

us, or tell them to have a look at our website to see for themselves - www.basingstokembc.co.uk

Popham Show

Over the weekend of the 7th and 8th of September the club once again had a static display of boats at the show. On the Saturday over 40 boats were on display with about 30 on the Sunday. Chris Cole's report follows:-



The Popham Model Show has come and gone, with lots going on, flying, boats, tanks, cars, drones and a bit of rain. We had a very good turnout of excellent boats, surprisingly more motor than sailing, but some real stars of the show, with lots of interest from the visiting public.



Our exhibitors included Barry Parsons, Terry Welsh, Joe Harwood, Colin Patient, Will Wilkes, Keith Ebsworth, Campbell Winder, Tim Jefferies, Ian and Jacob Halloway, and Chris Cole.

Many of the "fly-boys" did admit to having part built or unused boats in lofts and sheds.



Chris was reminded at times that his descriptions of electronics, and magnetism, wasn't what the visiting professors and development engineers were familiar with!

Many thanks are due to the Popham organisers, and particularly Emily, for our invite to the show and making us feel welcomed.

Visit by the Vintage Model Yacht Group

This visit finally happened on the 14th of July when a number of the group brought along a selection of their models.



The little lad on the right of the photo who was attending with his parents and grandparents (VMHG members) managed to fall into the lake attempting to turn around the small boat coming towards him. Fortunately he got himself back out and his Grandma had a towel and spare set of clothes!!





Following their visit I received the following from their meetings organiser and we hope to see them again next year.

“Hi Andy, thanks for making us feel so welcome today, our pond in Devizes is a bit shallow at the moment and Warminster is shut due to blue/green algae so it was worth the trip!”

Visit(s) by the Hovercraft Association 18th August and 22nd September

On the 18th August half a dozen members of the association came with a number of models and had an enjoyable time at the lake. A couple of our members are now interested in hovercrafts so we may see some examples at regular club meets.





The second planned visit of the year on the 22nd September fell afoul of the wet and windy weather on the day concerned. We hope to see the association next year if not before.

Next is the second in a series of articles by Chris our chairman, if you have any questions for Chris about this article he will back from his latest cruise in mid-October.

Brushless Motors

What is a motor? An electric motor is an assembly of magnetic fields, one stationary and one able to move on a motor shaft. The fields, “like poles repel, unlike poles attract,” try to match up, stationary to rotatable. To make the motor turn, we need to make one or both the fields change or vary their polarity, so that the other field tries to catch up, and hence the shaft rotates.

The fields can come from permanent magnets, or electrically powered coils, arranged to make an electro-magnetic field. If the coils are on the rotating part, we need to get the electricity into the coils, and so we need a system to feed the electricity from the static outside to the inner core. If the electricity is constant, (DC,) we need a commutator, or split rings, that as the core rotates, changes the current flow direction, when the brushes of the commutator move to a different connection on the rings. This is typical of the standard DC commutator motors. If we can change the electricity, i.e. range the voltage up and down in a pair of wires, we can replace the commutator for unbroken slip rings, as the change in the generated field comes from the change in magnitude & direction of the electricity. This is more typical of most domestic single phase (AC) electric motors. (3 phase electricity plays with this, but that is another story.)

What is a brushless motor?

A brushless motor is an electric motor, which simply has no electrical contact brushes, to connect the field generating set of coils of the motor to electrical power. The wires are solidly connected to the coils. This means that the “energized coil” does not rotate, but the variation of the electricity in the coil means the field rotates.

The other part, a permanent magnet set, arranged to produce a magnetic field, tries to keep up with the “moving” field.

For our purposes, in the model boat world, these motors are of 2 particular arrangements.

There are two distinct types of brushless motors “IN runners and Out runners.” They are essentially the opposite of each other. The in runner has the magnetic core on the inside, which rotates with the shaft, whilst the electrically connected coils are stationary and are on the outside. These are typical of the motors used in the RC car world. Out runners have the electrically generated field coils on the inside, fixed to the motor back plate and electrical cables, and so doesn't rotate. There are sets of magnets arranged round the inside of a “housing” which is mounted solidly to a shaft that passes right through the static core, on bearings. This “housing” and shaft do rotate, as the magnetic field tries to keep up with the moving electric field. The shaft is connected to couplings or directly to propellers, to give us motion.

So how do we change the electricity? We want the electricity to change so that the electrically generated field changes, or rotates. On a boat we don't have a ready supply of alternating current (AC) but we have direct current (DC.) So what we need to do is change what the DC is doing, through the coils. We could generate AC, but “why?”

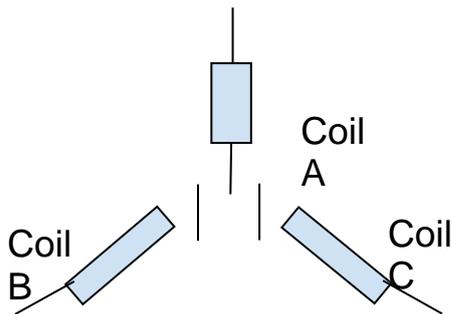
So the solution is to arrange the coils, in sets of 3, in a star formation. Coil A is connected on one side to a wire from the speed controller, and the other side to both coils B and C. Coils B and C have their other sides connected to the speed controller. So there are 3 wires from speed controller to the motor. The controller decides to output a DC current flow down through coil A, and out through B. A field is generated accordingly. After a while the controller decides that it will change the flow to A with C. B has no flow now. The field generated through A and C has now moved, and the magnetic field tries to follow it, moving the shaft. After a few moments more the controller decides to change the connections so that A is off and B flows through to C. The field has moved again. Then B flows to A, C off, etc. By changing which “pair” of coils is used, at any one moment, and then changing the choice, the electric field can be made to spin round the shaft axis, pulling the magnetic field with it. That essentially is how it works! It isn't alternating current, but more exactly “switched DC.” It was realized quite early in the development of the motors, that the “signalling” of “where the rotating parts were, could be done by the “unused” coil. That is, the unused coil is still connected to the speed controller, and though no current flows, it is “aware” by changes in EMF or electromotive forces, that the field is moving, and this can be fed back into the controller, so it knows that the unused coil is “that one!” The controller then knows it can make a switch, and looks for the new unused coil to respond. So no signal wires are used, just the 3 power

wires. This switching happens very fast, and developments in fast electronic components have allowed this to work.

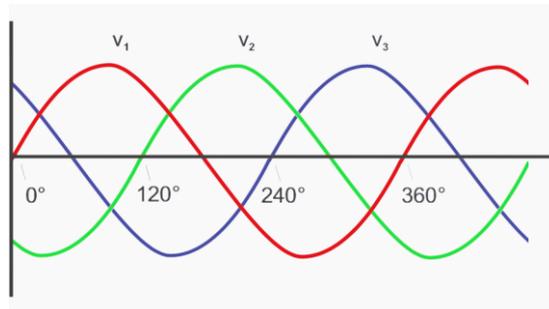
In alternating current 3 phase motors, all coils are in play at all times, and the current alternates in 3 sets of sinusoidal waves, such that the current flows into one coil, and out the other 2, in a continuously varied way, depending where in the sine wave the flow in the 3 electric cables are at the time. As the current varies in a coil, the other coils take or give up, to balance the flows at all times. Only at very brief times could a coil be considered to be off. A variant is the delta connection, again another story.

So there it is. Brushless motors are very efficient, only have low friction bearings, but no other wearable parts, and can produce a lot of power in very small packages. Often they are rated by the core size, and a KV value. For example a 2835 motor typically has an inner core of 28mm diameter, and a length of 35mm, and a KV of 1200KV which means that “unloaded,” from a 11V supply, it will rotate at $11 \times 1200 = 13,200\text{RPM}$. They do need to be matched to the speed controller.

Of course as the outside of an out runner does rotate very fast, and should be treated like couplings and propellers, when in motion. They can't easily be water cooled, but so long as there is sufficient clearance around the moving parts, they can be successful.



Typical star point coil arrangement



Typical 3 phase alternating current (AC)

Superyacht in Kos

Back in June of year whilst on holiday with lady friend on the Greek island of Kos we spotted a large superyacht at the quay adjacent to Kos town. A bit of online research gave the following results.

Name: All about u 2
Length: 164 feet (50 metres)
Guests: 12 Guests in 6 suites
Crew: 10
Launched: 2019
Built by: ADA Yacht Works Bodrum Turkey

Owner: Ron Zuckerman IT entrepreneur.

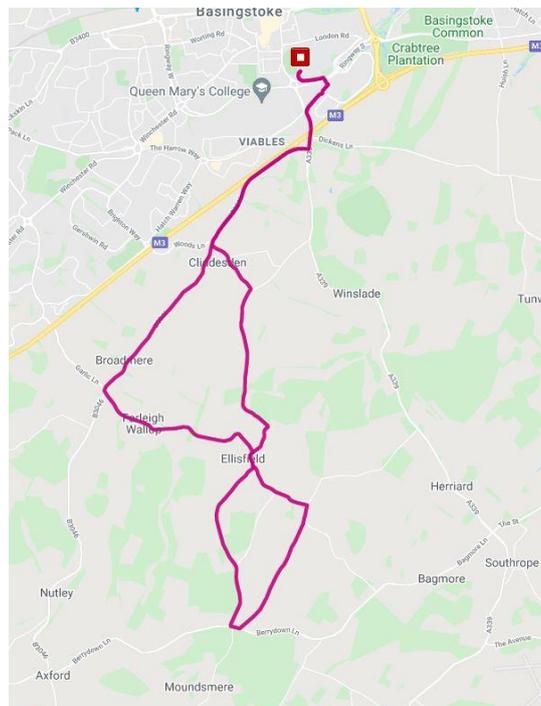
If any member is interested the yacht is available for private charter in the Mediterranean Sea during the summer months from 175,000 Euros falling to only 150,000 Euros in the winter. You would need to factor in expenses which typically adds another 20 to 25% of the weekly costs.



2024 Basingstoke Half Marathon

No don't worry I haven't signed you all up to take part in this! Just to let you know that the event takes place on the **6th October** and if you are travelling towards Basingstoke from the A339 Alton Road you may experience some disruption due to road closures. See the route map below.

Whilst the event does not start until 11:00 am the road closures will be in force from 09:30am



Close

Well that's it for this issue, for those of you taking bets on this, according to word count there are 2137 words in this edition with a few pictures. I hope you found at least some of them worthwhile. Articles from members for newsletters are always very welcome so if you are restoring a model or undertaking a new build share your experiences with the whole club.

Cheers
Andy

*To save costs the Newsletter is printed in black and white so you miss some of the detail of the photos in colour, etc. – if you would like to see it in full colour I will as usual ask **Carl** to add a copy to our BMBC website.*