a meter is a smoothed representation adequate for most purposes but with the peak about double that indicated, so that a higher ESC current rating should be used to provide a margin. For example, a 35-40 amp ESC would be appropriate for a motor drawing 30 amps. Provided the minimum cell count is appropriate, the only disadvantages of a higher current or voltage rating are the increased size, weight and cost!

Futaba transmitters require reversal of the throttle channel direction. With a new ESC, it is desirable to calibrate the throttle range as described in its datasheet to match it to the transmitter; this is particularly relevant for Futaba with its non-standard throws. Some ESC's will not operate until this has been performed. Multi-motor configurations need an ESC for each motor, preferably with a separate matching battery for each; if these batteries are always used as a set, they should age similarly with little relative variation during discharge - hopefully! If a battery is shared, the resultant voltage interactions are likely to upset the



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circuitry often causing one motor to operate erratically. It is obviously wise to match the ESC and motor on each side to minimise any variations; paralleling throttle leads and so supplying the receiver and servos from multiple matched ESC's should not cause any problems.

A number of programming options allow fine-tuning to match the motor characteristics and maximise efficiency. Other than Brake, the defaults are generally adequate so these options can be ignored for most purposes!

Brake is used for powered gliders to allow the propeller to fold otherwise the airflow is often enough to keep it wind milling with consequent drag. It is implemented by shorting the windings so applying a slowing force to the motor shaft. It defaults to off and should not be used for fixed propellers since considerable heat is generated within the ESC.

Battery Type defaults to LiPo and so should not need alteration. An ESC defaulting to any other type is likely to be old and overdue for replacement!

Low Voltage Cutoff defines the action taken should the battery voltage drop below a defined level indicating that it is discharged. This reduces consequential damage on over-discharge and allows the BEC and hence the radio to continue operation. The default reduces motor speed and hence current draw and is recommended for most applications. The alternative stops the motor and is generally preferred for gliders with folding propellers and enabled Brake. Most ESC's default according to Brake selection.

Low Voltage Cutoff Threshold defines the cell voltage at which the cutoff takes place. Due to the high current and consequential voltage drop at the ESC, this is below the standard no-load cell threshold. The default is generally satisfactory and should not be changed without consideration of the implications.

Motor Rotation Reverse is sometimes available, and as its name suggests, reverses the motor direction! This is only relevant where motor wires are used soldered directly to the ESC leads - otherwise, reverse by swapping any two motor plugs.

Soft Acceleration is used to slow motor startup and so reduce the damaging



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effects of high torque on gearboxes (including helicopters).

Timing is a rather obscure option and is rarely well-documented in the datasheet. It has similar effects to the ignition timing on an engine and is used for fine-tuning to improve efficiency. ESC startup tests are normally sufficient to determine this value. Large motors can be prone to generating odd noises in operation, particularly when accelerating, and some experimentation may be beneficial.

Switching Frequency is another obscure option where, for maximum efficiency, a low value is used for inrunners and a higher value for outrunners. However, high values generate significant electrical and RF noise which can affect receivers (including 2.4GHz) so most ESC's default to low.

Give Modelling a Go

Article by John Smith

This year I have found myself in the doldrums regarding both flying and replacing and repairing models, no doubt every one goes through times like these, however, I had an arrival due to a aileron servo failure in the wing of my Acro Wot which demolished the model.

I was then given a part fuz kit to effect a repair (he had nicked odd bits out of the kit) but all the basics were there. I was able to make the rest up from the instruction booklet loaned by John Higgins, he must have a real library of instructions from year dot, " yes I think he's that old". I am not going to go through a long winded description on building this model, the crux of the message is that now I have rekindled my enthusiasm in proper modelling in building with sheets and strips of balsa.

So all you guys who fly with almost ready to fly models, give MODELLING a go and achieve something different and feel the difference the hobby brings, and good building.

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A VIEW FROM THE HEDGE. (By Will Sparrow)



No warmth, no cheerfulness, no fruits, no flowers, no leaves, no birds that sing – November! Now that the clocks have gone back there are even fewer visitors to the field than usual. Even though the runway has been double-spiked, cut and rolled only the “usual suspects” have I observed venturing forth on the odd nice day that autumn deems to throw our way. It would be nice to think that all you members are snug in your modelling rooms, poring over the plans for your winter building project (more likely that they’re wondering how to stick a decal to a lump of foam or wondering how on earth they will manage since there wasn’t a screwdriver provided in the box – Jim Sparrow, chief cynic) or are leaving modelling magazines open at telling pages, in the hope that a loved-one might take the hint and buy a deserving modeller something really nice for Christmas.

We are now in the last throes of autumn – in my book winter starts on the 1st December – so I’ve been giving a bit of thought to my winter survival plan. It’s okay for you modellers, snuggled up at home with your central heating turned up, but we small, brown birds have a tougher time of it; I’ve known birds to be frozen to their twigs, some never to see another spring. Aye, it can get really tough for us hedge-dwellers. With this in mind, my mate, Jim, and I thought that we might try an idea that we picked up from a friendly squirrel who happened to pass by the hedge just a little while ago. The plan goes something like this. Firstly, one tries to eat as much as possible before the onset of winter – the squirrel advised us to stuff ourselves until we were fit to burst, and then to stuff ourselves some more! Secondly, a large store of food has to be gathered and carefully hidden away. Once all this has been done, a secure, sheltered twig is selected and the bird simply goes to sleep, has lots of nice dreams and, apart from rousing for the odd snack, wakes up in spring refreshed and ready for the new flying season. This strategy sounded pretty good to us. We’re going to give it a go; I’ll let you all know how we get on.



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A View from the Hedge Continued/.....

I know that you modellers always put on a bit of a bash to celebrate bonfire night so, as you can imagine, I was looking forward to the firework festivities right from the off. The day got off to a bit of a shaky start when the shooterists, who now and again scour the fields for birds to kill, objected to material being delivered for the fire on the grounds that the fire might "upset the birds", and tried to imply that the traditional festivities could not take place! After your president diplomatically explained things to the head shooterist he quickly realized the error of his ways and that he had been mistaken in his assumptions: bonfire night was to be celebrated after all!

I've been fortunate in having witnessed a couple of your November 5th get-togethers but I must say that this year's event was a corker; the fire was big and hot (and didn't scare any of the birds in this hedge!) and the weather was showing a kind face. When the lights were dimmed I expected the usual fireworks, but what I did not expect was the amazing illuminated model flying. First off was a large fixed-wing model covered in lots of switchable LEDs. The model looked superb against the bible-black, velvet sky and was backed up by a thudding sound-track from a music system. When the airborne fireworks were triggered they were met with spontaneous applause! Next up was a helicopter covered in hundreds of LEDs and with an illuminated rotor disc. Magic, pure magic! By this time our wings were sore from clapping; it never ceases to amaze me how ingenious you modellers are and how you are prepared to take the time and trouble to push the boundaries of the possible. Well done indeed. I may have been mistaken, for after all, we small, brown birds are not very good at counting, but the numbers attending seemed way down on the huge turn-out that this event usually produces. I cannot, for the life of me, understand why so many of you are so reluctant to participate in club events. One of life's little mysteries, I suppose.

I expect that there will still be a few good flying days left before winter tightens its icy grip so there is still a chance that I'll see some of you doing what you do best before I retire to my sheltered, winter twig...

WS

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The Spectra

Article by Peter Cathrow

One of the models I inherited from my brother is the 2 metre span Spectra. This was built by him back in the 1990's from a Great Planes kit. He had fitted a Graupner Speed 600 motor. I decided to replace the motor with a suitable brushless alternative.

I have always lusted after owning one of those MVVS 'motor in a can contraptions but they are just a bit expensive for my pocket. Looking through the Hobby King website I found that they too make this type of motor specifically for gliders. This would of course be at a fraction of the price they charge for those MVVS motors.

I chose the 960kv version and fitted it with an 11" x 6" folding prop. A nice new cool nose spinner, 40 amp ESC, new metal geared servos and revamped closed loop control to the rudder.



I tested the motor with my watt meter - it is pulling 200 watts which is about equivalent to the Graupner.

I only have to balance it out and fly it. I love the design and I remember the hours that I had watched the model fly all those years ago.



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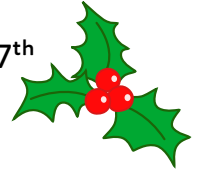
Events for 2014

AGM

The AGM will be held on the evening of 3rd December at the South Shore Tennis Club commencing 8pm.

Christmas Quiz & Hot Pot Supper

This is to be held at the South Shore Tennis Club on the evening of 17th December. As always, this is a FUN night!



Shows for 2015

LMA

East Kirkby Model Show	1 st - 4 th May
Strathaven Model Show	26 th - 28 th June
Cosford Model Show	18 th - 19 th July
Elvington Model Show	8 th - 9 th August

Other Shows

Weston Park International Model Airshow 19th - 21st June

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In Conclusion

So we come almost to the end of a year. As regards this newsletter, I am so grateful to all of you who have contributed so consistently to the publication. It has made it for me such a pleasure to do. I nevertheless appeal as ever for new contributors - share your experiences. Thanks to Brian H, Will Sparrow, John Smith and John Higgins for your contributions to this issue.

For me, it has been a privilege to be a member of such a 'vibrant' club. As you all know, the indoor flying has been brilliant and to be honest, I'm getting more out of it now than I did when I first started. I have been playing with the design of a simple biplane - they cost me less than £2 to build.

It is now much much stronger and very much lighter. Quite obviously therefore it flies so much better. It rolls, loops, stall turns and because of the confined area in which you fly, it is a high adrenalin sport. You cannot relax even for one moment when flying - you are on the sticks the whole time.

I've been using my old Spektrum DX7 but it is now giving trouble. I've ordered one of the Orange T Six transmitters from Hobby King. After 4 weeks, I'm still waiting for it to arrive!



I waited ages for these things to come back into stock - I just hope that the wait will be worth it - these things are cheap - some people say that they are brilliant but others have suffered problems.

Ladies and Gentlemen, see you at the AGM!