the Ampeer

January The EFO Officers 2013

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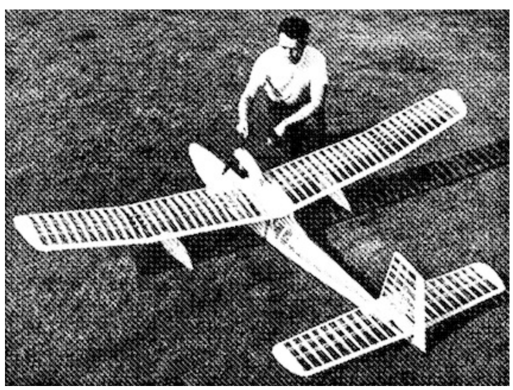
No Mailed Ampeer Subscriptions

The Next Meeting:
Thus., Jan. 10, 7:30 p.m., Ken Myers' house (address above)

What's In This Issue:

Custom Privateer - Some Nice Motor Mounts -
More on "A123" Toughness and a Little Complaint About Invasion Stripes on EVERY Model - Replacements for AF 15G Motors in a Bell YFM-1A - A Note from Canada - Regarding the October 2012 Ampeer - Electric Motor Kv or RPM/volt - Hobby King/ AEO Tech PO Wattmeter - Some Recommended Reading - Upcoming Events

Custom Privateer
From Ned Watts via email



Dear Ken,

You have been most helpful to me in the past. Today's question concerns my Custom Privateer. Many years ago I saw one fly powered by the big Astro Cobalt. It flew beautifully, with a folding prop as I remember. I have attached some specifications.

Data obtained from the Berkeley plan and my own Custom Privateer:

Wingspan: 114" (9.5 feet)
Wing Area: 1440 square inches
Weight with RC equipment (Circa 1955) 9.5 pounds
Wing loading of 16 oz./sq. ft
Maximum diameter propeller: 12 inches.

Mine is all built, but never flown, with an OS Max .52 four-stroke bolted onto the motor bearers. I think e-power would be an improvement for a number of reasons, and I am ready to undertake the conversion.

This aircraft is so far off the beaten track that I am seeking advice on power train components. I like (and have a bunch of) A123 cells, and a fair amount of weight is required up front in the hull to keep things balanced. I could perhaps jack the motor thrust line up half an inch in order to run a 13" prop instead of the 12" that the original thrust line permits, but I'd also consider a three or four blade prop if I could find a suitable one. With an under-cambered airfoil, this plane will fly slowly, so something like a 12x5 would probably be fine. Lots of thrust will be needed to get it up planing, but after that very little power would suffice for cruising about and touch and goes, which is about all the flight envelope that I would plan to

Name of Plane:	Custom Privateer	
Recommended Largest 2-stroke:	0.45	displacement in cubic inches
Recommended Largest 4-stroke:	0.52	displacement in cubic inches
Mfg. Max. Weight:	10.00	lb.
Mfg. wing area:	1440	sq.in.
Desired watts in per pound:	100	Use 100 if in doubt
Cubic area:	31.62	cubic feet
Wing Cube Loading:	5.06	oz./cu.ft.
Average watts in:	46.84	selected from watts in/cu.ft. table
Median watts in:	42.38	selected from watts in/cu.ft. table
Suggested Power:	1003	watts in
Lightest Motor:	401	g
Heaviest Motor:	627	g
80% watts in:	803	watts out
Largest Dia. Prop:	12	in. (see dia. note)
Prop pitch:	6	in.
Target RPM:	11309	
Pitch Speed:	64.25	mph - verify with pitch speed table
Stall Speed:	14.80	mph
Pitch Speed to Stall Speed:	4.34	:1

mber of "A123" 2300mAh cells:	2	3	4	5	6	7	8	9	10
Anticipated Amp Draw:	179.2	119	89.6	72	59.7	51	44.8	40	35.8
Estimated Kv (RPM/v):	2496	1655	1234	982	813	693	603	533	477
Kv (RPM/v) Range High:	2628	1742	1299	1034	856	730	635	561	502
Kv (RPM/v) Range Low:	2371	1572	1172	932	773	658	573	506	453
Approx. Battery weight:	160	240	320	400	480	560	640	720	800
ESC amp rating = or greater	224	149	112	90	75	64	56	50	45

Outru
As of August 22
Wing cube loading levels & "t
(Level 1 0.00 - 2.99) I
(Level 2 3.00 - 4.99) Bac
(Level 3 5.00 - 6.99
(Level 4 7.00 - 9.99) Sport/Tr
(Level 5 10.00 - 12.99) Adv.
(Level 6 13 - 16.99) Expert
(Level 7 17+) I

As of December 3, 2011
Pitch Speeds
(Level 1 0.00 - 2.99) Indoor
(Level 2 3.00 - 4.99) Backyard
(Level 3 5.00 - 6.99) Park
(Level 4 7.00 - 9.99) Sport/Trainer
(Level 5 10.00 - 12.99) Adv. Sport
(Level 6 13 - 16.99) Expert Sport
(Level 7 17+) Expert

explore with it. If you are willing to take a whack at what might be suitable, I would be most grateful.

I like AXi, Scorpion, and MVVS motors. I'd probably like one of the OS electrics also; I've just never tried one. There is a thread on RC groups for gas to electric conversions that discusses electric power for the Custom Privateer, but in the context of flying off a lake at 8,000 feet. My flying pond is at sea level, or not much beyond.

Ned Watts

Hi Ned,

Interesting plane from the 1955 Air Trails I see.

I've attached the Excel Workbook for this plane. It is found on the A123 tab/worksheet, which should be the first worksheet when you open the Workbook.

Looks like you've lucked out here in several ways. About 1000 watts in looks good. A 10S1P "A123" 2300mAh pack looks about right, current-wise (36.8 amps) when using a 12x6 prop.

I checked the Innov8tive Design page for the Cobra line of motors because Lucien has tested this brand with Master Airscrew 3-blade props. I found the Cobra C-4130-14 (5062-450, 400g)

http://www.innov8tivedesigns.com/product_info.php?cPath=21_120_124&products_id=854&osCsid=42f5325c1411cf96781248f3c4f0d570

That motor should work very well with a 10S "A123" 2300mAh pack and a 12x6 prop, either an APC 12x6E or Master Airscrew 12x6x3.

http://innov8tivedesigns.com/Cobra/Cobra_4130-14_Specs.htm

The Web page indicates that using this motor and a Master Airscrew 12x6x3 3-blade prop the specs are:
29.6v (that is just a bit more than would be expected for a 10S "A123" 2300 mAh pack at 35 amps)
37.6 amps (the amp draw should be just a tad lower)
1106 watts in (again, just a tad lower with the 123s)
11,404 RPM, and pitch speed of 64.8 mph.

Please remember that the Cobra numbers come from actual tests run by Lucien Miller.

Since you mentioned other motors, here are some similar ones to the Cobra, so performance should be quite similar as well.
Scorpion S-4035-460 (5063-460, 435g)
AXI 4120/20 GOLD LINE (5056-465, 320g)

I looked at MVVS, but didn't find anything that seemed to me that it would work, but I am not at all familiar with this line of motors.
O.S. OMA-5020-490 (5053-490, 350g)

Others I found using http://www.rc-book.com
Hacker A50-12S (4872-492, 389g)
Turnigy Aerodrive SK3 - 5055-430kv (4934-430, 378g)

The ESC should be one that is rated at 45-amps or greater.

Good luck with your project,
Ken

And a follow-up from Ned

Thank you so much. It looks as if the DEWALT pack was just made for this application. Take off the top and solder leads onto the plus and minus ends of the battery circuit.

I had been figuring about 750 watts in for sport flying a ten pound aircraft, but it looks as if going to 1000 watts will cost almost no weight increase at all, given that it is ballast or battery up in the bow.

I have never flown anything close to 10S, but I suppose that as long as it is within spec for the motor and speed control, it should work out just fine. You have also even given me a source for a twelve inch three blade prop. I will hope to send you a picture of her on the water this spring.

Some Nice Motor Mounts

From Mike Russell via email

This is the Small

Mike sent along the numbers for these nice motor mounts from Tower Hobbies. I had a chance to use the 40-size on a Sig LT-40 conversion this past fall. It really made the conversion super simple.

Small LXLCL3
http://www3.towerhobbies.com/cgi-bin/wti0001p?&I=LXLCL3&P=ML
Length: 1.65" (42mm), Width: 1.97" (50mm), Height: 1.44" (36.7mm), Weight: 1.2oz (35g), Mounting hole dimensions 1.19"x1.19" (30.2x30.2mm)

Medium LXLCL4
http://www3.towerhobbies.com/cgi-bin/wti0001p?&I=LXLCL4&P=ML
Length: 2.53" (64mm), Width: 2.18" (55mm), Height: 2.18" (55mm), Weight: 2.3oz (81g), Mounting hole dimensions: 1.325" x 1.325" (33.65 x 33.65mm)

Large LXLCL5
http://www3.towerhobbies.com/cgi-bin/wti0001p?&I=LXLCL5&P=ML
Length: 3.59" (91mm), Width: 3.11" (79mm), Height: 2.17" (55.1mm), Weight: 4.9oz (140g), Mounting hole dimensions:1.85"x1.85" (46.9x46.9mm)

Extra Large LXMVU6
http://www3.towerhobbies.com/cgi-bin/wti0001p?&I=LXMVU6&P=ML
Length: 3.56" (90.5mm), Width: 3.09" (18.5mm), Height: 2.56" (90.5mm), Weight: 5.1oz (145g), Mounting hole dimensions:1.94"x1.94"(49.3x49.3mm)

More on "A123" Toughness and a Little Complaint About Invasion Stripes on EVERY Model

From John Bell via email

Hi Ken:

My friend Andy Telzer and I have been flying A123 cells for about 5 years. We are still using the original packs and have not lost a cell to anything but "Finger Trouble". All I can say about them is that they are "Bulletproof".

But to my pet bitch: almost every time I see some WW2 airplane (Spit in your latest Issue) I see both "Invasion Stripes--and Red"!! It would seem that every WW2 Aircraft had Invasion Stripes--DC-3s. Spitfires, Mustangs. B25s B26s etc--ad infinitum.

While it is true, that on June 4th 1944, they were used to identify Allied Aircraft for the Normandy Invasion, following D-Day, the invasion stripes made Allied aircraft easy targets for the enemy. In late June 1944, some crews started removing the stripes on the upper surfaces of their aircraft. Stripes on wings were, per orders, to be removed between 25 August and 10 September 1944. On 6 December an order was issued to remove all invasion stripes by the end of the year.

The actual period of the war that these were used was quite short (Germans were not stupid) and to have every model in Christendom sporting them, is ridiculous.

Rant over--keep up the good work,
John Bell
Oakville, Ontario

How true! They do add a bit of 'punch' to a model though. KM

Replacements for AF 15G Motors in a Bell YFM-1A

From David Plummer via email

I couldn't come up with a suggestion for David. Can some Ampeer readers help?

That is one gorgeous plane! KM

Hi Ken!

I'm finally getting around to trying to fly my model of the Bell YFM-1A; it weighs about 10 lb. and I built it with a couple of AF 15Gs. I'm thinking it might be sensible to upgrade the motors to some brushless geared motors: do you have any suggestions for a candidate replacement (or two)?

David Plummer
Bellevue, WA

A Note from Canada

From Art Lane via email

Mornin Ken,

Gee, Cliff Tacey? (*October 2012 Ampeer email from Cliff about the PT-19 power system. KM*) It's been a long time since I heard or saw anything of him. He's still at it eh? I remember one of the Scale Events in Michigan, quite a while back. I had my Sig Clipped wing Cub there with the OS 120 FS and Cliff helped me get it set up, after a thorough safety inspection. That was a memorable weekend.

And, you are to be congratulated on your induction to AMA's Hall of Fame.... GREAT! (late as I am, Congrats!)

We, Forest City Flyers of London, have just finished our "Special" Fall fun fly. Two of our oldest members were awarded the prestigious MAAC "Pioneer" award for service over the many years they have been members, Ted Buck, MAAC # 85 and Archie Steels, MAAC # 73.

I've attached a picture of Archie receiving the award from our MAAC President, Ron Dodds, who flew in from B.C. to make this presentation.

Ted taught me how to fly, back in the late 70's and I've looked up to him ever since. Unfortunately, Ted couldn't join us, his health is not good.

My article on the Sbach, which I call "Pumpkin Pimples" is fantastic. You can't see the "Pimples" on it in those pictures, Thanks.

I'm now on flight #12 and it's becoming one of my favorite "Foamie" flyers. An amazingly BIG foamie flyer.

The article on our Indoor BMO flying, again, thanks.

We have a new indoor site for the upcoming season of indoor RC. It's at a place I used when I first started indoor programs, the Fanshawe College gym. It is a biggie, but not as big as the BMO center. It's the size of two basket ball courts with a 22' ceiling. It cost us much less, 50 bucks per hour.

Yes, summer is almost over, and indoor is now taking it's place. That means back to the smaller stuff, but keeps my fingers nimble while I'm waiting for that first day next spring.

Many thanks for the *Ampeer* again. I do enjoy reading this "Complete" newsletter.

Regards
Art

Regarding the October 2012 Ampeer and Batteries

From Willie McMath via email

Hello Ken,

Just read the latest issue (*October 2012 KM*). I found a lot of useful information in it. I am learning a lot about LiPo batteries and A123s. I'm putting LiPos in my Loving Love and putting balancing plugs on everything that is motorized.

So far I have not found the need for the receiver battery.

I've enjoyed all of your issues. Keep them coming.

I have a Top Flite Bearcat. It is a .60-size that was given to me. It is a kit built version from 27 years ago. I am putting a NTM 42-58-500kv on it and using a 6S1P "A123" 2300mAh pack. I will send some pictures later.

Willie McMath

Electric Motor Kv or RPM/volt

By Ken Myers

Updated: November 2012

Ampeer Articles Regarding Motor Kv:

Finding R and K, December 1989
http://www.theampeer.org/ampeer/ampdec89/ampdec89.htm#page2

Kv for Robbie 600, Aug. 1999
http://www.theampeer.org/ampeer/ampaug99/ampaug99.htm#KV

Motor Kv Question, January 2005
http://www.theampeer.org/ampeer/ampjan05/ampjan05.htm#KV

Measuring Kv Using the Drill Press Method, January 2009
http://www.theampeer.org/ampeer/ampjan09/ampjan09.htm#KV

It Is Not Just the Kv, May 2009
http://www.theampeer.org/ampeer/ampmay09/ampmay09.htm#KV

Ke variation, November 2010 (note: not a typing error; Ke is related to Kv)
http://www.theampeer.org/ampeer/ampnov10/ampnov10.htm#KE

Identifying the Usefulness of an Unknown Brushless Outrunner, October 2011
http://www.theampeer.org/ampeer/ampoct11/ampoct11.htm#UNK

Kv is a **motor** constant and is directly related to Kt, the motor torque constant. Kv is most often expressed as RPM/Volt or RPM/v. Kt is often expressed in the units inch ounces per amp. Kv (expressed as RPM/v) * Kt = 1352. (Note: Some sources uses 1355 as the constant.)

The Kv **motor** constant is part of the motor's physical makeup. The voltage used to multiply the Kv constant by, to determine the RPM, is **NOT** the input voltage at the motor, for a brushed motor, or the input voltage at the Electronic Speed Control (ESC) for a brushless motor.

There is a **voltage drop** from the input voltage. It is caused by the resistance of the motor. For brushless motors, there is an additional voltage drop caused by the resistance of the ESC.

The Math

Volts = **I** (current) * **R**esistance

The net voltage (Vnet) equals the input voltage (Vin) minus the current times the resistance (the voltage drop).

Vnet = (Vin - (I * R))
also
Vnet = RPM / Kv

Rm is a term that was used with brushed motors. It meant the motor resistance. **The term Rm, as used here, means the motor resistance plus the**

ESC resistance, so that it may apply equally to brushed and brushless systems.

Measuring Motor Constants

Two data points are required to determine the Rm and Kv of a motor. The data points are gathered using a power meter (aka watt meter) and tachometer. Either an optical tachometer or phase tachometer will work. An accurate phase tachometer is much easier to use.

All measurements are taken at FULL THROTTLE! Do NOT use partial throttle readings! Data should be gathered as quickly and accurately as possible. The motor should not be run for any extended period of time, ever!

One of the earliest iterations of this method was presented in the December 1989 *Ampeer*.
http://www.theampeer.org/ampeer/ampdec89/ampdec89.htm#page2
Unfortunately, I didn't really understand the concept and math at the time, but THE electric columnists, Bob Kopski and Mitch Poling, did.

Data Points 1

Select and mount as large a propeller as the supplier recommends for the motor with the number of cells to be used. (For help in selecting the prop, review “Selecting the CORRECT Supplier Recommended Props”.
http://www.theampeer.org/e-basics/e-basics.htm#CORRECT%20PROP

You should try to get as close to the maximum current rating of the motor as possible, without going over it. The readings should be as close as possible to the same instant in time. Record the current, voltage, and RPM readings. They will be known as I1 (current), V1 (volts), and RPM1 (RPM).

Data Points 2

Next affix a very small propeller or even small, flat 'stick' just large enough to get a tachometer reading. Servo arms have been used on small motors. With a phase tachometer, nothing needs to be attached to the motor, as the phase tach will yield the no load RPM, which is even better. Measure the light load or no load current, voltage, and RPM. They become I2 (current), V2 (volts), and RPM2 (RPM).

The math is completed using the Excel workbook spreadsheet titled Rm.
http://www.theampeer.org/Kv/Kv-Worksheet.xls

The Io (no load current) is also a valuable constant. Measure the volts and amps using a power meter with no propeller attached to the motor. For a no load test to calculate the Io, it is best to use a battery or power supply that applies only about 80% of the voltage that the motor is expected to run at. DO NOT ATTEMPT TO CONTROL THE VOLTAGE USING AN ESC! Getting the measurement at 80% of the expected voltage is sometimes difficult to do. If that cannot be done, just use the pack that has been used to do the Rm testing, but don't recharge it, unless it is extremely low.

A major problem with many suppliers' is that they give an Io without noting the voltage. Io varies somewhat with the volts applied. This causes a problem when the Io is used to estimate 'iron loss' in the power out formula.

Power Out Formula

Pout = (Iin - Io) * Kv (Vin - (Iin * Rm))

While called constants, the Rm and Io are not truly constant. They vary slightly with the applied voltage.

Some Examples

It is important to note that the Rm derived in the following examples is **NOT** the Rm that is often provided by the suppliers.

Cobra C2203/52, wt. 17.5g
http://innov8tivedesigns.com/Cobra/Cobra_2203-52_Specs.htm
I1 = 6.93, V1 = 7.4, RPM = 6740
I2 = 0.36, V2 = 8, RPM = 12,080*
*Adjusted to yield a Kv of 1540 - found in the Examples on the Rm sheet.

Results from spreadsheet:
Rm = 0.4363 ohms, Kv = 1540
Io was given as 0.36 amps at 8 volts

The maximum amp draw is given as 7 amps. 80% of the maximum is 5.6 amps. On the

Innov8tive Designs' prop test table the APC 7x5SF draws 5.6 amps.
The voltage drop at 5.6 amps with 7.4Vin.
7.4Vin - (0.4363ohms * 5.6 amps) = 4.96Vnet
RPM at 5.6 amps = 4.96Vnet * 1540Kv = **7638** RPM
The actual measured data for the APC 7x5SF is, 7.4Vin, 5.60 amps, **7,620** RPM
The Vnet is 67% of the Vin. That is not unusual for such a small motor (17.5g).

The Io is used to calculate the Pout in watts.
(5.6 amps - 0.36 amps) * (7.4 - (0.4363ohms * 5.6 amps)) = 26 watts **out**
Efficiency = 26 watts **out** / (7.4v * 5.6 amps) watts in = 0.627 or 63%
Again, this is pretty typical efficiency for such a small motor.

Cobra C4130/14, wt. 400g
http://innov8tivedesigns.com/Cobra/Cobra_4130-14_Specs.htm
I1 = 58.26, V1 = 29.6, RPM = 10581
I2 = 1.46, V2 = 20, RPM = 8940*
*Adjusted to yield a Kv of 450 - found in the Examples on the Rm sheet.

Results from spreadsheet:
Rm = 0.1049 ohms, Kv = 450
Io was given as 1.46 amps at 20 volts

The maximum amp draw is given as 60 amps. 80% of the maximum is 48 amps. 46.04 amps is used for the example as the measured APC 12x8E draws 46.04 amps at 29.6v.
The voltage drop at 46.04 amps with 29.6v in.
29.6Vin - (0.1049ohms * 46.04 amps) = 24.77Vnet
RPM at 46.04 amps = 24.77Vnet * 450Kv = **11,146** RPM
The actual measured data for the APC 12x12E is, 29.6Vin, 46.04 amps, **11,063** RPM
The Vnet is 83.7% of the Vin. That is not unusual for the larger motor (400g).

The Io is used to calculate the Pout in watts.
(46.04 amps - 1.46 amps) * (29.6 - (0.1049ohms * 46.04 amps)) = 1104 watts **out**
Efficiency = 1104 watts **out** / (29.6v * 46.04 amps) watts in = 0.81 or 81%
Again, this is pretty typical efficiency for this larger motor.

The examples chosen were not arbitrary. They demonstrate some general trends that can be applied to all motors. 'Smaller, lighter' motors have a higher Rm than 'larger, heavier' motors and therefore a higher voltage drop. In general, for the way that they are used, 'Smaller, lighter' motors have a lower efficiency than 'larger, heavier' motors.

One thing that was not demonstrated by the examples is that the highest Kv motor in a series will be the most efficient and have a lower Rm. Why? A higher Kv is created by using larger diameter wire for the windings compared to a lower Kv version of the same series motor with the same type of termination. Not all suppliers provided different Kv motors of the same 'size'.

The Cobra C2203/34, which is in the same series of motors as the first example, has a Rm of 0.2255ohms (about 1/2 the resistance of the /52) for a voltage drop of 1.55V at 6.89 amp yielding 5.85Vnet. (Shown in the Examples on the Rm spreadsheet).
http://innov8tivedesigns.com/Cobra/Cobra_2203-34_Specs.htm

At 6.89 amps the Vnet is 79% of the Vin and the efficiency is about 72.6%. The /52 is a 52-wind and /34 is a 34-wind. The fewer winds of larger gauge wire on the /34 means that it has a lower resistance and higher Kv than the /52.

One of the results of the previous testing method is the Kv.

Another way to derive the Kv is with a phase tachometer and voltage measurement. An optical tachometer cannot be used for this measurement as the motor needs to be 'unloaded'. The Emeter II with the RDU or MDU and the phase tach lead can be used.
http://www.rcdude.com/servlet/the-1229/Hyperion-Emeter-Version-2/Detail
http://www.rcdude.com/servlet/the-1230/Hyperion-Emeter2-Tachometer-Sensor/Detail

Also, a device like the AEO Tech KV Meter K0 may be used.
http://www.aeorc.com/english/?product-384.html

The motor is run with no load, while the voltage

and rpm are recorded. While not the 'true' Kv, it is close enough. For this type of measurement, RPM / volts = Kv.
i.e. 8940 RPM / 20V = 447Kv, which is close enough compared to the 450Kv in the previous example

Kv is also known as the generator constant or dynamo constant. When any electric motor's shaft is physically spun, it generates electricity. It doesn't matter whether it is a brushed or brushless motor.

A typical hobby brushed motor can be spun by a drill press at a constant speed. By measuring the DC voltage across the terminals, with brushes set to neutral timing, and knowing the RPM of the drill press, the Kv can be calculated.
i.e. 1560 RPM / 1.6v DC measured volts = 975 RPM per volt. To see how timing affects a motor, read Timing Test.
http://www.theampeer.org/timing/timing.htm

A brushless motor isn't quite as simple to test. A bit of math is required.

A brushless motor has three possible lead combinations that need to be measured using **AC** voltage.

First, determine the constant drill press RPM (1560 in this example).
Measure the **AC** voltage on each pair of leads. There are three possible combinations with a brushless motor.
Lead combination A - 2.08
Lead combination B - 2.08
Lead combination C - 2.08
Note, most cheap brushless motors do not have all three lead combinations come out exactly the same, but they do on the better quality motors. Use the average of the three voltage numbers if the measurements are slightly different.

Find the V-peak by multiplying the average **AC** volts by 1.414 In this example 2.08 * 1.414 = 2.94v
Divide 1000 (a constant) by the RPM (1560 in this case) = 0.64
Ke = V-peak ((2.94) * (in this case 0.64))/1000 = 0.00188
Find the inverse of Ke (1/Ke) (1/0.00188 in this case) = 531
Divide the inverse of Ke by 0.95 = 559 RPM/v or the approximate Kv expressed as RPM/v

Brushless Kv formula using drill press

Kv = (1 / ((Vac * 1.414) * (1000 / drill press rpm)) / 1000) / 0.95
Kt = 1352.4 / Kv

The Kv Spreadsheet (sheet Kv) can do the math for you.
http://theampeer.org/Kv/Kv-Worksheet.xls

It should be noted that many manufacturers/ suppliers, even the good ones, provide inaccurate information about the motor's Kv, so if you can, measure it to be sure you have the motor you want. Using this method, nothing really needs to be done to the motor to measure the Kv, so it should be easily returnable if the Kv is not suitable, as the shaft will only have been chucked into a drill press that is set up with a known RPM.

Advancing the timing on a brushed motor (using rotation of the brushes) or brushless motor (via an ESC setting) changes the apparent Kv, increases the RPM and Io (no load amp draw), increases the heat (wasted energy) more than neutral timing, but increases the power out.

Hobby King/ AEO Tech PO Wattmeter

From James Frolik via email

Ken,

I just read your test(s) with the HobbyKing watt meter in the November 2012 *Ampeer*.

Last spring I bought the PO Wattmeter directly from HobbyKing for $21.46 including shipping to Germany. I needed it for my EDF testing. And it works really well. It's not nitty-picky exact, but the figures are close enough for basic testing. You can see my test stand and data in these posts from RCGroups and RC-Network.

http://www.rcgroups.com/forums/showpost.php?p=21272782&postcount=22

http://www.rc-network.de/forum/showthread.php/297209-Epic-Victory-S?p=2752581&viewfull=1#post2752581

http://www.rc-network.de/forum/showthread.php/297209-Epic-Victory-S?p=2753898&viewfull=1#post2753898

You may also recall my emails about the voltage of LiPo vs. $LiFePo^4$ cells to power a brushed 4-motor EDF model. Well, the 3S $LiFePo^4$ cells never could really cough up enough reliable voltage and the voltage drop from battery to motors was too steep. Fortunately the 3S LiPos voltage sank just enough, but not too much, by the time it reached the brushed motors and this voltage provided plenty of thrust at a total of approximately 68 amps (using an 85A non-BEC controller).

That little PO Wattmeter is really a nice little tool! Setting it up was really a no-brainer: black is negative, so blue must be positive.

James Frolik

P.S. I've tested the HOLD function only once and it works easily on my unit. But I don't use it much at all.

Some Recommended Winter Reading

By Ken Myers

This time of year is a good time to check out some of the articles on the EFO site.

There are several articles by **Keith Shaw**, while some may consider them a bit 'old', they are still valuable reading.

Keith Shaw gave a talk to the EMFSO (Electric Model Flyers of Southern Ontario) on proper electric powered RC design, and it was transcribed by Martin Irvine of Kingston, Ont. in 1992. This is a timeless "How to" on designing electrically powered RC planes. It is in Adobe Acrobat .pdf format. The original was broken into four parts to be sure that it would fit on floppy disks. Patrick Surry has combined the original four parts into one.

www.theampeer.org/shaw/ShawConstructionNotes.pdf

He also made a version to view on a phone, Kindle, etc.

www.theampeer.org/shaw/ShawConstructionNotes_4up.pdf

Other Keith Shaw articles include;

Keith Shaw's"Electric Sport Scale" article from the July 1987 *Model Builder* edited and commented on by Ken Myers, July 1989
http://www.theampeer.org/shaw/SCALE.PDF

Keith Shaw's "Charging Into Electric Flight" - A Primer from the Master, Radio Controlled Sport Flying, January 1994.
http://www.theampeer.org/shaw/chrg2ef.pdf

Keith Shaw's"The Art of Low Power Aerobatics: Maximize your performance with energy management" originally in *Model Airplane News*, Feb. 1996. Keith describes how to reduce drag, set up the CG properly using the "Dive" technique and get the most from your plane for the least power.
http://www.theampeer.org/shaw/aerobat.pdf

The Complete Ampeer Index is located at www.theampeer.org/ampeer/Complete-Ampeer-Index.html.

Upcoming E-vents

December 26, Wednesday, Christmas Holiday Event - Skymasters Indoor Electric Flying at the Ultimate Soccer Arenas, 11 - 3, 4 hours of flying for $15. More info Roger Schmelling 248-321-7599

January 10, Thursday, EFO meeting at Ken Myers, 1911 Bradshaw Ct., Commerce Township, MI 48390, 7:30 p.m. Everyone with an interest is welcome!

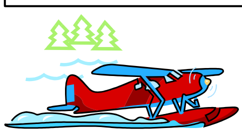
January 21, Monday, Martin Luther King Day - Skymasters Indoor Electric Flying at the Ultimate Soccer Arenas, 11 - 1, 2 hours of flying for $10. More info Roger Schmelling 248-321-7599

Tuesdays through March - Indoor flying at the Ultimate Soccer Arenas, Pontiac, MI, 11 a.m. - 1 p.m.

Some Recommended Winter Reading
(Continued from Page 9)

The first issue of the *Ampeer* was February 1988. The early issues contain a lot of electric ‘history’ and still make for some interesting reading.

For some recent outrunner motor reviews;
O.S. OMA-3820-1200 Review where Ken reviews this O.S. ".25-size" ‘racing’ outrunner and makes prop suggestions.
http://www.theampeer.org/OMA-3820-1200/OMA-3820-1200.htm
O.S. OMA-3825-750 Review where Ken reviews this O.S. ".30-size" outrunner and makes prop suggestions.
http://www.theampeer.org/OMA-3825-750/OMA-3825-750.htm
O.S. OMA-5010-810 a preview of this motor and why the battery/prop data is incorrect.
http://www.theampeer.org/OMA-5010-810-Preview/OMA-5010-810-preview.htm



The Ampeer/Ken Myers
1911 Bradshaw Ct.
Commerce Twp., MI 48390
http://www.theampeer.org

The Next Monthly Meeting:
Date: Thursday, January 10, 2012 **Time:** 7:30 p.m.
Place: Ken Myers’ house (address above)