

the

Ampeer

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Ampeer subscriptions are \$15 a year US & Canada and \$20 a year worldwide	<p>The Next Meeting:</p> <p>Date: Thursday, March 13 Time: 7:30 p.m.</p> <p>Place: Rick Sawicki's house, Commerce Twp, MI</p>		

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The "Skinny" On A123 Cells

The following is an excerpt from my article *"One Way of Selecting a Brushless Outrunner Electric Motor for a Radio Controlled (RC or R/C) Sport Plane or Sport Scale Plane Using ANR26650M1 (A123 Systems Nanophospate™ lithium ion) 2300mAh Cells"* which can be found at <http://homepage.mac.com/kmyersefo/M1-outrunners.htm>.

Background on Cylindrical Cell Sizing

There are standards in Lithium based cylindrical cell sizing that are important to know about. There are several different Lithium based rechargeable (secondary) chemistries used in cylindrical cells.

Many folks are familiar with Ni-Cad (nickel cadmium) and NiMH (nickel metal hydride) cells. Their sizes are commonly referred to with nomenclature such as AAA (triple A), AA (double A), 2/3A, 4/5A, 1/2SC (sub-C) 4/5SC (sub-C), SC (sub-C), C, D, etc. These size

designations don't really tell us much about the cell's actual size, except that we are familiar with AAA (triple A), AA (double A), C and D type non-rechargeable (primary) cells that we use in a lot of our portable electronic devices.

There are several different "Lithium" chemistries that come in cylindrical cells. Their manufactures specify the size in a different way. They use a number such as 26650 or 18650. While at first glance the designations may seem more confusing, these are actually much more useful designations. The first two digits to the far left in the "designation" indicate the approximate diameter of the cell in mm, therefore a 26650 cell has about a 26mm diameter and an 18650 cell has a diameter of about 18mm. The third and fourth digits from the left indicate the approximate length in millimeters. Both of the example cells would be about 65mm long. At this time I am unable to determine what the fifth digit from the left means.

Using this numbering system, a sub-C Ni-Cad or NiMH might be a 23430 and an AA would be a 14500, just to

show how it works. I'm not sure whether those numbers would be "exactly" correct. They are just being used to show how the system works.

For those who think in Imperial units;
 18mm = 0.708661 in. or between 11/16" & 3/4"
 26mm = 1.02362 in. or just over 1"
 65mm = 2.55905 in. or about 2 9/16"

The Lithium Iron Phosphate Cells from A123 Systems, Inc.

I have personally used the **ANR26650M1** cells produced for A123 Systems, Inc. for about eighteen months. Besides my personal experience, I owe a HUGE thanks to Charles of Haralson County, GA who is known as everydayflyer on RC Groups. He got me interested in these cells and has been a great contributor to the knowledge base about these cells on RC Groups.

There is no such thing as an **A123 cell**. What have been most typically called A123 cells are a form of a lithium iron phosphate cell developed at the University of Texas. Yet-Ming Chiang, at MIT, is said to have improved the cathode for this type of cell for better power delivery and A123 Systems, Inc. holds the patent (currently in dispute) for this improved technology. There are two different cell sizes that are being used in R/C planes as a power source for electric motors.

A123 Systems Inc., 1 Kingsbury Ave. , Watertown, MA 02472 (www.a123systems.com) Feb. 21, 2008
 DeWalt/Black & Decker references no longer appear on this site.
 (617) 778-5700

and

A123 Racing (appears to be a division of the above), 12 Avenue E., Hopkinton, Ma 01748 (www.a123racing.com) is marketing the 2300mAh cell to the R/C car community.

The Cells Being Used by R/C Fliers:

ANR26650M1 (2300mAh)

Source:

www.a123racing.com/SpecSheets/A123FAQ.pdf

Dimensions: diameter - 25.85mm or 26.62 w/sleeve; length - 65.15mm (~1" x 2 9/16")

Weight: 70g or w/sleeve and tab 72.55g (**note:** I weighed with sleeve and tab) (~2.5 oz.)

Nominal Capacity: 2.3Ah/2300mAh

Nominal Voltage: 3.3V

Recommended pulse charge: 3.8V

Recommended discharge cutoff: 1.6V

Maximum continuous discharge: 70A (**note:** that is ~30C)

APR18650M1 (1100mAh)

Source:

www.elektromodely.sk/A123/APR18650M1_2007-05.pdf

Dimensions: diameter - ~18mm; length - ~65mm (~3/4" x 2 9/16")

Weight: ~40g (~1.5 oz.)

Nominal Capacity: 1.1Ah/1100mAh

Nominal Voltage: 3.3V

Recommended Charge Voltage: 3.6V

Recommended Cutoff Voltage: 2.0V

Maximum continuous discharge: 30A (**note:** that is ~27C)

Common Names

ANR26650M1; A123 cells, M1 cells, DeWalt 36V cells [DC9360], DeWalt Lithium cells (**Note:** These cells can also be found in the DeWalt 28V [DC9280] pack and 18V [DC9180] pack.)

APR18650M1; Black & Decker VPX, VPX cells, smaller A123's

Information from the FAQ (Frequently Asked Questions) at A123 Racing

Summarized, paraphrased and annotated from:
www.a123racing.com/SpecSheets/A123FAQ.pdf
 This information applies specifically to the ANR26650M1 but can be generalized to the APR18650M1.

1.) The cell is cylindrical in an aluminum canister. It has a nominal voltage of 3.3V and a charge voltage of 3.6V. It has a capacity of 2300mAh, and is capable of 30C (69A) continuous discharges and 60C (138A) pulse (10 second) discharges. Each cell weighs 70 grams (2.47 oz). (See specific notes about the APR18650M1)

2.) A special electronic speed controller (ESC) is not needed to run these batteries. The low voltage cutoff should be set to 2.0V per cell or it can be turned off. (**KM Note:** It is best to fly timed flights with these cells. There is no knee to warn of lowering power. It's a "cliff" and it drops off "right now!")

- 3.) There are no special instructions for protection during use or charging. Treat it as you would any other battery.
- 4.) Balancing is an important precaution when using Lithium batteries. Batteries made up of these cells are not as prone to as much individual cell voltage variance as other batteries, but balancing keeps the pack in good health and ensures maximum cycles.
- 5.) Voltage sag is how much the voltage drops during the course of a discharge. A Nickel Metal battery's voltage sags throughout the complete discharge. A Nickel Metal battery is only operating at full performance for part of the discharge. The batteries being produced by A123 Systems, Inc. show very little voltage sag during the discharge. (**KM Note:** until the “bottom drops out” at the end)
- 6.) These batteries have the fastest charge time for any RC battery. They can be charged to full capacity in 15 minutes or less with a charger capable of providing the input amperage and voltage. Charging at these high rates seems to have no effect on the cycle life of the pack.
- 7.) These batteries are very safe, and abuse tolerant. They have many safety advantages over Lithium Polymer batteries.
- a.) They are not prone to thermal runaway, which is the leading cause of fire in a Li-Po battery.
 - b.) They will tolerate some amount of over voltage before failing. These batteries should be charged to 3.6V/3.7V per cell.
 - c.) They will tolerate a charge of up to 4.2V per cell with little damage. Charging to 4.2V per cell repeatedly will have negative effects on the pack. Repeated abuse will yield a much lower cycle life, and can result in pack failure.
 - d.) They will also tolerate over discharge. A cutoff voltage of 2.0V per cell is recommended, but these cells will charge up even if discharged to as low as 1.50V per cell. As with over charging, it is not recommended to repeatedly discharge below 2.0V per cell, as it will affect the cycle life and could cause pack failure.
 - e.) These cells are manufactured with a Laser welded aluminum canister. This helps to prevent damage from physical abuse such as dropping or crashing them. Even with this protective canister care should be taken when handling and using any battery.

8.) These batteries can be stored at any state of charge for short periods of time 3-5 days. They can also be stored safely for long periods of time. At a 50% to 100% state of charge, the batteries can be stored for 6 months. They can be stored for up to 24 months if they are charged to 100% state of charge beforehand.

9.) Up to 1000 cycles can be expected before reaching 75% capacity. In an average RC application, expect to see over 300 cycles before noticing any change in the battery pack. (**KM Note:** This has been independently confirmed by several individuals.)

10.) The battery can be charged immediately after use.

My Personal Comments and Observations

I am extremely pleased with the safety, performance, ease of care and charging, fast field charging time and longevity of the ANR26650M1 (2300mAh) cells, previously manufactured by China BAK for A123 Systems, Inc. It appears that Enerland Co., Ltd., which is now a division of A123 Systems, Inc., is now the manufacturer.

I also like the fact that they may safely be charged in the plane. I am using battery packs consisting of ANR26650M1 (2300mAh) cells instead of large capacity Li-Po/Li-Poly (Lithium Polymer) batteries in my sport and sport scale planes. To understand how I arrived at this conclusion, read my article “*Lithium Face Off: A Head-to-Head Comparison of Li-Po, M1/A123 & Emoli*” homepage.mac.com/kmyersefo/temperature.htm

I also like the shelf life of these cells. Like Li-Po cells, they will stay charged for a long time while just “sitting around” but unlike Li-Po cells, they do not seem to deteriorate as rapidly over time, losing performance, as quickly as Li-Po cells.

I am having great success using ANR26650M1 (2300mAh) cells at about a 35 amp static draw (about 15C) at wide-open throttle (WOT). Seven minute+ flights are the norm for my sport planes using packs made up of these cells. The recharge time, using my Astro Flight 109 charger (unmodified, when charging my 6-cell packs at 7.45 amps [$\sim 3.2C$]), is between 18 minutes and 22 minutes. The charge time would be shorter if I could get the amps higher! The cells can handle being charged at a much higher rate. The limiting factor in fast charging these cells is the ability of the “charger” to charge at a higher rate.

The voltage, from the pack into the electronic speed control (ESC), using about a 35 amp static load, averages about 2.85v per cell. When used in this way, a single cell equals about 100 watts in ($2.85v * 35 \text{ amps} = 99.75 \text{ watts}$). Don't confuse watts in (a power in rating) with watts out (a power out rating).

Powering a sport or sport scale plane at about 100 watts in per pound (1 lb. = 453.592g) usually yields a plane that will give no quarter to the majority of glow and gas powered planes flying at the local R/C flying field.

To simplify the process, is the reason I have chosen to use the ANR26650M1 (2300mAh) cells at the "fixed" 100 watts in per cell level. The ANR26650M1 (2300mAh) cells can certainly be used at much higher and somewhat lower watts in per cell quite effectively.

Personally, I have found that using them in the 35-amp static draw area gives me the flight time and power I desire for very good performance.

I have not used the APR18650M1 cells, but from the discharge graphs I have seen, they seem to be best used in the 35 watts in to 40 watts in per cell range. This is only speculation on my part at this time.

Cell Sources & Obtaining Packs

At this time, February 2008, the cells are available from several sources.

The least expensive way to purchase them is as a DeWalt DC9360 36v 10-cell power tool pack from a source on ebay. I have purchased two of these 10-cell packs, at different times, from Cool Breeze Tools for about \$100 each, delivered in 2007. (**Note:** These cells can also be found in the DeWalt 28V [DC9280] pack and 18V [DC9180] pack.)

A search on ebay (www.ebay.com) for DeWalt DC9360 reveals auctions and buy now choices for these power tool packs. The 10-cell packs are selling for about \$130US to \$140US including delivery in the USA. Sometimes you may even "get lucky" in an auction and get them for less. (Also, you can use pricegrabber.com.)

Dismantling the DeWalt power tool packs and harvesting the cells is quite easy. A thread on RC Groups by Lucien Miller/aka LBMiller5 shows just how to do it.

(www.rcgroups.com/forums/showthread.php?t=587606)

"Mini-How To - Disassembly of a DeWalt 36v Battery". Lucien Miller also has an excellent "How To Build a Battery Pack from A123 Cells" at www.rcgroups.com/forums/showthread.php?t=599316.

Sid Kaufman has figured out the "best way" to take these DeWalt packs apart and make various cell configurations for power packs using the cell interconnects already on the DeWalt pack. The interconnects on the DeWalt pack appear to work okay when used at about the 35 amp static draw being advocated here.

(www.slkelectronics.com/DeWalt/hints.htm) is the location of "Easy Packs from DeWalt 36V Packs (A123 Systems)" by Sid Kaufman.

If you do not wish to build your own pack, Model Electronics Corporation (MEC)/Pete Peterson (www.modelectronicscorp.com/view_products.php?tid=2&stid=2) has them available in even numbers in the Solderless Power Tubes (SPT), a very easy way to make up packs.

Mike Charles/BigERC.com has all types of pack configurations available as pre-built packs. Be sure to register on Mike's site to get the "best price", not the one stated on the Web page without being registered.

Tanic Packs, www.tanicpacks.com has packs available, but they seem quite "pricy" to me.

Horizon Hobby, www.horizonhobby.com/Products/Default.aspx?ProdID=AQR400140, the US distributor of single cells, has the individual ANR26650M1 cells for \$20US each, if you want to pay that much for them.

Robotic Power Solutions, www.battlepack.com/A123.asp, has both the 2300mAh and 1100mAh cells available as single cells or in packs.

Max Amps Performance RC, www.maxamps.com/products.php?cat=62 also has the 2300mAh cells available as single cells in groups of four or packs in 2S through 8S configurations.

Air Craft, aircraft-world.com, has both the 1100mAh and 2300mAh cells available as well as soldering bars for both sizes.

At this time, the BLACK & DECKER VPX 7V LITHIUM-ION BATTERY containing two of the APR18650M1 1100mAh cells is listed on the Walmart site for \$17.88.

(www.walmart.com/catalog/product.do?product_id=7081184)

Important Note: the "button" end of the ANR26650M1 2300mAh cells is the NEGATIVE

Charging Packs

Unlike Li-Po and Emoli cells (another type of "cased" Lithium based cell), which have a termination voltage of 4.2v, the cells from A123

Racing have a termination voltage of 3.6v or 3.7v and need to be charged to that termination voltage. If you already have a NiCad/NiMH or Li-Po charger, Sid Kaufman has an adapter to be used with those types of chargers for charging these cells. He calls it the "Dapter" To find out if your charger will work with the "Dapter" visit this page -

www.slkelectronics.com/lipodapter/index.htm - Newly Improved! Dapter (a.k.a. LiPoDapter+).

If you do not already have a charger, I recommend the Astro Flight Lithium Ion Charger for A123 Cells (www.astroflight.com) or the Tejera Microsystems Engineering, Inc./TME Xtrema (<http://www.tmenet.com/xtrema.htm>). The Xtrema charger also has the capability to be an in-line power meter. Both chargers can charge up to 10-cell packs from a 12v DC source like a Marine/RV deep cycle battery or power supply.

If you already have an Astro Flight 109 Li-Po charger, you may purchase a new chip from Astro Flight (www.astroflight.com). It is called the upgrade microchip for model 123 Lithium Ion Charger. Replacing the original Li-Po chip with the new chip modifies the charger for ANR26650M1 (2300mAh) and APR18650M1 (1100mAh) cell use only. If you wish to be able to charge both Li-Po and these types of cells with your AF 109 then you can use this thread to modify your AF 109 - (www.rcgroups.com/forums/showthread.php?t=602445&pp=15) - AF109 hardware hack to charge A123 cells by Pat Mackenzie. BigERC also offers a service where Mike will do the modification for you for \$25. (bigerc.com/index.php?cPath=67)

The Hyperion EOS 1210i revision A is said to be able to do 12 of these cells. The power limit for this charger is 180W so it might be able to charge a 12S pack of these cells at about 4 amps and a 10S M1 pack at not quite 5 amps.

For the fastest possible charging

IMPORTANT NOTE! The following methods are only for those who know what they are doing.

Misuse can result in personal and property damage!

These cells may also be charged using a power supply such as the MASTECH HY3020E (bigerc.com/product_info.php?cPath=67&products_id=171) or MASTECH HY5020E

(bigerc.com/product_info.php?cPath=67&products_id=170).

For field charging a small, 1200W or 1250W, generator may be used to power the power supply. Also, several Marine/RV deep cycle batteries may be used with an inverter that changes the DC input to AC output for use by the power supply.

For cell combinations where the pack can be broken into three cells groups for charging (i.e. 3, 6, 9, 12 etc.), a Marine/RV deep cycle battery or two in parallel, to increase the capacity NOT the voltage, may be used to directly charge the 3-cell pack(s) from the Marine/RV deep cycle. A How-To for a 3S pack may be found at www.rcgroups.com/forums/showthread.php?t=747911. If you understand this set up, then even greater numbers of these "3-cell" packs can be done.

Balancing The Cells

One of the big advantages of these cells is that they are very robust and seem to withstand over-charging and over-discharging quite well. They do not seem to need as much balancing as Li-Po packs, but it appears to be a good idea to have balancing leads on them and balance the pack(s) on occasion using the Astro Flight "Blinky" Battery Balancer for A123 Cells (www.astroflight.com). Here is a thread on RC Groups about balancing these packs - (www.rcgroups.com/forums/showthread.php?t=742707&highlight=balance+A123) - "Yet another A123 Thread / Balancing, is it necessary?"

More Good Information About These Cells

As mentioned before, everydayflyer is an excellent resource for information about these cells. Here is a post that contains links to just about everything you might want to know about these cells. (www.rcgroups.com/forums/showpost.php?p=6769001&postcount=2)

Lithium iron phosphate battery (Summary)

Reference:

(en.wikipedia.org/wiki/Lithium_iron_phosphate_battery) Recommended background reading on the lithium iron phosphate battery (LiFePO₄) for the type these cells belong in.

Quoted and paraphrased from the above source:

1.) LiFePO₄ was developed by John Goodenough's research group at the University of Texas in 1997.

2.) In 2002, Yet-Ming Chiang and his coworkers at MIT (Massachusetts Institute of Technology) reported that they had successfully doped the cathode with appropriate cations¹ - such as aluminum, niobium, and zirconium allowing development to move forward. Products using the doped nanophosphate materials developed by Prof. Chiang are now in high volume mass production by A123Systems, Inc. and are in use in industrial volumes by major corporations including Black and Decker, DeWalt, General Motors, Daimler, Cessna and BAE Systems among others.

1. Cations (cat-eye-ons) are positively charged ions. Cations have fewer electrons than protons.

Rumors and Other Stuff That May Affect the Availability and Pricing of These Cells

There has been ongoing litigation between the University of Texas, MIT and A123 Systems, Inc. about patent issues regarding these cells.

Rick Page of Victoria, BC Canada posted some interesting information on RC Groups. (www.rcgroups.com/forums/showpost.php?p=9079989&postcount=112)

“A123 says they are producing batteries at their own plants now, but because of the continuing legal actions they are not being more specific.

BAK indicated that they may use their A123 tooling with Phostech electrodes to make an A123 substitute but only time will tell.

All of which should be very worrisome for A123 investors. The industry seems to have decided that their patent may be invalid. The reason for the A123 high current advantage that was stated in the patent has now turned out to be incorrect and their patent may infringe on the one originally issued to U of Texas and now held by Phostech.

Rick”

And

(www.rcgroups.com/forums/showpost.php?p=9082059&postcount=115)

“This is some of what BAK disclosed for their reasons to terminate their contract with A123. BAK is 'the Company'.

Quote:

The agreement with A123Systems, Inc., under which the Company agrees to manufacture products for A123 Systems, Inc. according to the specifications

furnished by, and using the finished electrodes and other materials consigned by, A123Systems, Inc. to the Company, had terminated on August 30, 2007.

On September 12, 2006, Hydro-Quebec, a Canadian company, and the Board of Regents of the University of Texas System brought a federal patent infringement suit in the United States District Court for the Northern District of Texas against the Company. The Company has an agreement with A123Systems, Inc., under which the Company agrees to manufacture products for A123Systems, Inc. according to the specifications furnished by, and using the finished electrodes and other materials consigned by, A123Systems, Inc. to the Company. The plaintiffs alleged that by manufacturing rechargeable lithium cells for one of the Company's customers, A123Systems, Inc., for use in DeWalt 36-volt cordless power tools manufactured by Black & Decker Corporation, the Company has infringed two U.S. patents owned by and exclusively licensed to the plaintiffs. The plaintiffs seek injunctive relief and damages in an unspecified amount. If the court issues an adverse decision, the Company may be required to pay the plaintiffs substantial monetary damages. The court has not yet issued a decision on this matter and the Company is unable to quantify the extent of any possible award of damages that might become payable by the Company.

Rick”

Also:

On February 6, 2008, I was made aware that A123 Systems, Inc. had purchased Enerland Co., Ltd of Korea. Enerland, the manufacturer of extremely high quality Li-Po cells used in Polyquest batteries, FlightPower EVO batteries and more, is now a division of A123 Systems, Inc. and is sharing marketing with the A123 Racing division. My research on the Internet showed that the acquisition was completed in August of 2007. This most likely explains who has been manufacturing the cells since China BAK backed out their deal with A123 Systems, Inc.

FlightPower has also become a share holder in A123 Systems, Inc., Feb. 21, 2008

http://www.flightpowerusa.com/News/open_article.asp?articleNo=547&parent=front

What this all means to us, I am not sure at this time. It seems that the DeWalt packs have been increasing in price on ebay, which may indicate that the supply is getting shorter or that the manufacturing

costs have risen. What is actually happening at this time is unknown.

The Drawbacks to Using LiFePO₄ Cells

- 1.) **Duration:** Flight times for the 2300mAh cell are good (~ 7 minutes), and about equivalent to a 20C 2700mAh Li-Po, which they no longer seem to produce. Most manufacturers are now jumping from a 20C 2500mAh to a 20C 3300mAh Li-Po cell.
- 2.) **Weight:** A 6-cell pack made up of ANR26650M1 2300mAh cells weighs a bit over 17 oz. with wiring and connectors. A 5-cell 2500mAh 20C Li-Po (~\$148) (equivalent voltage to a 6-cell pack made up of ANR26650M1 2300mAh cells) weighs about 11.3 oz. and flies for about the same duration. A 5S1P 20C 3300mAh Li-Po (~\$178) weighs about 14.8 oz. but has about 440 usable mAh, or about a minute and a half longer flight time based on the 35-amp static draw that I have recommended. All flight times will vary, as the pilot's skill, aircraft's task and RTF weight varies.
- 3.) **Form factor:** There are times when it is much easier to get the basically low-profile brick type form factor of a Li-Po pack to fit well into a given plane.
- 4.) **Easy Availability of Li-Po packs:** The availability of pre-made Li-Po packs, to power our electrically powered models, is extremely high with many mAh capacities, power ratings and physical form factor choices. They come ready to use.
- 5.) **Ease of charging:** With the very large number of Li-Po packs being sold, finding a charger is much easier for Li-Po cells, as well as Nickel type packs.
- 6.) **Ease of motor selection:** A majority of power systems, recommended for today's aircraft, are based on Li-Po use and require some serious rethinking when using the cells from A123 Systems, Inc.
- 7.) **Cell voltage difference:** Because the single cell voltage of LiFePO₄ is quite different from Nickel based cells and Li-Po cells, direct conversion in existing systems is sometimes difficult.

Afterward: Feb. 22, 2008

While this article was being prepared, the prices for the DeWALT DC9360 10-cell pack have been steadily rising. They are almost to the point where purchasing single cells from Robotic Power Solutions <http://www.battlepack.com/A123.asp> makes sense. They do require a little different technique than the "tabbed" cells from the DeWALT packs. You'll find a "how to" at <http://media.hyperion.hk/dn/a123/packassy/A123packassy.pdf>

The February EFO Meeting

The February meeting of the EFO had been postponed a week because of the poor weather conditions on February 7. The postponed meeting was absolutely excellent. Thank you Mr. Bill Brown for your great hospitality and wonderful ambiance for a meeting room. His basement is full of current and "historical" projects, and it has to be seen to be believed!

Jim Young started off the official part of the meeting by asking if anyone had any idea how he could mount the specially made retracts (by Robart) into the nacelle of his DH-88 Comet. This 300 sq.in., great flying twin can be seen at <http://www.tnjmodels.rchomepage.com/tnjdh88.php>.



Jim Young photo from his Web site



Checking out the nacelle and retracts

Unfortunately, we didn't come up with any possible working solution for him, but we did admire the retracts! They will be a very nice addition to this model and make getting it into the air a bit easier and safer.

Ken Myers shared the changes he made from the original Fred Reese "Swallow" to create his own version, which he has named "Son of Swallow". Ken will give complete details about this model in an upcoming *Ampeer*. The basics are:
 Wing Area: ~415 sq.in.
 Wing Span: 54.75 in.
 RTF Weight: 41 oz.

Motor: Hyperion Z3019-10 (well, sort of the 10 seems wrong!)

ESC: CC Phoenix 45

Battery: ANR26650M1 3S1P 2300mAh from A123 Systems, Inc. via DeWalt 36V tool battery pack

Proposed watts in: ~300 (motor/battery not run yet)

CWL (cubic wing loading): ~8.38 oz./cu.ft. (ability level, sport)

Watts in per lb.: ~120 (performance level, very good, not quite 3-D)

RC Groups thread link is:

<http://www.rcgroups.com/forums/showthread.php?t=788482>



Ken pointing out some techniques used on the SOS

Jim Maughan shared his beta build of the Radical RC Das Mini Low Stick. You can check out some of Jim's build notes in this thread on RC Groups

<http://www.rcgroups.com/forums/showthread.php?t=779501>.

Jim is aka SKYPILEIT. Jim's still thinking about finishing up with some stars and bars and possibly some invasion stripes and a canopy.

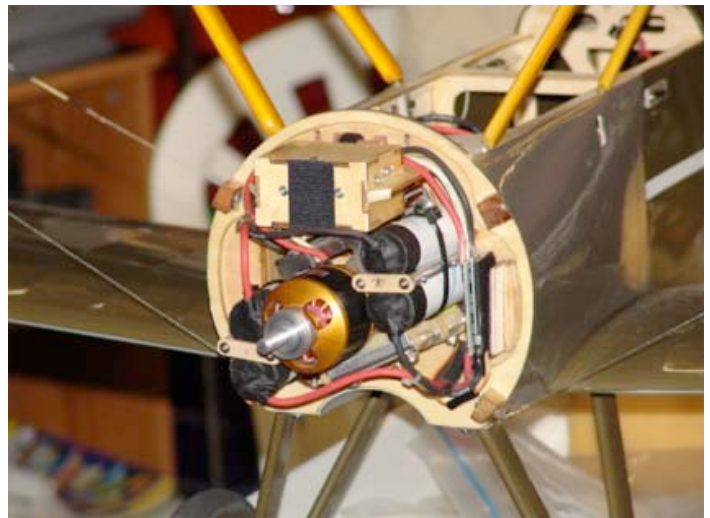


Jim with his beta build Das Mini Low Stick



Roger Wilfong had his 2-Cutie. It is a modified version of the SR Batteries Cutie, which now has been converted to a biplane. The top wing was shortened by a bay per panel and the lower wing by 2 bays per panel. He's planning on doing the initial flight with a 120 watt in power system, and will up the power if he feels that it is necessary. For even more on this mod, see Roger's thread on RC Groups at <http://www.rcgroups.com/forums/showthread.php?t=809371>

Bill Brown shared several of his current projects. He has a Hangar 9 Sopwith Camel 60 ARF in the finishing stages. He has the ANR26650M1 A123 Systems, Inc. cells nestled around the AXI 4120/xx motor. The reason for the xx after the motor, is he, like Ken, has a motor that does not match any known specifications for this series of motor.



Cells as far forward as possible



Bill and his Camel (J. Maughan photo)

Bill showed off some of the finer points of his Wright Flyer and noted that it uses some 40 feet of thread in the functional rigging!



Bill has a version of a wing type model that first flew with a glow motor and galloping ghost type RC system. He had tried to convert it to electric power several years ago using a brushed motor and Ni-Cads. It flew, but not “correctly.” It would fly very well up wind, but it would become almost uncontrollable when going downwind. He asked for ideas about how to make it “behave” while flying. He knew that it would fly, as he had flown using glow power. Several ideas were given, so Bill should once again have this very interesting model flying.



Jim Young looks over Bill's model and makes suggestions (J. Maughan photo)



A better photo of the wingy-thingy

It was an excellent night with a lot of sharing of ideas and suggestions and a lot of “plane” talk. Dang, these meetings are fun! Thanks a ton Bill for hosting!

The Upcoming March Meeting

The March meeting will be held at Rick Sawicki's house on Thursday, **March 13**. Please note the date. It is the second Thursday of the month, NOT the first! The meeting will start at 7:30, so hope to see you there. This is the same place that we've met many times for the previous two years. You can find Rick's address and phone number in the header on page one of this issue. Hope to see you there with your latest projects!

Upcoming Illinois Event

From Brad Evenson

Thanks for your great work on the *Ampeer* newsletter. I just wanted to let you know about an upcoming e-vent. The Kishwaukee RC Flyers of DeKalb, Illinois will be hosting our 5th annual electric fly-in at our club field on May 18, 2008. This is an open flying event for all electric aircraft. The \$10 entry fee includes free lunch for the pilots. An AMA license is required to fly. For more details visit our website at:

<http://www.kishwaukeercflyers.org/>

Sincerely,
Brad Evenson

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

Upcoming E-events:

Thursday, March 13, 2008 EFO Meeting, 7:30 p.m., Rick Sawicki's house, Commerce Twp., MI (see March Ampeer)

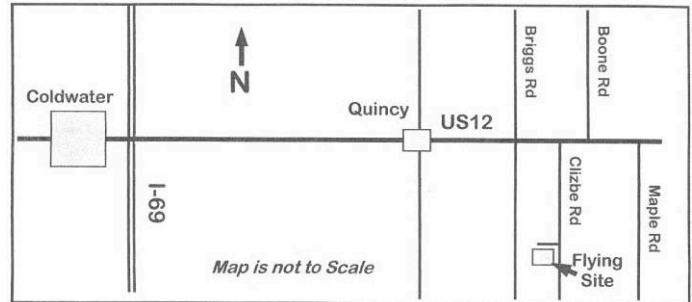
April 4th, 5th, & 6th, 2008 "THE TOLEDO SHOW", SeaGate Centre, 401 Jefferson Avenue Toledo, Ohio 43604
Show hours: Fri/Sat 9am to 5pm - Sun 9am to 3pm
Handicap parking available - Tickets readily available at the door! Admission is only \$8.00 per person per day, and as always kids 12 and under are FREE!

May 1 - 4, 2008 Southeast Electric Flight Festival, Hodges Hobbies hodgeshobbies.com, 428 Neil Hodges Rd, Andersonville, GA 31711

May 18 Kishwaukee RC Flyers of DeKalb, IL, 5th Annual

Electric Fly-in at the club field. Open flying event for all electric aircraft. The \$10 entry fee includes free lunch.
Info at: www.kishwaukeeercflyers.org

June 7 & 8 Keith Shaw's Birthday Electric Fly-in, Quincy (Coldwater area) MI, CD Dave Grife, for info email Dave at grifesd@yahoo.com, or phone 517-279-8445



Balsa Bashers Flying Site – map not to scale
Lots of Fun for Everyone. ☺



The Ampeer/Ken Myers

1911 Bradshaw Ct.

Walled Lake, MI 48390

<http://members.aol.com/kmyersefo>

The Next Flying Meeting:

Date: Thursday, March 13 **Time:** 7:30 p.m.

Place: Rick Sawicki's House

See info in this issue

Please NOTE the DATE & PLACE!