the Ampeer

May 2003

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The Next Meeting:
Date: Saturday, May 17 **Time**: 10:00 a.m.
Place: Midwest R/C Society 5 Mi. Road flying field

What's In The May 2003 Issue:

Li-Poly Batteries
Where Are We Now?

Norm Dmuchowski, EFO club member, presents information on what he's been doing and flying with Lithium-Polymer batteries, and I try to gather some information on using them in "higher-performance" sport and sport scale planes.

An Introduction to Lithium-Polymer Batteries

By Norm Dmuchowski

Over the past several years I have flown slowflyer and parkflyer electric powered planes using several generations of "lithium" formulated batteries including lithium-metal (Tadiran), lithium-ion (Qualcomm), and now lithium-polymer (Kokam) batteries.

In 2001, I won the all up last down event at the Mid-Am using a "surplus" 2-cell 830 mAh lithium pack by Qualcomm in a Mini-Pleaser parkflyer powered by a GWS IPS – A motor. Flight times with that setup would typically be in the 35 to 60 minute range.

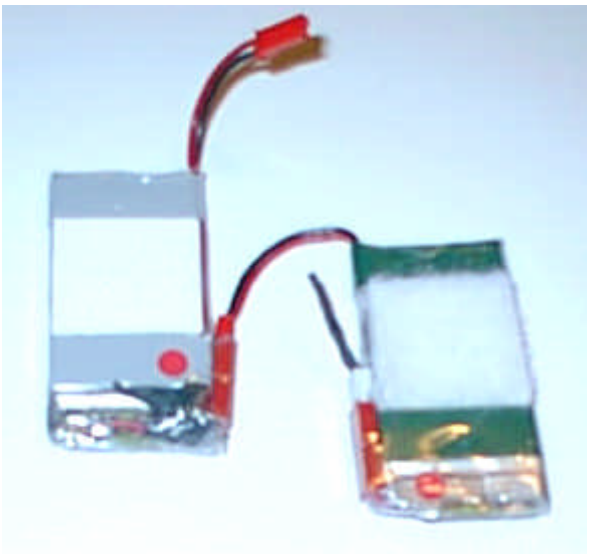
With the advent of the Kokam brand lithium polymer (a.k.a. Li-Po or Li-Poly) batteries which are safer, lighter and capable of handling higher current loads relative to their ratings, more mainstream electric flyers are beginning to take note.

A Li-Po battery cell is charged to 4.2 volts using a charger specifically designed for lithium-polymer cells. Each cell has a nominal voltage of 3.7 volts (as compared to 1.2 volts for Nicads). Most current Kokam brand Li-Po batteries can safely draw three to four times their rated capacity. For example, a 1020 mAh Li-Po pack can handle a current draw of 3-4 amps. Because of the individual cell voltage differences, flight packs of Li-Po cells for slowflyer/parkflyer applications usually consist of only 2 or 3 cells wired in series (+ to -…). Comparable packs of Nicads or NiMH cells which require packs of 7 to 10 cells wired in series.

Li-Po cells have a higher energy density compared to Nicads and NiMH cells (translation: more amp capacity per ounce). A 2-cell Li-Po battery, with a capacity of 1020 mAh, is similar in power to a 7-cell 300 NiMH pack and weighs 0.4 ounces less! By substituting a 2-cell Li-Po pack for a 7-cell NiMH pack, you can get flights three times longer, due to the higher battery capacity, and better flight performance due to the lighter battery pack weight. For small planes, a half ounce can make a difference in

flight performance.

A 2-cell 1020 mAh Li-Po pack with connector can be purchased for $27. A 7-cell 300 mAh NiMH pack with connector can be purchased for $15. To get comparable capacity and flying time, you would have to buy 3 NiMH packs for $45. Going with Li-Po packs could save you $18. Also, chargers for Li-Po packs are comparably priced. I recently purchased a dedicated Li-Po charger called the SC-2 from Bishop Power Products (www.b-p-p.com) which can charge two Li-Po packs (with a maximum of three cells in series each) simultaneously at current rates up to 4.2 amps. This charger only costs $59.95!



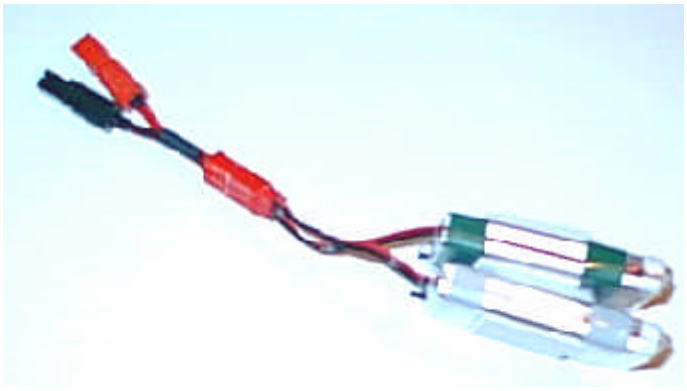
Li-Po packs can be charged at the field, if desired. However, I prefer to charge at home because, unlike NiMH packs, Li-Po cells have a very low self-discharge rate, only 5% over 6 months. Thus, you can charge your Li-Po packs several days (or weeks for that matter) ahead of time without losing significant power capacity. You can spend your time at the field flying, rather than waiting for your NiMH or Nicad pack to peak!

Li-Po battery packs offer great flexibility in terms of meeting a wider range of power requirements for different electric motors. Most seasoned electric flyers have an extensive inventory of packs with different cell counts and amp capacity to meet the varied requirements of their electric motors. Li-Po packs of the same individual cell amp capacity can be used to create whatever size pack (amp capacity and/or voltage) is required. By creatively using battery connector adapters to put Li-Po cells into whatever series (to vary the pack's voltage) or parallel (to vary the pack's amp capacity) configuration is desired, almost any configuration can be created. For example, using 1020 mAh Li-Po cells, you

could easily create a pack to handle a GWS IPS motor or a pack to handle the higher voltage or amp capacity for a Speed 400 or a brushless motor. This can be done with as few as six 1020 Li-Po cells.

I have created two "normal" 2-cell series packs with male connectors and created two 1-cell packs. Each 1-cell pack has two connectors. One connector is the traditional male connector and the second connector is a female connector with the red wire connected to the negative tab of the cell and the black wire connected to the positive tab in order to facilitate the creation of three or more cell series packs.

To create a higher voltage pack, I plug the male connector of a 2-cell pack into the female connector of the 1-cell pack and use the male connector of the 1-cell pack as the main power connector for the newly created 3-cell higher voltage series pack. I can continue adding as many 1-cell packs as desired in order to get the pack voltage required.



To create a higher amp capacity pack I put individual packs of the same voltage in parallel.. To do this, I first create as many same voltage packs as I desire to put in parallel and create an adapter with multiple

female connectors wired to a single male connector (each red wire of the female connectors would be connected to the single red wire of the male connector and do the same with the black wires). Now, I plug two 2-cell series configured 1020 mAh packs into the female connectors of the adapter and I've created a pack with a 2040 mAh capacity with the same voltage as the individual series connected packs. I can then add as many packs in parallel as needed to get to the capacity desired.

I can also combine the two 1-cell packs together to create a 2-cell series pack. To do this, I plug a male connector of one 1-cell pack into the female connector of the other 1-cell pack. Since both 1-cell packs have a female connector, the remaining female connector requires a male connector with both its red and black wires connected together to form a jumper. I plug this jumper into the remaining female connector and end up with a newly created 2-cell series pack. The remaining male connector becomes the pack's main battery connector.

Thus with the six Li-Po cells I can create:

1. two 2-cell packs and two 1-cell packs (starting setup),
2. three 2-cell packs, or
3. two 3-cell packs.

Combining Li-Po packs is easy to accomplish. It can also save money and the need to have a large inventory of single purpose battery packs which we currently have with Nicads or NiMH batteries.

Li-Po battery technology is not standing still. New sizes, capacities and higher current draw capability cells are under development and will reach the R/C electric market in the not too distant future.

Happy flying and pull up a chair because you will be spending more time in the air!

Thank you Norm. It's great to see EFO members contributing to the Ampeer!

Li-Po for Powering Sport Planes

By Ken Myers

While on Winter Break in March, I decided, after hearing Norm at our February EFO meeting, to learn more about using these cells in sport and sport scale applications. I read three articles about them; "Lithium-Polymer Cells for R/C Flying" by James Wang, Quiet Flyer, April 2003 – Jim Zare's "Silent Power" column in RCM (the most helpful – Thanks JIM!), March 2003 and Cal Orr's "Radio Spectrum" column in RCM, March 2003.

The articles provided me with a couple of important pieces of information. When cells are put in parallel, the to total amp draw can be safely increased. For example, the maximum amp draw on a single cell can be up to 3C or 4C. C is the capacity of the cell, therefore the maximum amp draw for a 2070 mAh cell is 6 to 8 amps. For higher current draws, the cells can be put into parallel configurations. Two parallel sets of the Kokam 2070 mAh cells should safely deliver about 12 to 16 amps, 3 in parallel 18 to 24 amps and 4 in parallel 24 to 32 amps. As the cells are paralleled the capacity also increases. For the 2070 mAh cells, 2 in parallel would have a capacity of 2070 x 2 = 4140 mAh, 3 would have 6210 mAh and 4 would equal 8280 mAh.

Next I went to the Kokam cell site at FMA Direct on the Web (https://www.fmadirect.com/site/Products.htm?cat=28). I got out my calculator and figured what is stated below in my question to the eflight list. At that time, I did not see the "Calculator" on the FMA site that enables you to select the proper batteries for your electric powered models. It either wasn't there, or I just missed it. I then posted the following question to the eflight mailing list;

"Hi All,

Snowed in today, so I've been trying to learn all I can about Li-Po batteries. After reading several articles, I still have as many questions as answers.

I want to check and see if I have this correct. I used the FMA information on the Kokam cells to do this figuring. I believe I am TOTALLY wrong, so I'm looking for more enlightenment.

Plane: my own design low-wing TigerShark. Present power system AF035G w/2.82:1 swinging a 10x6 MA wood prop. Static current draw 27-28 amps at the beginning of the charge. Of course the draw goes down in flight, as I average an honest 6-8 minutes of aerobatic type flying. No it won't hang on the prop, but she's a pretty good sport flier.

Right now I use 10 Sanyo 1700SCR cells, but 10 CP-1700 would do just as well and lighten the load. Ralph Weaver gives a weight of 40g per cell, so 10 cells = 400g

= 14.1 oz. for the cells. (I do believe this weight may be too low, as I've also seen 1.62 oz. per cell given for these cells. But even taking 1.62 oz. per cell into account, the following still must be wrong.)

If I've figured correctly, a 3S4P 2070 mAh Kokam or 3S3P 3270 mAh Kokam pack would work. That is my first question. Did I figure this correctly?

Using the calculator that is now on the FMA Kokam site, it looks like I did.

If my figuring is correct, then a 3S4P 2070 pack would be 12 cells times $20.50 or $246.00 (*what the calculator says is $210 – I don't understand that*) and at 44g each would weigh 528g = 18.6 oz. for the cells. It would have a capacity of 8280 mAh, which would be equal to the capacity of 4.87 1700 mAh cells. $246 / 4.87 gives an equivalent price per pack of $50.51 for the "same" flight time as $40 (B&T Racing $4.00 per cell) worth of CP-1700 cells. The pack weight of the Li-Po cells appears to be 4.5 ounces heavier. Where have I made my mistake?

The 3S3P Kokam pack would be 9 cells times $30.50 or $274.50 (*the Calculator says $247 – they must be discounting a larger number of cells*) and at 64g each = 576g or 20.3 oz. for the cells. It would have a capacity of 9810 mAh or 5.77 times the 1700 mAh capacity. $274.50 / 5.77 gives an equivalent price per pack of $47.57 for the same flight time as the $40.00 1700 mAh pack. The 3270 cell weighs 64g times 9 cells = 576 grams or 20.32 ounces, or 6.2 ounces more than a pack of CP-1700s. Again, I just can't believe I'm doing the figuring correctly.

Would you Li-Po experts/users please give me a hand with this, so I can get a handle on this concept? For those of you using these cells in low amp applications, please don't respond to how well they fly your Pico Stick, I need to know about typical sport amp draws of 25-35 amps.

A confused

Ken Myers (Walled Lake, MI USA)"

Anything in *italic* font above was not in the original post, but added information since my post.

This became a "hot topic" for a few days with several posts on the topic.

The designation 3S4P means 3 cells in series to get the required voltage and 4 three-cell packs in parallel to get the desired amp draw. The final battery, using 12 2070 mAh cells in this configuration (3S4P) would yield a pack with a voltage of 3 cells in series times 3.7 volts = 11.1 volts, 8280 mAh and a potential amp draw of 24.84 amps (3C) to 33.12 amps (4C).

One of the first replies pointed out that since I'm getting 6 to 8 plus minutes of flight time, my average amp draw is 13 – 17 amps. That person recommended a 3S2P pack of Kokam 3270 mAh cells. Again that would be 11.1 volts with a capacity of 6540 mAh and a safe amp draw of 19.62 amps (3C) to 26.16 amps (4C). That seems to make sense, since the 28+ plus amps is static on a fresh pack. This means that 6 cells would be needed to make the pack. Six times $30.50 = $183.00 (the FMA Calculator says $165.00) and a weight of 6 times 64 g = 384 g or 13.5 oz. The weight is now very close to the same as a 10-cell pack of CP-1700SCR cells. 6540 / 1700 = 3.85, which means that the Kokam pack would be equivalent in flight time to about 4 packs or charges of CP-1700 Nicad cells. It is getting interesting now.

Jason Markle has been a beta tester for Thunder Power lithium cells. According to Jason, Thunder Power cells are Japanese built Li-Po cells. He said that these cells have been working very well in higher amperage situations. Again he mentioned the 3C and 4 C figures, but he stated that these cells can sustain a short burst of up to 8C without damaging the cells. These cells are going to be marketed by a company called Flight Energy

http://www.flightenergy.com

They have a capacity of 1950 mAh. He stated that he is using a configuration of 3S4P of these cells in his 10-cell planes. According to the Flight Energy site, this pack would weigh 16 ounces, again about the same as a 10-cell CP-1700SCR pack. The capacity for this Li-Po pack would be 7800 mAh and possible amp draw between 23.4 amps (3C) and 31.2 amps (4C). That's right in the ballpark. Unfortunately, there is no pricing available yet.

I know that these cells are working, as I've seen photos, taken by a friend of mine, at the San Diego MWE meet this year. He had photos of fairly large sport and aerobatic models flying with these Thunder Power Li-Po cells, and he told me that they were quite impressive.

Jason noted that charging is an issue, but also mentioned that the cells can be charged in parallel at up to 1C. He said that there are few chargers at present that can charge at that rate. That would be a rate of 7.8 amps for the pack mentioned above. He likes the Great Planes Triton charger for Li-Po cells. He stated that it can do 1-4 cells at up to 2.5 amps.

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He also stated that the internal resistance of Li-Po packs is a lot lower than that of Nicads, and that there is a very shallow discharge curve to the Li-Po cells. That means that power throughout the flight, from beginning to end, is just about the same.

One other thing that he noted, and others such as Bernard Cawley backup, is that the self-discharge rate of Li-Po cells is very low, so charging a week ahead of time is not a problem.

Another supplier of Li-Po cells appears to be Air Craft. They are supplying the E-tec line of cells. http://www.aircraft-world.com/prod_datasheets/lipoly.htm Air Craft should have a charger available that will charge 1-4 cells at up to 1.5 amps by the time you read this.

The Flight Energy site has no information on chargers. FMA direct advertises a charger for the Kokam cells that can charge 1-4 cells in series at up to 1.5 amps. Bishop Power Products has a charger that can charge 1-3 cells at up to 4.2 amps. Tower Hobbies carries the Triton charger which can charge 1-4 cells at up to 2.5 amps.

At the time of this writing, there appears to be a "new&quot" Kokam high output cell arriving on the market, according to the Bishop Power Products site. There was not enough information on the site for me to see a difference, as they were still talking about 3C to 4C sustained current with the packs they made out of 145 mAh cells, with just a somewhat higher rise in the "burst" current into the 8C to 10C plus range. I'm still very confused about them.

The Air Craft site states that their 1200 mAh cells can sustain a discharge rate of 5C.

With all of these cells in series and parallel making up the battery, there appears to be a problem with "cell drift". It appears that the voltage of individual cells in the pack vary greatly after several uses and charges. There is going to have to be some way to overcome this problem.

At this time it seems we are on the cusp of being able to take several sport aerobatic and sport scale planes to the field with Li-Po cells in them, fly several flights on each plane, and not have a charger present. In some ways, that seems like a very good idea to me. If I obtain any further information before the time of publication of this month's *Ampeer*, I'll be sure to present it!

Internet Sources Mentioned in these articles:

Air Craft: http://www.aircraft-world.com
Bishop Power Products: http://www.b-p-p.com
Eflight list via the Ezone Magazine: http://www.ezonemag.com
Flight Energy: http://www.flightenergy.com
FMA direct: http://www.fmadirect.com
Triton Charger via Tower Hobbies: http://www2.towerhobbies.com/cgi-bin/wti0001p?&I=LXCJG7&P=7

A Simple Slow Flyer Wing

From: Lowrie McLarty jmclarty@wi.rr.com
Milwaukee, WI

Slow Flyer Under-Cambered Wings

After being frustrated by cutting patterns for small slow flyer ribs for a Firefly motored own design, I made a compromised airfoil using flat panels to shape a wing section. The details are attached.

What has been irritating is the change from cutting 6" and longer symmetrical ribs to those small ribs having under-camber. To allow undersurface film attachment most of these slow flyers ribs have many small notches for span-wise sticks. There is not enough material left for me to get satisfactory rib shape or alignment.

The following wing construction makes compromise rib forms as flat panels.

This has been tried with a single surface airfoil and seems to perform well in gliding flight. A double surface is believed possible and may be more efficient.

Advantages:

No contoured ribs or notches required.
Under-camber covering is on separate flat panels.
Wing plan form can be easily tapered.
Rib contour can be varied widely by setting panels at different angles.

Disadvantages:

Rib contour is a compromise and probably suitable only for small flyers.
A fixture may always be required to for alignment of the right and left panels.

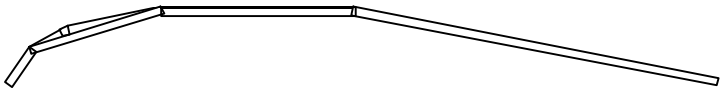
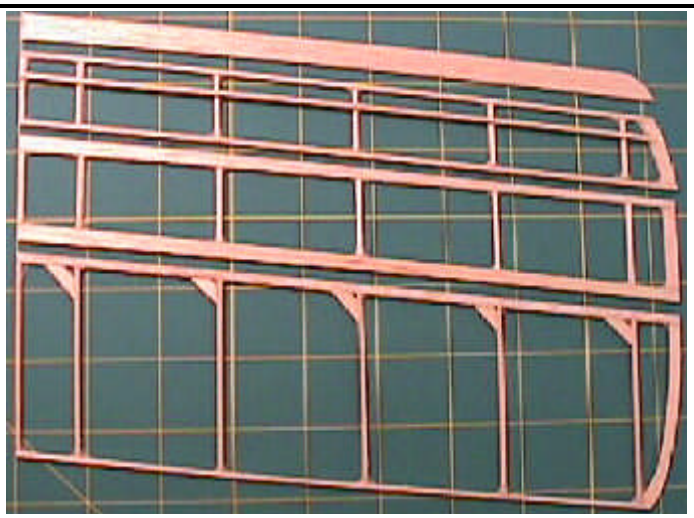


Diagram Shows Airfoil from Side-view
Panels shown in photo on next page

The airfoil section shown could be closer to the ideal contour by adding longitudinal strips. The section above has only one added strip. Strips could be added to the center panel also the trailing edge panel in order to improve the shape. A strip between the leading edge panel and the adjacent panel would also improve the contour.

The separate panels shown are of 1/16" Sq. medium balsa. The leading edge is soft 1/16". The center panel



has leading and trailing edges of tapered width 1/16" medium balsa. Both sides were later film covered individually before assembling and cementing panels to each other on a simple balsa fixture.

I'm trying to find a Milwaukee area club with big room for fragile flying.

Dave Grife's 1/4-Scale "Ike" Flies

Once again, Dave sent me an email to check out the R/C Groups Discussion thread as he had finished and flown his "Ike". The thread address is: http://www.rcgroups.com/forums/showthread.php?threadid=74533&referrerid=1382
(**Note**: there is no space after the ? mark and the word threadid) This is a great thread to read to learn about the evolution of a model from conception through completion. Highly recommended reading. Here are some of the highlights. ———

"IKE" FLYS GREAT !!!!!!!!!!

8-10 mph crosswind today, But the "Ike" flew very nicely. Loops, rolls and 4 point rolls are all that I did today. She wanted to weather vane slightly but still a great pleasure. First flight with 4/5ths sub C's landed at 4 min. Second flight with CP-2400's landed at 6 min. I still had some electrons left after each flight. Ground handling was a bit tricky, those gear are long! Chris Balser took some in flight photos that I hope to put up later. I'll have to get some Lithium Polymers

"Ike" on a Hacker Today !!!!!!

The Hacker B50 11XL w/ 5.2:1 powered the "Ike" today. I used the same prop 18-10 APC-E. The same two battery packs of 20 cells. 4/5ths sub-C's & CP-2400's. MaxCim motor drew about 40 Amps and 5100 rpm

Hacker motor drew about 44 Amps and 5500 rpm

The Hacker motor system flew like it was running on about 4 to 6 more cells. Flight duration turned out to be nearly identical. The Hacker motor was also significantly cooler upon flight completion.

My excitement, yesterday with the maiden "Ike" flight, was eclipsed by my excitement with the performance today. This is the most powerful scale electric that I have ever seen.

I suspect that the MaxCim motor would have preferred that I not ended up 1.5 pounds over my initial gross weight target of 7 lbs.

I'm confident that if I altered the gear ratio and cell count w/ the MaxCim I could get similar results.

But luckily, my 1/6th scale Howard Hughes H-1 racer is a 7 lb. airplane waiting for a motor upgrade. New home for the MaxCim.

The "Ike" is now Hacker powered.

"Ike" Specs based on info from the thread

With MaxCim MaxN32-13Y & 20 4/5th sub-C
Wing Area: 700 sq.in. (mfg.)
Weight: 128 oz. – 8 lb.

Wing Loading: 26.33 oz./sq.ft.
Wing Span: 64 in.
MaxCim MaxN32-13Y
Wt. 7.5 oz.
Kv = 1420, Io = 0.8, Rm = 0.058
3.7:1 reducer: Wt. 2 oz.
Total Motor + reducer Wt. = 9.5 oz.
20 CP-1700 (1.62 oz.) = 32.4 oz.
Motor + reducer % of total = 7.4%
Cell weight % of total = 25.3%
Total motor + reducer + CP-1700 battery = 32.7%

Note the following mathematical estimations are based on the voltage near the beginning of the pack discharge and apply to static testing conditions. Amp draw will decrease in the air and as the pack discharges through the flight, but since most of us tach and test on the ground, these figures can be used for comparison.
Using 18x10E prop:

Watts in 1000 (40*1.25*20)	Watt/lb. 125
Watts to motor 764.8	Watt/lb. 95.6
Watts to prop 658.6	Watt/lb. 82.3
RPM 5,103	

Orme's Rule: 14 – 21 cells
Ken's Modified Orme's Rule: 14 – 23 cells
Flight Factor: 2.966
Diameter Factor w/ 18x10: 1.99
Pitch Factor w/ 18x10: 0.56
"Speed" to RPM Factor w/ 18x10: 2.69

With Hacker B50 11XL & 20 CP-2400
Wing Area: 700 sq.in. (mfg.)
Weight: 140.8 oz. – 8.8 lb.
Wing Loading: 29 oz./sq.ft.
Wing Span: 64 in.
Hacker B50 11XL
Wt. 11.7 oz.
Kv = 1435, Io = 1.12, Rm = 0.0152
5.2:1 reducer: Wt. 2 oz.
Total Motor + reducer Wt. = 13.7 oz.
20 CP-2400 (2.05 oz.) = 41 oz.
Motor + reducer % of total = 9.7%
Cell weight % of total = 29.1%
Total motor + reducer + CP-1700 battery = 37.4%

See note above about mathematical estimations used for comparison.
Using 18x10 prop:

Watts in 1100 (44*1.25*20)	Watt/lb. 125
Watts to motor 889	Watt/lb. 101
Watts to prop 837.7	Watt/lb. 95.2
RPM 5,529	

Orme's Rule: 14 – 21 cells
Ken's Modified Orme's Rule: 14 – 23 cells
Flight Factor: 3.262
Diameter Factor w/ 18x12: 1.81
Pitch Factor w/ 18x12: 0.56
"Speed" to RPM Factor w/ 18x12: 2.78

If you look at the prop watts on both motor setups you will see that the Hacker is 837 watts out and the MaxCim is 658.6. That is a difference of 178.4 watts out. At the end of the thread Dave states, "The Hacker motor system flew like it was running on about 4 to 6 more cells. Flight duration turned out to be nearly identical. The Hacker motor was also significantly cooler upon flight completion." What a great observation, since the Hacker motor is putting out about the equivalent of 4 more cells at this amp draw!

The only thing that I can't figure out is how the planetary gearbox on the MaxCim is a 3.7:1 ratio, since both motors have about the same Kv and Io, with the MaxCim having about 3.8 times the resistance of the Hacker, I expected the gear ratios to be closer to each other in ratio. The motor RPM for the MaxCim at 40 amps should be about 23,800 and with about 5,100 RPM at the prop, the gear ratio figures closer to 4.7:1.

Another way to look at this problem is that at 5,100 RPM and with a gear ratio of 3.7, that yields a motor RPM of 18,870. With a Kv of 1420 that means that the motor "is seeing" 13.3 volts. At 40 amps and a Rm of 0.058 the "volt loss" equals 2.32 volts. The volts to the motor then equal only 15.62 volts, and with 20 cells, even at 40 amps, it should still be closer to 19 volts. That's a head scratcher.

Great plane Dave. I can't wait to see it fly.

NIRAC

(NATIONAL INDOOR REMOTE-CONTROLLED AIRCRAFT COUNCIL)

COMPETITION NOTICE

FIRST ANNUAL INDOOR R/C CHAMPIONSHIP

DATES: Saturday May 31, 2003
And Sunday, June 1, 2003

Location: Oakland Yard, Waterford, Michigan (approx. 100 miles north of Toledo, northwest of Detroit and just east of the Pontiac International Airport)

Facility Size: 240 X 300 feet, with an 82 feet ceiling

Contest Director: Dave Robelen @ aplusfarm@hovac.com

Events: 6 events planned, with trophies to third place
An overall high point Championship Award
Individual Event rules and a registration form can be found on the NIRAC website: www.nirac.org
Hobby Vendors will be selling on-site
Information on local lodging and a Saturday night banquet can be obtained from John Worth @ johnworth@cox.net
General information available from NIRAC President
Bob Wilder @ rjwmaw5@attbi.com
And
NIRAC Vice President
Bob Aberle @ baberle@optonline.net

Pre-Registration is recommended!

Mid-America Electric Flies

AMA Sanctioned

Saturday, July 12 & Sunday, July 13, 2003

Hosted by the:

Ann Arbor Falcons and **Electric Flyers Only**

Site Provided by the:

Midwest R/C Society

Your Contest Directors are:
Ken Myers phone (248) 669-8124 or KMyersEFO@aol.com – http://members.aol.com/kmyersefo/
Keith Shaw (734) 973-6309

Flying both days is at the Midwest R/C Society Flying Field - 5 Mile Rd., Northville Twp., MI (see map)

Registration: 9 A.M. both days
Flying from 10 A.M. to 5 P.M.

Narrowband Transmitters are required - Channels 00 through 60, six 27Mhz frequencies, & eight 53MHz frequencies, will be in use. Flying on five 49 MHz frequencies may be accommodated on request - Narrowband receivers are recommended for flying on Channels 00 - 60 - Very Wideband 27, 49, & 53 MHz, receivers may be accommodated on request

Pilot Entry Fee $15 a day or $25 both days - - - - Parking Donation Requested from Spectators

Saturday's Events

All Up - Last Down
(No Li ion, Li-Po, etc.– NiCads or NiMH only in AULD)
Pilots' Choice
Best Scale
Most Beautiful
Best Ducted Fan
Best Sport Plane
CD's Choice

Sunday's Events

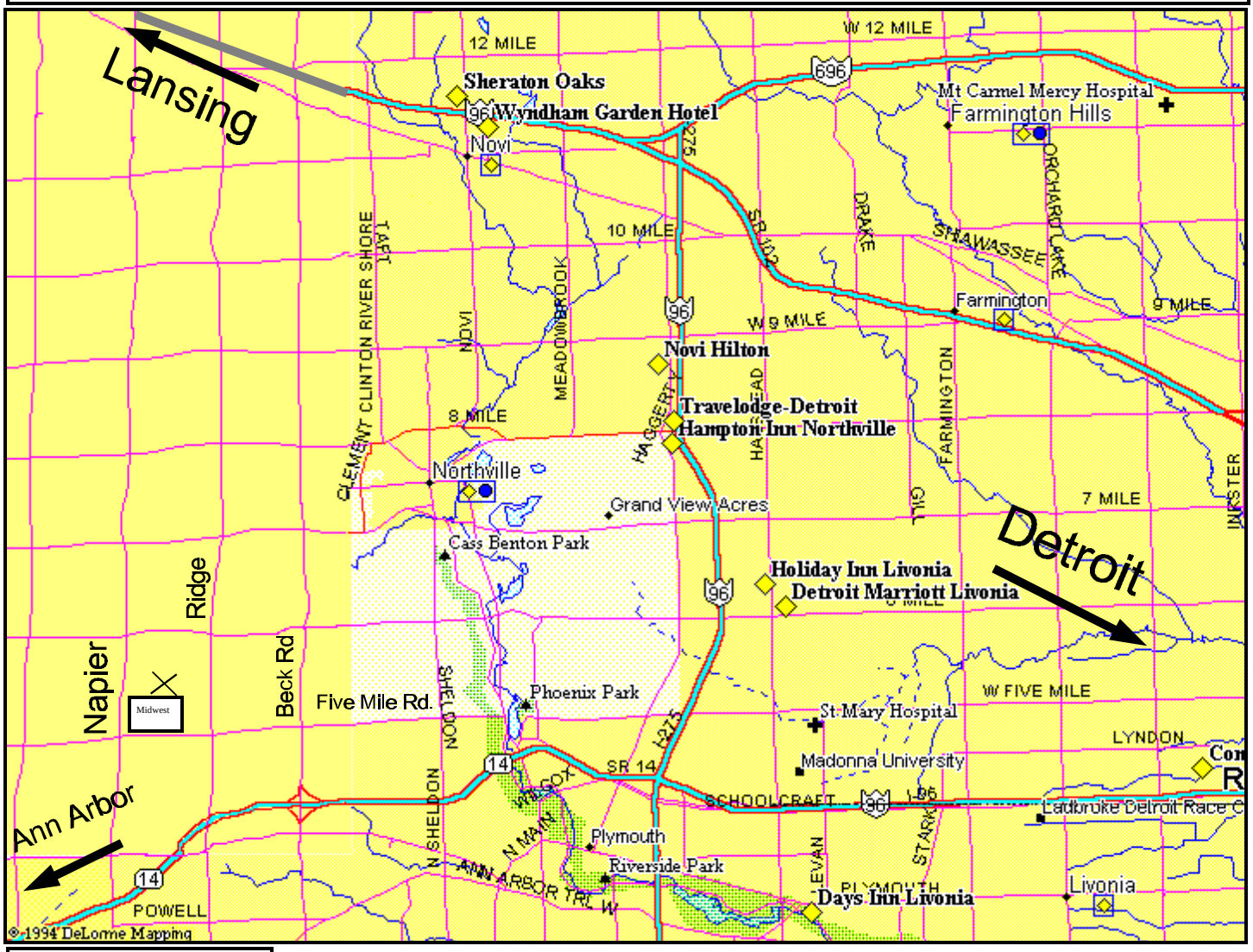
All Up - Last Down S400 or smaller only
(No Li ion, Li-Po, etc.– NiCads or NiMH only in AULD)
Pilots' Choice
Best Scale
Most Beautiful
Best Mini-Electric
Best Multi-motor
CD's Choice

All Planes Must Fly To Be Considered for Any Award
Open Flying Possible on Friday
Night Flying Possible, Weather Permitting, Friday & Saturday Nights
Refreshments will be available at the field both days.
There will be a pot-luck picnic at the field on Saturday evening.

Come and join us for two days of fun and relaxed electric flying.
Even though this is called a contest, the purpose is fun and the enjoyment of sharing the electric experience.

Come, Look, Listen, Learn - Fly Electric - Fly the Future!
Saturday's & Sunday's Awards:
Plaques for 1st in each category

Merchandise drawing for ALL entrants



Mid-America Flies Hotel List - 2003 (note: prices deleted for 2003)

Please call the hotels for current rates

Novi Hilton
21111 Haggerty Rd.
236 rooms
800-445-8667
248-349-4000

Sheraton Oaks
27000 Sheraton Dr.
206 rooms
248-348-5000

Wyndham Garden Hotel
42100 Crescent Blvd.
152 rooms
800-222-4200
248-344-8800

Hampton Inn Northville
20600 Haggerty Rd.
125 rooms
800-426-7866
313-462-1119

Travelodge Detroit
21100 Haggerty Rd.
124 rooms
800-578-7878
248-349-7400

Detroit Marriott Livonia
17100 Laural Park Dr. N.
227 rooms
800-228-9290

Holiday Inn Livonia
17123 Laural Park Dr. N.
225 rooms
800-465-4329

Hotel Baronette
27790 Novi Rd.
149 rooms
248-349-7800

Days Inn Livonia
36655 Plymouth Rd.
72 rooms
800-325-2525
313-427-1300

Comfort Inn Livonia
29235 Buckingham Ave.
112 rooms
800-221-2222

To locate the Midwest R/C Society flying field, site of the 2003 Mid-America Electric Flies, look on the far left side of the map, where X marks the spot near Five Mile Road and Napier. The field entrance is off of Five Mile Road. M-14 can be entered and exited via Beck Road.

Up Coming Events 2003

May 3 & 4 Celebration of Silent Flight, Washougal, WA, electric and sailplane only. CD Jerry Holcomb phone: 360.892.7732 or email: jholcomb@pacifien.com

May 17 7th Eagles Electric Fly In, Hope, NJ, Club Field, Contact: Joe Beshar CD, 198 Merritt Dr. Oradell, NJ 07649, Phone: 201.261.1281 - sponsor: Old Time Eagles (note rain date not second day is May 18.)

May 23 - May 25 King Peach Electric Championship for 610, 612, 613, 614, 618, 620(JSO), Peach Tree City, GA, CD Mike McGowan phone: 770.487.9647

May 25 2nd Annual Small Plane Fly-in, Terre Haute, IN, small plane fly-in for electric and glow, CD Charles Gray phone: 812.877.9215 email: cgray@hhcorp.org

May 30 & June 1, 2003 S.M.A.L.L, N. Little Rock, AK Enignes limited to .26CID, ***Electrics Welcome.*** Indoor Flying Friday evening. Ron Stanfield CD, Phone: 501.851.1697 email: stanfieldr@aol.com

May 31, 2003 & June 1, 2003 FIRST ANNUAL INDOOR R/C CHAMPIONSHIP, Oakland Yard, Waterford, Michigan, 6 events planned, with trophies to third place + overall high point Championship Award, CD: Dave Robelen aplusfarm@hovac.com, more info: www.nirac.org

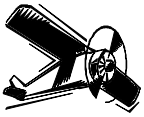
May 31st Greater Lansing Area Soaring Society [GLASS] electric fun fly. Site McLeod sod farm 4 mi. So. of Grand Ledge on M-100 then E. 1/2 mi. on Davis hwy. Speed 400 F5J & open AULD. Otherwise, just fun. ROG is difficult. Contact is Tom Gates. Ph: (517) 339-8787.

June 1 F5B for 601(O), Salem, OR, CD Don Pesznecker, phone: 503.659.9624

June 7 & 8 Keith Shaw Birthday Party Electric Fun Fly, Coldwater, MI, Balsa Butcher's Flying site, Coldwater, MI CD Dave Grife, email: grifesd@yahoo.com Phone: 517.279.8445

A Word of Caution:

It should be noted that the Li-Po 1020 cells that Norm mentions in his article are working very well in the applications that he's writing about. All other uses of Li-Po cells, especially for higher performance planes are just in the beginning stages. Very, very few modelers have used them in higher current applications, so a lot of the information presented is just speculation at this point. Please be advised that if you try Li-Po cells in higher current aircraft, you are pioneering and your investment may or may not be sound.



The Ampeer/Ken Myers
1911 Bradshaw Ct.
Walled Lake, MI 48390
http://members.aol.com/KMyersEFO

The Next Meeting:
Date: Saturday, May 17 **Time:** 10:00 a.m.
Place: Midwest R/C Society 5 Mi. Rd flying field
All interested folks are welcome to join us – Must have AMA card on you to fly!