The Flightline

Volume 37, Issue 5 Newsletter of the Propstoppers RC Club AMA 1042 May 2007

The President's Message

Well, even with the bad weather all around us we got in Warbird Day we had a good turn out even with it being the rescheduled. Thanks for all that showed up. We have some nice pictures of the event. Dave did a nice job of flying the bomber as you can see in the photos. The fighters just couldn't shoot it down but they tried hard. Dr. Mike blew by it like it was stopped; His fighter was hopped up to the nines.
I would like to thank ***Rick Grothman*** for a nice job of getting the interest up and organizing the day ***Great job.***

Moving on, this months event is Middletown Pride Day; Sat May 12th Thanks to Dave and his large tent and motor home we will have some shade and a focus for our activities. We hope to have a nice turn out with Cox Warbirds, electric park flyers, electric and fuel helicopters. We will run some old fuel motors and fly control line planes too. Please bring a friend and let's make this a grand event.

You may have notice the field hasn't been cut, that's because it is too wet, but it will be cut soon, so pray for sun.

How are the Trenton Terrors coming along, bring some to the meeting we all would like to see how you are doing.

See you at the meeting.

Dick Seiwell, President

P.S. I have the club's first aid kit and frequency board which will be brought to the field.

Agenda for May 8th Meeting
At Middletown Township Library;
Opens at 7pm meeting at 7:30 pm

1. Membership Report
2. Finance Report
3. Field Situations
4. Flying Field Improvements
5. Review of Club Scheduled Activities
6. Plan for Middletown Pride Day
7. Plan for Aerobat Day
8. Old Timer Building Program Status
9. Show and Tell

INSIDE THIS ISSUE

Minutes of the Propstoppers Monthly Meeting 10th April at the Middletown Library

Minutes of the Propstoppers Model Airplane Club
April 10th, 2007
The meeting was called to order at 7:30 p.m. by Vice President Dave Bevan
Roll-call by Ray Wopatek found 19 members and 1 guest present
Minutes of the previous meeting as printed in the newsletter were approved by the membership.
Treasurer's report by Phil Oetinger was presented and accepted without comment.

Old Business:

The Trenton terror building project was discussed. Several people have made progress but none are finished. There was some interest in organizing a section devoted to covering. Mick Harris is looking into organizing such a session.
Plans for our participation in Middletown Pride Day, May 12th were discussed. We will again have our aviation demos along with static models, flying and the toy glider give away.

New Business:

Dave Bevan updated us on the Widener college team's progress in building a payload model for the international contest. They have so far built 4 prototypes and are making steady progress.
Dr. Mike spoke about his efforts to find a new field in Chester County. He has been negotiating with several groups but so far movement is slow because the field has recently been purchased by 2 companies.

The meeting went into a break to allow informal discussion.

Show and Tell:

Chuck Kime showed his 30 year old chipmunk ARF that he is reviving for e-flight.
Eric Hofberg showed his M E109 Cox Warbird in finished condition.
Dave Harding showed his Cox Spitfire fully finished.
He also showed his finished B-24 with 4 wing-mounted speed 400 motor and 2-cell LiPo for power. He will have it ready to fly for Warbird day this weekend.

The meeting was adjourned at 8:45 p.m.

Richard Bartkowski, Secretary

Calendar of Events

Club Meetings

Regular Meeting at Middletown Township Library: opens 7 pm, meeting 7:30 pm Tuesday 8th May, 2006

Next Meeting Tuesday 12th June 2007 at the field.

Tuesday Breakfast Meeting
The Country Deli, Rt. 352 Glenn Mills
9 till 10 am. Just show up.
Flying afterwards at Sleighton Field

Regular Club Flying

At Middletown / Sleighton Field
Monday - Friday;
10 am until dusk - Electric Only
Saturday
10 - 3pm-for FUEL PLANES and
10 - Dusk for Electric
Sunday - 12 - Dusk – Electric Only

At Christian Academy; Electric Only
Monday through Friday after School till dusk
Saturday 10 am till dusk
Sunday, after Church; 12 pm till dusk

Special Club Flying

Saturday mornings 10 am Sleighton Field
Tuesday mornings 11 am Sleighton Field
Thursday evenings 5pm on CA Field

Note; only electric powered airplanes. Beginners using due caution and respecting club rules may fly GWS Slow Stick without instructors.

Propstoppers RC Club of Delaware County, Pennsylvania.

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Propstoppers Web Site; www.propstoppers.org

Widener SAE Aero Competition Program Update

The widener 2007 SAE Aircraft team made their presentation to the judges, as did all the other teams, last Friday. At the post-presentation party at the Springhaven Country Club, they were awarded for having given the best presentation of all the engineering projects.

The team flew three times last week without payload. The flights were videoed. On Monday this week we met in the morning and then we went to Bridgeport in the afternoon. They had been telling me that the ailerons worked correctly when rolling to the left, but there seemed to be little effectiveness to the right. Later it was said that the ailerons worked properly at low speeds, even during take-off, and during landing, but when higher throttle resulted in higher speeds the trouble was apparent. I measured the height of the LE and TE from the ground and it seemed that the right wing had considerable (1/2 inch) washout! The team was advised to re-twist and reheat the wing.

They head for the competition next weekend in Fort Worth, TX. We wish them luck.

Dave Bevan

Propstoppers Vice President, Dave Bevan, with last year's Widener model.

This is last year's Widener SAE Aero model. They are required to design, build and fly and airplane, using a standard 60 sized motor, to carry the maximum weight and take off in 200 feet or less. Points are also awarded for the quality of their design presentation and for predicting the demonstrated performance. Last year's winners from Brazil carried over 25 pounds of ballast.

The rules are changed slightly each year so as to force the incoming students to design and build a new model.

Dave Bevan has been coaching the Widener University teams for some years. This is quite a commitment as these Senior Year students come to these activities with good academic knowledge but few aerodynamics, structures and project management skills. To meld together a diverse team of individuals and guide them to design, build and fly a large RC airplane is challenge enough, but to achieve a top competitive design is a feat of a lifetime.

Of course, this is the goal of SAE and students learn a great deal from these competitions.

Cox Warbird Day

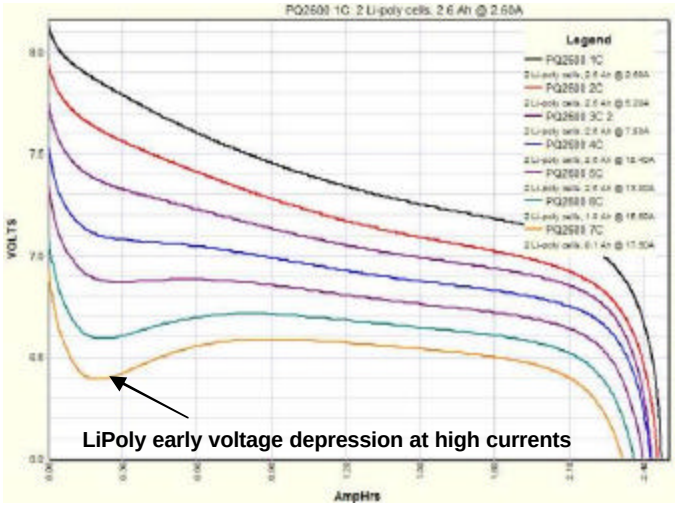
Weather forecasts are usually pretty good and nowadays you can cross check from several sources. On this basis it looked highly probable that the day scheduled for Cox Warbirds would be a blow-out. Consequently Event Manager, Rick Grothman, called the event and re-scheduled for the following Saturday. A message was sent out on Friday evening late, ahead of the advertised time of Saturday morning. None the less, a bunch of flyers and spectators turned out for what was actually excellent flying weather. Oh well, we ought to find a better way of notifying our members of event schedule changes.

Fortunately, the following Saturday also turned out to have excellent weather and a good turn out, although some of those who came on the scheduled day were not available this time. President Dick Seiwell had done his usual superb job of field preparation although it was still saturated from the heavy rains a few days before. Indeed, Lake Christian was up to the level of the field and lapped at the back edge of the pits. Wish it were a little less wooded as it would be a fine ROW pond.

Five Cox Warbirds showed up for the fun and Dave Harding had completed the B-24 Liberator so we could re-enact Winston Churchill's mission to Moscow. But first everyone wanted to make a test flight then re-charge before the first mission.

Editor Dave Harding with B-24 Liberator

The first flight was a test for the Liberator as it had received two coats of paint since its earlier test. Mick Harris made another excellent launch and the four-motor model slowly climbed towards the tree line. A somewhat tail heavy, sloppy turn brought it around and climbing slowly towards the Sweeney crane. Dave brought it around for a safe landing and some thinking about where the performance went. First thing that was found was the big LiPo had been left connected to the ESC for a week, allowing for some charge reduction. So the battery was put on charge for another test flight. This time things went a little better and once the first turn of the field was made ample power was evident for the rest of the flight. Subsequent further thinking about these events led us to conclude that the initial sluggish flight was due to the initial voltage depression experienced in LiPo batteries under high currents as depicted in the accompanying chart. After this initial depression the voltage recovers and then gradually drops over the rest of the flight. The second flight was over ten minutes and the re-charge put in only about 2000 mah, or half charge. This plane could cruise for over fifteen minutes with ease.



Soon we were ready for the first mission, but just then Dr. Mike arrived with his just completed Spitfire. He had not been able to get the decals on so this was in the nature of a first test hop. This model is very non-stock since it is powered by a direct drive Razor 300 brushless motor turning a Graupner speed prop and precision spinner fed from a LiPo battery.

Dr. Mike with his very hot Spitfire celebrates a spectacular first flight

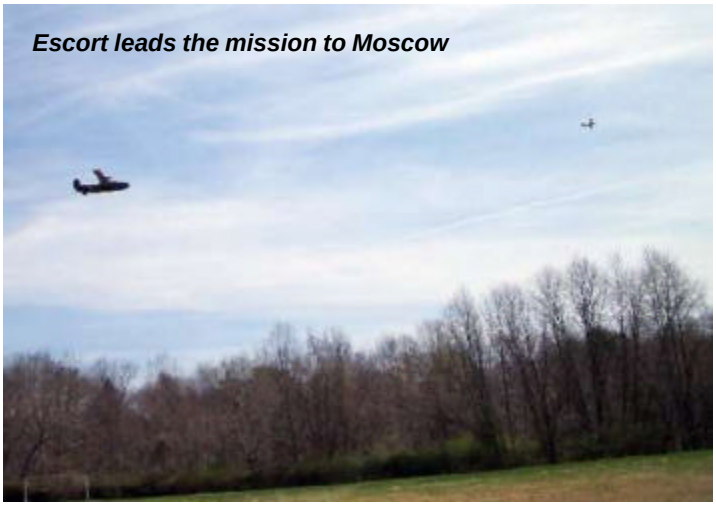
The first test launch resulted in a short fast arrival, but after fitting a new prop the second launch became the prelude to a wild ride like something from Disney. While trying to gain control Mike just managed to keep it off the cars, the spectators and the ground till he eventually got it up and away….. waaay up and away. This little rocket-ship goes almost out of sight in seconds. But it was a winner so he brought it down for a recharge and make ready for "The Mission".

Event Director, Rick Grothman, called a pilots meeting to plan the mission. Bomber pilot Dave Harding said he planned to fly race track patterns to allow the friendlies to escort and the axis fighter(s) to attack. Escorts were Dick Bartkowski and Rick Grothman with P-40's, Dr. Mike and Al Basualdo flying Dave Harding's Spitfire and the lone axis fighter was Eric Hoffman with his Bf-109. Mick made another excellent launch and the mission was on.

Mick Harris does stalwart duty with another good launch

For a while one of the friendlies flew cover but as in real life the job of bomber escort and attack is a daunting one, fraught with risk. By the end of this mission, only two fighters remained. The bomber was just too fast for the inexperienced "warriors" to make effective attacks and a number of these attacks resulted in target fixation and ground contact. The bomber continued to make repeated passes and eventually made a satisfactory landing in Moscow. The deal was cut with Stalin to open a second front in North Africa. After lunch the US entered the fray and once again Churchill's personal transport flew him to meet with another World leader. The mission; to Casablanca and a meeting with Roosevelt.

Escort leads the mission to Moscow



Coming home on a wing and a prayer

Wheels up landing after a long tough mission!

But wait, what is that forming up over there? Can it be the Ploiesti Romanian oil field raid? Where did all those Liberators come from?

Good grief; the Ploiesti Raid?

Although a set of Stars and Bars were on hand to re-badge the bomber and continue the war in the Pacific theater, the forces found themselves exhausted and broken, so these mission await another day. But all in all, this was a fun event and with a little more practice we could expand on the theme from time to time. Let's do it again.

Rick Grothman

But wait, what is that? Could it be? Yes it is; Dick Seiwell's nemesis; "the Black Snake of Lake Christian". It was delivered by a friendly neighbor safely back to the lake following Cox Warbird Day.

Middletown Community Pride Day Plans

Ok, we need all members to support this event with models for show, models for go and engines to make noise.

The Cox Warbirds should be just right for this field and maybe we could do some streamer towing….. and cutting? No way you guys could get close enough with those little props! The field is not big enough for the Liberator though, but I will bring it just for display.

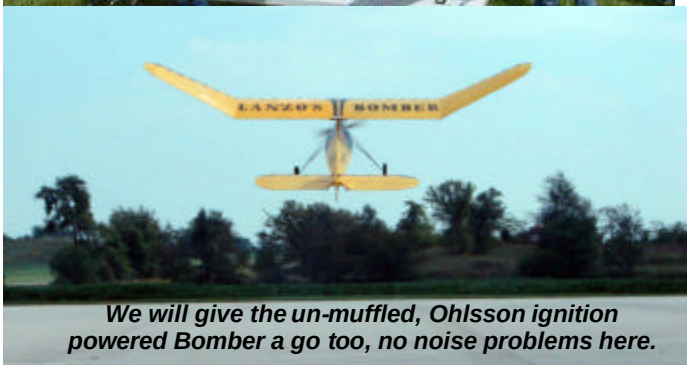
Yes, display! Last year that was one of the popular activities where we layed out our models on display. So bring something so we can show all the different type of models.

This is our layout last year and we plan to do much the same this time too.

Propstoppers at Middletown Pride Day 2006

Jess Davis with his Focke Wolf helicopter model

Treasurer Phil Oetinger with his models last year



We will give the un-muffled, Ohlsson ignition powered Bomber a go too, no noise problems here.

Electric Motors, Little Known Facts

I have been asked many times how do you pick a motor and that is a good question, but I think before that step you should know something about motor quality. Steve Neu has just published an excellent article on motors in the April Quiet Flyer magazine. So I thought I would summarize some of the important factors for you. But first the take home message;

Motor efficiency and quality are most important considerations together with careful matching the characteristics to the application. Not all motors are created equal; some are really inefficient and/or contain cheap materials. This can mean low performance, higher weight, excessive heating and intolerance to heat.

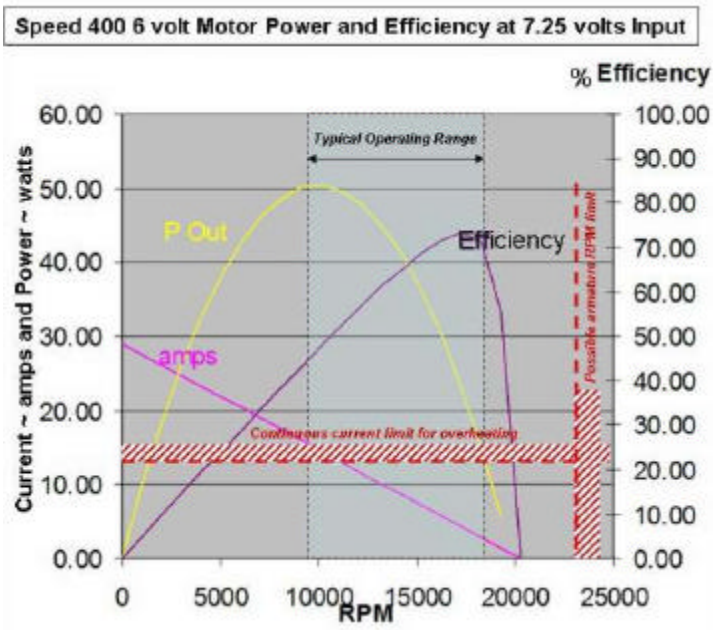
Good motors use high temperature wire insulation, thin laminations of high quality material, high quality permanent magnet materials and are well designed. Quality is not necessarily reflected by external appearance. Some of this may be indicated by the motor constants, the measured data from which we may calculate performance, but low temperature tolerance is not. May the buyer beware!

Electric flight for models has become of age because of advances in technologies have allowed the power we need at a weight we can afford. Most of these advances are in batteries, but the other part of a successful model is a lightweight motor. Motor technology has not progressed much in recent times but we get what we need by selecting a motor which is a good fit to our needs and then operate it close to its limits.

In a fantasy world we might just pick the smallest motor that fits and then apply enough voltage to get the power we need. Electric motors, unlike glow or gas engine, will try to provide increases in output power for increased input voltage, but this is where they run into the limits. There are three basic limits;

- Temperature in the coil windings
- Temperature in the magnets
- RPM of the armature

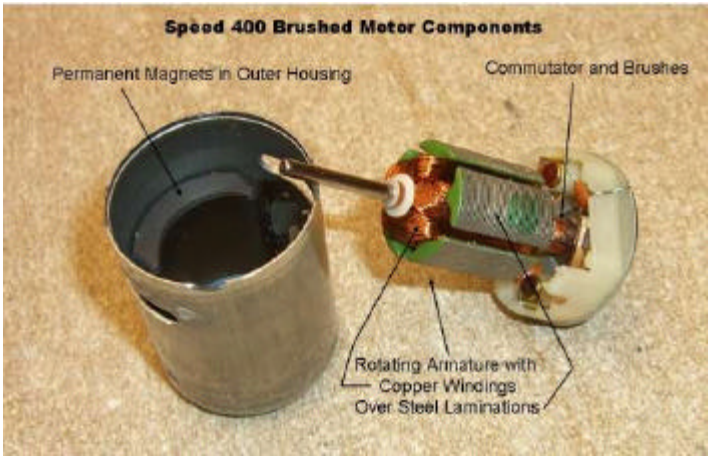
Temperatures are driven by the inefficiency of the motor, armature rpm by its mechanical strength.

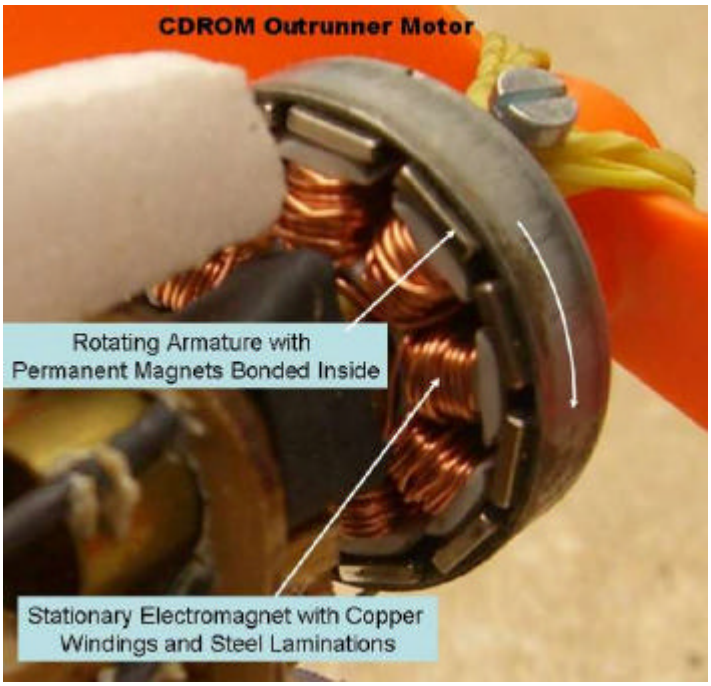


Consider the graphs for the Speed 400 6volt can motor above. If we just apply the 7.25 volts with no prop we get a little over 20,000 rpm and a small current, Io, the idle current. As we install bigger and bigger props the motor slows down and the current increases. The efficiency initially increases then at a certain current it begins to decrease. We may choose to operate at the higher current, but less efficient point to get the output power we need, but eventually we will run into the current and associated temperature limit. The result of operating beyond this point will be a burned up motor; you will "let the smoke out"!

If you disassemble a motor, either a good one or one you have fried, you will see coils of copper wire wound around steel laminates. These are the electro magnets which push against the permanent magnets to create the torque with which they turn the propeller. The current is switched so as to keep the armature pushing against its adjacent magnet. Brushed motors do the switching with a commutator and brushes, simply a way to get the current from the stationary battery to the rotating armature coils at the right time. Brushless motors do the switching with electronics.

In the motors we use, the brushed motors have a rotating electromagnet armature within the permanent magnet housing, whereas the brushless motors have a stationary electromagnet with the permanent magnets fixed to the rotating armature. The inrunner brushless armature rotates inside the electromagnet, whereas in the outrunner the magnets rotate outside.





The electro magnet copper wire is insulated by a thin coating so that when they are tightly wound no current may pass from wire surface to the adjacent wire.

Copper is a good conductor of electricity, but it is not a perfect conductor, so there is a resistance within these coils and where there is resistance power is lost in the form of heat. There are also other losses in a motor, in particular those associated with the switching of current and therefore magnetism within the electro magnet laminations. These too manifest the loss as heat.

The magnitude of the power loss from these inefficiencies is;

Power loss = I^2 x R

Where the power, P, is in watts, I is the operating current in amps and R the motor internal resistance in Ohms.
It is this power loss that drives the temperature of the coil windings and magnets.

The operating efficiency of our motor population varies from about 50% for can type brushed motors up to over 90% for well designed, quality inrunners, like Hackers and Steve Neu's series.

We select our motors to produce a certain propulsive force; the propeller thrust. We suffer the effects of inefficiency in terms of requiring a bigger motor to get a given power level and there are the two components in this motor size issue;

- Output Power, and
- Temperature limits

The output power is obvious; if the motor we choose operates at 50% efficiency at our design point, we need a motor twice the size of an ideal one.
The temperature limits may make us select an even bigger motor so as to operate it at lower current levels to avoid melt down. Manufacturers often, but not always specify the maximum current for continuous and short term operation; some express this capability in terms of power levels. Check out Steve Neu's site; www.neumotors.com

If you have the motor constants for your selection;
Kv; the rpm per volt
Io, the idle current
Rm, the internal resistance.

You can calculate the performance and in doing so you will also calculate its efficiency. Motocalc has both the calculator and a database of motors, batteries, props, ESC's and models. But you can also do these calculations on-line at Steve Neu's site; http://brantuas.com/ezcalc/neumotorscalc.asp

Of course, the power loss has to come from the battery so not only do you have a temperature issue, you also loose flight duration. Here is how these issues add up;

Effects of motor efficiency on motor and battery size for the same output power vs. 90% efficient baseline motor.

Motor Efficiency	Increased Motor "Size" for same output power	Increased battery size for same duration	Heat generating loss as % of output power*
50.00%	80.00%	80.00%	90.00%
60.00%	50.00%	50.00%	60.00%
70.00%	28.57%	28.57%	38.57%
80.00%	12.50%	12.50%	22.50%
90.00%	0.00%	0.00%	10.00%

* Not reflected in further increase in motor size to accommodate loss within temperature limits.

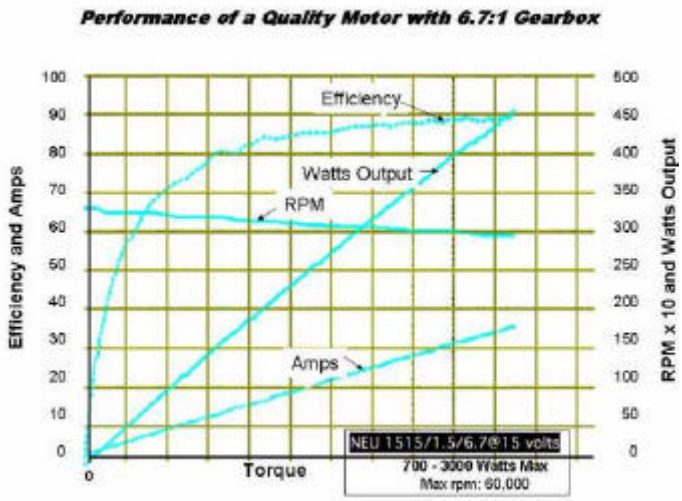
Now what drives these limits? For the wire temperature limit it is the quality of the insulation. Magnet wire insulation coatings can have temperature capabilities from 100°C to over 200°C.
Cheap motors use the lower temperature insulation because it is less expensive and allows simpler lest costly manufacturing processes.

The permanent magnets may be made from any one of several materials with widely differing magnetic performance and temperature capability. Magnetic materials loose their properties when heated and the capabilities of these materials also vary widely. Below is a table of basic permanent magnet materials and their properties, but in practice some of these begin to loose performance at only 100°C. How many of us have put together a setup and experienced "sizzle spit" temperatures on the motor case at the end of a flight? Often, such flights exhibit spectacular performance, but only for one flight. They also smell "funny" and rarely perform well again.

But there is another factor in the thermal properties of a motor, and that is the ability to reject heat. After all, it is the sum of the input heating minus the heat rejection that drives the temperature. Some motors are fitted with a finned heat sink to help remove the heat. Also, there is a difference between inrunners and outrunners in heat rejection. The inrunner is usually superior because the heat producing wires are on the outside, close to the case or heat sink surface. Whereas the outrunner has no such connection and it is hard to reject heat from their coils, although some larger units include a built-in fan.

Material		Cost Index	Maximum Energy Products (BH)max (MGOe)	Coercivity Hci (KOe)	Maximum Working Temperature (°C)	Machinability
Neodymium-Iron-Boron	Nd-Fe-B (sintered)	65%	Up to 45	Up to 30	180	Fair
Neodymium-Iron-Boron	Nd-Fe-B (bonded)	50%	Up to 10	Up to 11	150	Good
Samarium-Cobalt	Sm-Co (sintered)	100%	Up to 30	Up to 25	350	Difficult
Samarium-Cobalt	Sm-Co (bonded)	85%	Up to 12	Up to 10	150	Fair
Alnico	Alnico	30%	Up to 10	Up to 2	550	Difficult
Ceramic	Hard Ferrite	5%	Up to 4	Up to 3	300	Fair

Aside from buying quality products it is desirable to operate our motors at an efficient point, although sometimes a higher, less efficient operating point is appropriate, so long as we understand the consequences. Here is the operating performance data for one of Steve Neu's quality high performance motors;



This is a performance motor, designed to be efficient at high power. Indeed it is as it achieves almost 90% at about 35 amps on 15 volts. This data is for a motor with a 6.7:1 gearbox. A gearbox is frequently necessary for efficient operation with inrunner brushless motors as you need to match the motor efficient operating point with an efficient propeller. Without the gearbox this motor would turn a very small propeller at very high speeds. This would only be suitable for a ducted fan. A comparable outrunner may drive the propeller directly, but they usually are less efficient and have lower heat rejection capability and, as a consequence, need to be that much bigger in size and weight.

So there you have it; buy quality and design the installation to fit your model. On the other hand, buy cheap and just have fun with less performance and duration. But in any case, let the buyer beware.

Dave Harding

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Propstoppers R.C. M.A.C

Cox Warbird Day Participants, ready for action.

Chuck Kime with his 30 year-old Chipmunk, now with E-Power

Future Special Flying Events

Saturday 12th May, Middletown Township Community Pride Day at the Williamson Trade School.

Saturday 16th June, Aerobat Day

Saturday 14th July, Club Picnic

Saturday 18th August, Electric Texaco Postal Competition Flights

Membership Renewal
For 2007 - Last Chance