the Ampeer

March | The EFO Officers | 2007

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The Next Meeting:
Date: Thursday, March 1 **Time:** 7:30 p.m.
Place: Ken Myers' house – see address above

What's In This Issue:

Separating Fact from Fiction When Selecting a Brushless Outrunner Motor

By Ken Myers

I have been using several brands of brushless outrunners for many years now. It is hard to believe that in 2007 the manufacturers and suppliers still cannot consistently provided the information needed to select the correct motor for the proposed application. There is still a lot of advertising hype and a lot of useless and/or confusing, as well as misleading information, about the available motors. This makes motor selection extremely difficult for everyone, not just someone entering electrically powered RC.

Some things to be aware of:
There appears to be two "groups" of motor users.

1.) "Ampers" – They are the folks who use relatively high currents to achieve the desired Watts In. Using a high amp draw reduces the volts needed to achieve a given Watts In, which reduces the battery size, weight and sometimes the cost. 3-D fliers do this to keep the weight down, especially on smaller models. The folks flying giant scale do this to keep the cost down as well as the weight of the battery. In general, when compared to glow or gas powered planes, "ampers" use what would be considered large diameter props with low pitches. Competition sailplane and old-timer pilots also tend to be "ampers" as they have limited motor runs. Some Park Flyers use this method to keep the cost and air speed down. The majority of the brushless outrunner motors available are being pressed to their limits when being used by "ampers." "Ampers" are willing to give up some power system efficiency to gain a higher power to weight ratio.

2.) "Volters" – They use relatively higher voltages and comparatively lower amp draws to achieve the same Watts In. Generally a "volter's" plane uses a smaller diameter prop, compared to an "amper's" and a higher pitched prop for the same Watts In. The higher pitch, along with the generally higher RPM, produces a higher pitch speed and faster model. A lot of sport, sport scale and some park flyers are "volters." In general, the "volters" are using the power system more efficiently.

The Three-Cell Trap

Just as years ago there was a 6-cell trap, when using NiCads, there now appears to be a 3-cell trap when using Li-Po batteries. This is causing a lot of folks to become "ampers."

Pretty much the same market pressures that caused the 6-cell trap are now causing

the 3-cell trap.
1. A majority of the planes available at the local hobby shop (LHS) and online are marketed for 3 Li-Po cell usage, just as the majority of early available electric planes were designed, albeit poorly, for what was claimed to be 6-cell operation.
2. 3-cell capable charges are cheaper than higher cell count chargers, and they are more abundant, just as 6-cell chargers were.
3. 3-cell packs are cheaper for the distributor to "put on the shelf" than packs with higher cell counts. The 6-cell NiCads were also cheaper than 7-cell packs. For all practical purposes, no one ever stocked anything over an 8-cell NiCad flight power pack. The good thing back then was that the RC car community was using a lot of 6-cell packs, so they were abundant. Today, the electric flight market itself is driving the 3-cell type planes and the stocking of 3-cell Li-Po packs.
4. When battery eliminator circuits (BEC) were first used to reduce the weight of 6- to 8-cell NiCad electric planes, there was not a big problem with the linear BEC, usually found in the ESC, being able to handle the 3 servos typically used in the electrically powered planes of the time. For the majority of electronic speed controls (ESC) with a linear BEC 3 Li-Po cells is about the "limit" for being able to use 3 or possibly 4 servos depending on type.

Prop Diameter Considerations

The prop diameter is limited for some airframes by the length of the landing gear. If a plane has landing gear, that must be taken into consideration when choosing the power system. It is possible for two versions (winds/termination) of the same motor to be taking the same amount of power from the battery, but the prop they are using to do it will be different. The higher Kv motor will be turning a smaller diameter prop at a higher RPM and may be the one to use over the relatively lower Kv motor to get a prop size that will work with the length of the landing gear.

Additionally, there is a ratio between the ready to fly (RTF) weight in ounces and the disk area in sq.in. of the prop. That ratio can used to determine the prop diameter for a given task. This is a general rule, with many exceptions.

The formula is:
(Square Root ((RTF wt. in oz. * multiplier) / Pi)) * 2

The multipliers:
Indoor: Average 8.5, Median 8.0, Range 7.34 – 12.08
Backyard: Average 4.4, Median 3.7, Range 0.86 – 7.66
Park Flyer: Average 3.2, Median 3.0, Range 0.71 – 7.48
Sport: Average 2.3, Median 2.0, Range 1.04 – 4.7
Advanced Sport: Average 2.0, Median 1.4, Range 1.03 – 4.61
Expert Sport: Average 1.0, Median 1.2, Range 0.94 – 1.27

An Example to clarify:
Average: 64 oz. Sport plane: (64 * 2.3 = 147.2) / Pi = 46.86
SQRT of 46.85 = 6.85 * 2 = 13.69 or 14 inch diameter
Median: 64 oz. Sport plane: (64 * 2 = 128) / Pi = 40.74
SQRT of 40.74 = 6.38 * 2 = 12.77 or 13 inch diameter.

Therefore a 13 in. or 14 in. diameter prop would be about "right" for this sport plane.

Compare that to a Park Flyer of the same weight.
Average: 64 oz. Park Flyer: (64 * 3.2 = 204.8) / Pi = 65.19
SQRT of 65.19 = 8.07 * 2 = 16.15 or a 16 in. diameter prop
Median: 64 oz. Park Flyer: (64 * 3 = 192) / Pi = 61.12
SQRT of 61.12 = 7.82 * 2 = 15.63 or 16 in. Note that a 15 in. diameter prop would be okay as well.

Prop Pitch and RPM

The prop pitch and RPM create the theoretical pitch speed. Pitch speed is the theoretical speed at which the prop will move the aircraft through the air in level flight at a given RPM if the plane is designed to fly at that speed, if the true pitch is actually known and all the elevation and atmospheric conditions are just right.

In general, the quickly calculated pitch speed[1] for Park Flyers, 3-D Park Flyers, old-timers and sailplanes (not hot linters) does not exceed 40 mph/64Kmph and usually is between 30 mph/48Kmph and 35 mph/56Kmph. Sport and Advanced Sport planes generally have a pitch speed from about 50 mph/80Kmph to 70 mph/113Kmph, with majority having pitch speeds closer to 50 mph rather than 70 mph.

1.) quickly calculated pitch speed: RPM/1000 * the "given" pitch in inches or with a calculator (RPM * the "given" pitch in inches)/1056 which gives a slightly lower result. The results are in mph. 1 mph = 1.61Kmph

Examples:
Stated 7” pitch at 8000 RPM
8000/1000 * 7 = 56 mph * 1.61 = 90Kmph
or
(8000 * 7)/1056 = 53 mph * 1.61 = 85Kmph

Either method is close enough, as your plane will never achieve the theoretical pitch speed, but it is good enough for quick calculations used in motor selection.

Prop Design and Age

Many manufacturers have several different designs for a designated prop size (i.e. 10x6) that perform differently. The designs also vary from manufacturer to manufacturer. To muddy the waters even more, some manufactures have actually changed the design of a prop over time without giving it a new designation, therefore some prop characteristics then depend on <u>where</u> and <u>when</u> the prop was purchased. The material used in the manufacture of the prop also affects its performance. Choosing the “best” prop for a specific application is usually a matter of trial and error on the bench and in the air. To make it easier on myself, I have limited, because of the type of planes I tend to fly, my prop choices to the APC E, Sport, and Pattern and Aeronaut E types. That doesn’t mean that I don’t occasionally give something else a try, but by limiting the type and brand of prop I use, motor selection can be somewhat easier.

Power

Watts In is relatively easy to measure and is used by many to say how much power their plane has. It is Watts Out that really makes a difference on how the plane performs. Watts Out is much harder to calculate, even though we try to do it in many ways.

There seems to be a lot of interest in comparing a glow engine’s power to an electric motor’s power so that an existing glow powered plane can be converted to electric power. As you read the following, keep in mind that some motors and ESCs are more to much more efficient than others, so while the general information pretty much holds true, there are exceptions.

Generally, to covert a glow plane to an electrically powered plane, use the upper cubic inch displacement, recommended by the supplier for a 2-stroke glow motor for the particular aircraft, and multiply it by 1000. i.e. a .15 cu.in. 2-stroke recommendation would require 150 Watts In and a .46 cu.in. 2-stroke recommendation would require 460 Watts In. When powered this way, the plane will fly quite nicely, remembering that the glow plane was really “over-powered” to begin with when powered by the upper end 2-stroke, but this electrically powered plane would not be equivalent to the 2-stroke version in performance. To get closer to equivalent performance the multiplier should be 1500. Therefore, to have equivalent performance for a .46 cu.in. 2-stroke would require about 690 Watts In when using an efficient motor and ESC.

What the motor numbers tell and don’t tell you:

Kv is the motor speed constant given as the RPM per volt <u>**out**</u>. It is directly related to the motor’s **Kt**. **Kt** is the torque constant. The relationship is: Kv * Kt = 1355.

There is a voltage drop through the brushless ESC, wiring and motor combined with other losses that causes the volts out to be lower than the volts in.

The effects of Kv can be seen with an example taken from the Drive Calculator (http://www.drivecalc.de) motor simulation program. The battery for the simulation is the PolyQuest 3300XP 3S1P and the prop an APC 10x7E. The only change is the motor Kv.

AXI 2820/08 Kv=1500, Volts 9.93, Amps 65, RPM 10670, Watts in 645, Watts out 443, Drive Eff. 68.6%
AXI 2820/12 Kv=1000, Volts 10.57, Amps 29.7, RPM 8970, Watts in 313, Watts out 254, Drive Eff. 81.0%

Looking at the data shows that for a given motor, using the same battery pack and the same prop, the higher Kv version of the motor will pull more amps and have a higher RPM even though the Volts In is lower due to the higher amp draw. Of course the reverse of that is true for the lower Kv version.

In this example, Model Motors, the manufacture of the AXI line of outrunners, changed the Kv on this version of their motor by changing the number of winds and the wire thickness or gauge. The /08 indicates that it has eight winds of thicker wire while the /12 has twelve winds of thinner wire.

Changing the number winds on a stator is not the only way to change the Kv. The way that the winds are terminated will also change the Kv. TowerPro (http://www.towerpro.cn) has a motor they designate as the 2915-5, therefore a 5 wind, but it has two versions. One terminates in what is designated as a “Y/WYE” termination and the other in a Delta termination. In this example it is the way that the motor is terminated that makes the difference in the Kv. BP Hobbies (http://www.bphobbies.com) sells both versions of the motor. BP Hobbies gives the Kv as 790 for the "Y" and 1100 for the Delta. To make things even more interesting, TowerPro also has a 2915–6 (6 wind) version of this motor and gives the Kv as 950. Like Model Motors, TowerPro has three versions of the "same" motor, but one version of this TP motor has its Kv changed by the termination method while the other has its Kv changed by the number of winds and wire thickness.

To make things even more interesting, the ESC timing makes a difference in the operational Kv.

The bottom line is that it doesn't matter how the Kv is changed, the higher the Kv on the same series of motor, the higher the amp draw and RPM on the same battery and prop and visa versa.

Weight - A Useful "Clue"

The weight of the motor in grams (1 oz. = 28.349g) is a good indicator of the power it will be able to handle before it is pushed to the extreme and possible destruction.

The numbers I am about to use do not apply to CD-Rom motors converted to flight motors or high revving outrunners like the famous LittleScreamers Micro OUTRUNNERS.

The multipliers used below are really Watts In per gram of motor weight.

I have seen Maximum Watts In = 3.5 * motor weight in grams. This is used by some as the maximum. It should be noted that some columnists and their "parent" magazines do reviews that press brushless outrunner motors beyond this point. I cannot recommend it and do not recommend it!

My Personal Maximum Watts In = 3 * motor weight in grams – I am just not comfortable using or recommending a higher number.

My Personal Minimum Watts In = 1.5 * motor weight in grams – below this, a lighter motor can be used without pressing it too much.

My Personal preference range is between 2 and 2.75 Watts In per gram of motor weight.

Remember that these numbers apply to the most common outrunner motors. In-runner brushless motors have much higher multiplier numbers, while brushed motors have a significantly lower number multiplier.

Specific Examples

I started writing this in December 2006. The data presented here was available online at that time. I have chosen and arranged the data in an identical manner, although it may **not** have been presented on the supplier's Web site in this format. I have included both imperial units and metric units, even if the supplier didn't. Anything in quotes was cut and pasted from the supplier's Web site. All spelling and punctuation is theirs! Whatever follows the word "**Remarks**" are my comments. While smaller, lighter motors are in more general usage, I've chosen the 5 oz./142g "class" to compare. (~130g – ~160g)

Hacker A30 (http://www.hackerbrushless.com)
Weight: 144.6g/5.1 oz.
Outside diameter & length mm: 37.2 x 43.0
Price: $84.99 inc. mount & prop adapter

Using my weight formulas:
My Max: 434 Watts In
My Range: 289 to 398 Watts In
My Min: 217 Watts In

http://www.hackerbrushless.com/motors.shtml, "The Hacker A30 series motors are designed for Larger Parkflyers, 3D Aerobatic, and Scale models from 24oz to 60oz and utliize 2 to 4 series LiPoly batteries."
http://www.hackerbrushless.com/motors_a30.shtml "A30-L- for 30 to 45 oz. 3D-Aerobatic and Scale models with 2-3 cell LiPoly batteries"
Remarks: It appears that Hacker is revamping its brushless outrunner line as this is being written. It has been reported that they have been reducing inventory of the current line of motors and that "newer" versions will be available soon.

Hacker A30 -10L
Kv=1185
Battery 3 - 4 LiPo
Operating current: Max Constant 3S 29 amps, 4S 20 amps
Peak Amps: 3S 40 for 15 seconds, 4S 30 for 15 seconds
Peak Watts: 425,
Prop: 3S APC-E 9x4.5 to 10x5, 4S TBA
Remarks: Typical Usage
3D 2S, 23 oz. – 29 oz., 350 sq.in. – 410 sq.in, APC 12x6 sport – APC 13x7 sport
Park 2S, 35 oz. – 43 oz., 460 sq.in. – 530 sq.in., APC 12x6 sport – APC 13x7 sport
Sport 3S, 35 oz. – 68 oz., 360 sq.in. – 570 sq.in., APC 9x4.5E – APC 11x5.5E

Advanced Sport 3S, 38 oz. – 68 oz., 320 sq.in. – 470 sq.in., Aeronaut 8.5x7E – APC 11x5.5E
Expert Sport 3S, 55 oz. – 57 oz., 340 sq.in. – 360 sq.in., APC 9x7.5E – APC 9x8 sport
Note: Even though they recommend 3-4 LiPo cells, I found only one instance where a 4S pack might work.

Hacker A30-12L
Kv=1000
Battery: 3 – 4 LiPo
Operating current: Max Constant 3S/25 amps, 4S/15
Peak Amps: 3S/37 for 15 seconds, 4S 27
Peak Watts 400,
Prop: 3-cell APC-E 9x6 to 10x7, 4-cell TBA
Remarks: Typical Usage
3D 2S, 25 oz. – 25 oz., 370 sq.in. – 390 sq.in, APC 14x10 sport – APC 15x8 sport
3D 3S, 31 oz. – 45 oz., 390 sq.in. – 500 sq.in., APC 11x5 sport – APC 13x4E
Park 2S, 38 oz. – 41 oz., 490 sq.in. – 510 sq.in., APC 14x10 sport – APC 15x8 sport
Park 3S, 40 oz. – 59 oz., 510 sq.in. – 650 sq.in., APC 11x5 sport – APC 12x6 sport
Sport 3S, 32 oz. – 60 oz., 340 sq.in. – 530 sq.in., APC 9x4.5E – APC 11x5.5E
Sport 4S, 34 oz. – 75 oz., 360 sq.in. – 610 sq.in., Aeronaut 7x7E – APC 10x6 sport
Advanced Sport 3S, 44 oz. – 59 oz., 360 sq.in. – 430 sq.in., APC 9x9E – APC 10x10E
Advanced Sport 4S, 34 oz. – 75 oz., 300 sq.in. – 510 sq.in., Aeronaut 7x7E – APC 10x6 sport
Expert Sport 4S, 34 oz. – 75 oz., 250 sq.in. – 420 sq.in., Aeronaut 7x7E – APC 10x6 sport
Note: I tried many different ways to come up with a "helpful" way to present the data I generated on these motors. The above is NOT helpful in the least! I presented the data here for the Hacker motors to illustrate the point that there is no useful way to present the data. There are so very many ways that these motors can be used, it is pointless to try and pinpoint specific useful examples.

Remarks: There is an applications page on the site, http://www.hackerbrushless.com/motors_a20application.shtm, but no applications are shown for this motor.

It is interesting to note that they say this is a 2-3 cell motor just before giving the 3 and 4 cell information with no information for 2-cell usage.

KONTRONIK KORA 15
(http://www.kontronik.com/Kora152005e.htm)
Weight: 150g/5.3 oz.
Outside diameter & length mm: 40.5 x 39.0
Price: $127.00 no mount or prop adapter included

Using my weight formulas:
My Max: 450 Watts In
My Range: 300 to 413 Watts In
My Min: 225 Watts In

Remarks: Very little useful data posted by the manufacturer.

KONTRONIK Kora 15-10W
Kv=1125 or 1133 (both given on Kontronik site)
Battery: 2 – 3 LiPo
Operating current: Max Constant NA
Peak Amps: NA
Peak Watts NA
Prop: 2S 12x6, 11x8, 3S 10x6 (no brands or type mentioned)
Remarks: I found useful 2S & 3S applications.

KONTRONIK Kora 15-12W
Kv=920
Battery: 2 – 5 LiPo
Operating current: Max Constant NA
Peak Amps: NA
Peak Watts NA
Prop: 3S 12x6, 11x8, 11x6, 4S 9x6, 10x5 (no brands or type mentioned)
Remarks: I found useful 2S, 3S & 4S applications.

KONTRONIK Kora 15-14W
Kv=790
Battery: 2 – 5 LiPo
Operating current: Max Constant NA
Peak Amps: NA
Peak Watts NA
Prop: NA
Remarks: I found useful 2S, 3S & 4S applications.

KONTRONIK Kora 15-16W
Kv=690
Battery: 2 – 6 LiPo
Operating current: Max Constant NA
Peak Amps: NA
Peak Watts NA
Prop: 3S 18x8, 14x9, 15x8, 4S 11x5.5 – 14x7, 5S 11x5.5 (no brands or type mentioned)
Remarks: I found useful 3S, 4S, 5S & 6S applications.

Remarks: Actually, there is no useful application information posted on the Web site but there are prop charts with expected performance. That is too bad, since this appears to be the "best" motor in the group.

TowerPro 2915-5
(http://www.bphobbies.com/view.asp?id=V450327)
Weight: 140g/4.94 oz.
Outside diameter & length mm: 36.5 x 39.0 (guestimate based on TP photo on Web site)
Price: $49.95 inc. mount or prop adapter

Using my weight formulas:
My Max: 420 Watts In
My Range: 280 to 385 Watts In
My Min: 210 Watts In

TowerPro 2915-5 "Y" wind
Kv=750
Battery: 3 LiPo
Operating current: Max Constant NA
Peak Amps: 35 no time specified
Peak Watts 450
Prop: APC 11x6 or 12x6, type unspecified
Prop: alt from TP site, 9*6, 10*5
http://www.towerpro.cn/english/motor/2915.html
http://www.bphobbies.com/view.asp?id=V450327&pid=V284038
"This motor is roughly equivalent to a .30 sized glow engine and is recommended for planes up to 5 lbs (80 oz / 2.3 kg) total weight."
http://home.comcast.net/~truerc/esc/escNmotor.htm
"Powerful motor for .40 size models"
"Suitable for 2-4 cell Li-polymer battery"
Remarks: I really found no "useful" two-cell applications. It is interesting that one supplier calls it equivalent to a .30 and another supplier says for a .40 size model. It appears to be best used with 4 or 5 Li-Po cells.

TowerPro 2915-5 Delta wind
Kv=1100
Battery: 3 LiPo
Operating current: Max Constant NA
Peak Amps: 40 no time specified
Peak Watts: 450
Prop: APC 9x6 or 9x7.5
Prop: alt from TP site, 9*6, 10*5
Remarks: This is a 3S motor, no real uses for 4S, but could be used with a 2S for 3-D or park flyer.

http://www.bphobbies.com/view.asp?id=V450327&pid=W392031
"This motor is roughly equivalent to a .30 sized glow engine and is recommended for planes up to 4 lbs (64 oz / 1.8 kg) total weight."

TowerPro does not list the "Delta" wind on their site. The data given above is a combination of data from the TP, BP Hobbies and True RC Web sites. It should be noted that most suppliers list the weight as 123g, but TP and a review I read on the Internet of a measured motor give the weight as 140g.

Model Motors AXI 2820
(http://www.hobby-lobby.com/brushless-axi2820.htm)
Weight: 151g/5.3 oz.
Outside diameter & length mm: 35 x 48
Price: $85.60 plus $13.90 for mount and prop adapter

Using my weight formulas:
My Max: 453 Watts In
My Range: 302 to 415 Watts In
My Min: 227 Watts In

AXI 2820/08
Kv=1500
Battery: 2 – 3 LiPo
Operating current: Max Constant NA
Peak Amps: 55 for 30 seconds
Peak Watts: NA
Prop: 2S 12x8, 3-cell 11x5
Remarks: Appears to be best used with 2 Li-Po cells, NOT 3.

AXI 2820/10
Kv=1200
Battery: 3 – 4 LiPo
Operating current: Max Constant NA
Peak Amps: 42 for 30 seconds
Peak Watts 420 in AXI prop chart*
Prop: 3S 11x8
Remarks: Appears to be best used with 3S.

AXI 2820/12
Kv=990
Battery: 3 – 5 LiPo
Operating current: Max Constant NA
Peak Amps: 37 for 60 seconds
Peak Watts: 485 in AXI prop chart*
Prop: 3S 11x6
Remarks: Appears to be best used with 3 or 4 Li-Po cells, NOT 5.

http://www.hobby-lobby.com/brushless-axi2820.htm

"OUTRUNNER replacement for .40 size glow engine"
http: //modelmotors.cz/index.php?page=61&product=2820&serie=8&line=GOLD
"Glow Engine: .32 - 2stroke .40 - 4stroke"

E-flite Power 15 BL
152g/5.4 oz.
Outside diameter & length mm: 35 x 48
Price: $79.99 inc. mount & adapter

Using my weight formulas:
My Max: 456 Watts In
My Range: 304 to 418 Watts In
My Min: 228 Watts In

Kv=950
Battery: 3 – 4 LiPo
Operating current: Max Constant 34 amps
Peak Amps: 42 for 15 seconds
Peak Watts: NA
Prop: 10x6 to 13x6.5 Electric
Remarks: Appears to be best used with 3 or 4 Li-Po cells.
http://www.horizonhobby.com/Products/Default.aspx?ProdID=EFLM4015A
"Equivalent to a 15-size glow engine for sport and scale airplanes weighing 36- 56-ounces (1020- to 1590-grams)"

Hyperion Z3019
145g/5.1 oz.
Outside diameter & length mm: 37 x 43.8
Price: $79.95 plus $7.95 for mount and prop adapter

Using my weight formulas:
My Max: 435 Watts In
My Range: 290 to 399 Watts In
My Min: 218 Watts In

Hyperion Z3019-10
Kv = 1070*
Battery: 2 – 4 LiPo
Operating current: Max Constant NA
Peak Amps: 46 for 60 seconds
Peak Watts: NA
Prop: APC 8x6E – 14x7E
Remarks: * I have this motor and found the Kv to be closer to 1230. It appears to be best used with 2 or 3 Li-Po cells.

Hyperion Z3019-12
Kv = 900
Battery: 2 – 4 LiPo
Operating current: Max Constant NA
Peak Amps: 42 for 60 seconds
Peak Watts: NA
Prop: APC 10x5E – 13x6.5E
Remarks: Appears to be best used with 3 or 4 Li-Po cells.

Summary

It can be seen that, for the most part that there are HUGE differences in the way that these similar motors are marketed.

These are basically 450 Watts In maximum continuous use motors, which means, when they are being used near the maximum continuous Watts In, they are roughly equivalent to a glow .30 2-stroke or .45 4-stroke. When they are used near 300 Watts In they are roughly equivalent to a glow .20 2-stroke or 30 4-stroke. These numbers are especially useful when doing glow conversions.

Selecting a motor can be quite difficult. Many times, not enough or even the right kind of information is available. Suppliers make some "interesting" statements, that are not really that helpful. For the above motors, I found almost 500 prop combinations that would be useful with these motors in widely varied applications! That doesn't count the instances where a given prop would run on the motor fine but not be particularly useful. My computer simulation runs didn't even include any folding props, wood props, or many more kinds of props!

Four Groups

When the motors are arranged by their Kv values, four groups emerge. They are:

AXI 2820/08 Kv=1500
Main use: 2S

Hyperion Z3019-10 Kv = 1230*
AXI 2820/10 Kv=1200
Hacker A30 -10L Kv=1185
KONTRONIK Kora 15-10W Kv=1125 or 1133
TowerPro 2915-5 Delta wind Kv=1100
Main use: 3S

Hacker A30-12L Kv=1000
AXI 2820/12 Kv=990
E-flite Power 15 BL Kv=950

KONTRONIK Kora 15-12W Kv=920
Hyperion Z3019-12 Kv = 900
Main use: 3S or 4S

KONTRONIK Kora 15-14W Kv=790
TowerPro 2915-5 “Y” wind Kv=750
KONTRONIK Kora 15-16W Kv=690
Main use: 4S or 5S

The Kontronik Kora series is a European manufactured motor. It costs the most, probably is the “best” in quality and performance of the group, and yet has the least information available about it.

The Model Motors AXI series is also manufactured in Europe. The distributor in the USA, Hobby Lobby International, seems to supply some misleading information on their Web site. It should also be noted that Hobby Lobby is not the only importer now. BP Hobbies and other vendors also now supply the AXI line of motors.

As soon as I get the time, I will post a chart for these motors on the EFO Web site that will provided specific use information, which because of space in this issue, could not be presented here.

More on the Jeti Spin 44 and Spin Box

By Ken Myers

On January 2, 2007, I decided to take a closer look at the data collected by the Jeti Spin 44 ESC. I had done more “research” and decided that the number of poles should be set to 12, not 14 as previously reported.

It was a bright, sunny morning and the testing was done in my dining room, at room temperature in natural light.

The motor was run up fairly slowly to full throttle and a couple of seconds after the throttle stick hit the stop on the transmitter; the data was captured and held with the Hyperion Emeter.

Emeter data:
Volts: 12.64
Amps: 30.6
RPM: 8010
V-Min: 12:55
V-Max: 15.87
A-Max: 30.6

Spin Box data:
MaxCurrent 33,1A, 12,79 V, 00:08
MinCurrent 32,7A, 12,79 V, 00:08
Max Voltage 16,30 V 00:00
Min Voltage 12,79 V 00:08
Actual Voltage 16,27 V
Off Voltage 15,36 V 00:08
Motor Run Time 00:08 s
Power ON Time 01:33 s
MOTOR POLE NO. 12
Gear 1:1,0
Max motor RPM 09560, 00:06
Max prop RPM 09560, 00:06
Errors U=n, T=n, C=n, I=n

Differences:
RPM 9560/8010 = 1.19 or Jeti 20% higher
Volts: 12.79/12.64 = 1.01 or Jeti 1% higher
Amps: 33.1/30.6 = 1.08 or Jeti 8% higher
Amps: 32.7/30.6 = 1.07 or Jeti 7% higher

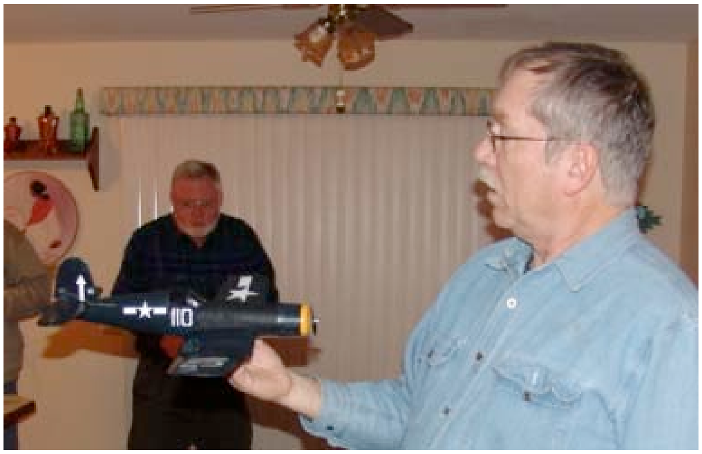
When the number of poles is changed in the Spin Box to 14 then:
MOTOR POLE NO. 14
Gear 1:1,0
Max motor RPM 08220, 00:06
Max prop RPM 08220, 00:06
RPM 8220/8010 = 1.03 or Jeti 3% higher

The real problem is that Jeti does not define MOTOR POLE NO. The number of magnets is sometimes given as the “pole” number by the manufacturer or supplier. BP Hobbies states 14 poles for the BP 3530-6 being used as the “test” motor as it has 14 magnets. The number of poles on the stator is also sometimes referred to as the number of “poles”. There are 12 “poles” on the stator of this motor. Using MOTOR POLE NO. 12 produces the greatest RPM error.

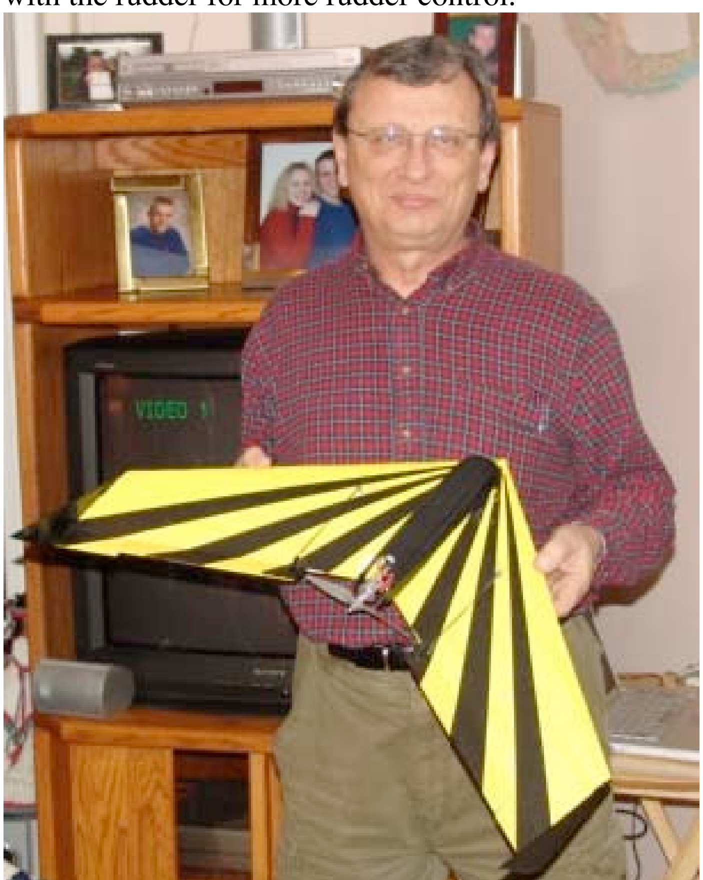
Again, I would like to note that the Emeter is NOT a lab grade instrument, but its tachometer readings closely match my Hobbico tachometer readings and the Emeter’s volt and amp readings closely match those of my Astro Flight Whattmeter.

The January EFO Meeting

The January 2007 EFO meeting was held at Ken’s house and well attended on a rainy Thursday evening.



Richard Utkan shared information on his Cox Corsair. He says it flies very well and is stock, except for using a Li-Po pack. It weighs 4.5 ounces ready to fly (RTF). It has a wingspan of 20.25 in. and uses the supplied130 electric motor. It uses rudder, elevator and speed control (REM). He modified the rudder by cutting the top of the vertical stab free and joining it with the rudder for more rudder control.



Rick Sawicki shared his modified Wedgie. He put this plane together for his son who had a hankering for speed. It weighs in at 11 oz. RTF and has a 28 in. wingspan. He is very thrilled with the motor selected to motivate this wing into the 80 mph to 90 mph range. The motor is the Little Screamers Park Jet 2. This motor weighs less than one ounce yet using a Castle Creations 25, Thunder Power 3S 2100mAh Pro Light Li-Po pack and 6.5x5 prop it is handling the 18.5 amp static draw.

Hank Wildman is putting together a large Corsair. He has installed a sound system in it that generates the sound of the Pratt-Whitney R-2800 Double Wasp radial engine. It can be pumped up to 98db. Can you say not so silent flight! He also brought along several DVD videos with highlights of some of his big planes flying. Good videos and enjoyed by all. Thanks, Hank.

Ken Myers showed the physical differences between a 16-cell 3600mAh NiMH pack, 5-cell 4000mAh Li-Po Pack and a 5-cell Emoli (Milwaukee V28) pack. There was discussion about the Milwaukee V28/Emoli cells and the DeWalt/A123 cells.

Ken did a presentation on why using cubic wing loading (CWL) can be more useful than using the traditional wing loading. (More information on CWL will be in next month's *Ampeer*. KM)

Ken also set up his computer so the anyone could see the data he has gathered on planes, their CWL relationships and power requirements.

Dues were collected from many of the members present, and the dues are due for other EFO member now.

Spektrum DX7 Transmitter Charging

From John Mrozinski johnexi@aol.com

John recently brought to my attention an interesting facet of the Spektrum DX7. He notes that the transmitter battery is a 1500mAh NiMH (confirmed on the Horizon Hobby Web site) and the supplied charger is a 50mA charger. I had checked the Spektrum Web site and found that the manual says it is a 110mA charger. John was told this was a misprint. I have a copy of his email to Horizon Hobby about this and the person who replied stated, "As of this time there are no plans to change the charger in the DX7."

I called Joe's Hobbies and verified that the supplied charger is indeed a 50mA charger. The Spektrum DX7 online manual p. 10 states, "It is imperative that you fully charge both the transmitter and the receiver battery packs prior to each flying session. To do so, using the included wall charger, leave the charger and batteries connected overnight (16 hours).

Do the math folks and be forewarned! Oh, forgot, you don't like math. 1500 / 50 = 30 hours.

Upcoming Events

Thursday, March 1
EFO Monthly Meeting, 7:30 P.M., Ken Myers's house, 1911 Bradshaw Ct., Commerce Twp./Walled Lake, MI 48390

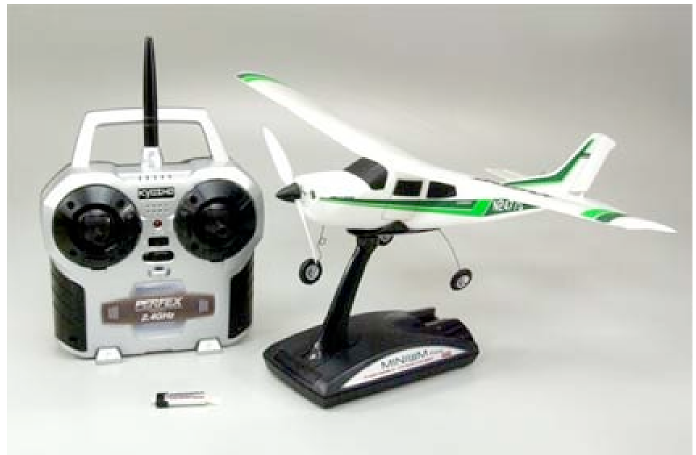
April 13 - 15, Weak Signals - R/C Expo, "The Toledo Show", SeaGate Centre, 401 Jefferson Avenue, Toledo, Ohio 43604, Info www.toledoshow.com/

July 7 & 8 Mid-America Electric Flies, Electric Fly-in, Midwest R/C Society 5 Mile Rd. flying field, Northville Twp., MI Sponsored by the Ann Arbor Falcons, Electric Flyers Only of southeastern Michigan and the Midwest R/C Society. CD's Ken Myers & Keith Shaw. Info: kmyersefo@aol.com

August 18 & 19, Greater Detroit Soaring and Hiking Society (GDSHS), Detroit X5J (Electric Launched MOM sailplane contest), club field at Addison Oaks County Park, 1480 W Romeo Rd Leonard, MI 48367, Info gdshs.com

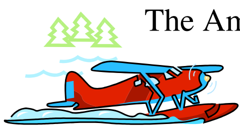
Ampeer Paper Subscriber Reminder

When subscribing to or renewing the **paper** version of the *Ampeer*, please make the check payable to Ken Myers. We do not have a DBA for the *Ampeer* or EFO. Thanks, Ken



http://www.kyosho.com/eng/products/rc/detail.html?product_id=101484
Check this out. Details and photo here are found on the Kyosho Web site.

Minimum Airplane Readyset - Cessna 210 Centurion (Green)
Revolutionary slow flight capability changes the world of scale aircraft. Only 18g! Advanced 2.4GHz control system uses FHSS (**) method!
Kyosho says it will be available in May 2007.
Thanks to Bob Aberle for the pointer to this new product!



The Ampeer/Ken Myers
1911 Bradshaw Ct.
Walled Lake, MI 48390

http://members.aol.com/kmyersefo

The Next Meeting:
Date: Thursday, March 1 **Time:** 7:30 p.m.
Place: Ken Myers' house – see address in heading
Yes, it is the same one from two years ago!