



The Flightline



Volume 32, Issue 3

Newsletter of the Propstoppers RC Club

AMA 1042

March 2002

Editorial. 3D and Fun Fliers in SD

One of the reasons we go to organized meets is to see what fertile minds are doing with our hobby. We are particularly curious in areas where technology or cultural interests are undergoing rapid change. And so it was with my trip to the Silent Electric Flyers of San Diego's Mid Winter Electrics.

San Diego is paradise to some, mild climate all year, no smog, beautiful parks and play areas that are always meticulously maintained. However, the ever-present threat of the "marine layer" off the Pacific can overshadow the good stuff sometimes and January / February are the most likely months.

This popular meet is run over four days of the President's Weekend. It starts on Friday afternoon and stretches through Monday. This year Friday and Saturday weather was mild, low sixties, and rather breezy although the sun came out in strength and the wind dropped on Saturday afternoon. Sunday brought rain after a cool start and chased me back to sunny Pasadena. I had made the trip with my #1 grandson Matthew in tow and we both made a few flights before the weather closed in.

So what are the arbiters of change doing in the field of electrics? Glad you asked because this year the technology has brought us 3D or Fun Fliers with the performance level of their gas powered equivalents. This is true for helicopters too.



*Tail dragging and endless hover.
Electric power in "sunny" San Diego*

Agenda for March 5th Meeting

- Approval of February meeting minutes
- Finance report
- Membership report
- Field work plans and dates
- Plans for 2002 club events.
Bring your calendars
- Central Penn Aeromodelers Flee Market plans.
- Club Bye Laws Committee establishment
- New business
- Battery pack soldering demonstration
- Show and Tell

We all know the fun-fly airplane. Al Tamburro has dazzled us with his virtuosity with Morris the Knife for years. The more refined CAP / Extra scale models of the full size aerobats have somewhat similar performance with room for a cockpit. Rusty Neithammer wows us with his .91 powered Extra.

But now it is the turn of electric powered airplanes to provide clean, silent power for such models.

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*Diablotin and CAP
electric powered
aerobats*

Continued on page 4

Calendar of Events

Club Meetings

Tuesday 5th March 2002 7:30 PM
Marple Newtown Library

Flying Events

Propstoppers Indoor Flying
Tincicum School – 6:30 – 8:30 PM
Friday March 1, 2002

Silent Knights of Delaware Indoor flying.
Jewish Community Center, off 202
See Dave or Dick Bartkowski

Mar 26 "
April 30 "
May 28 "

http://www.silentknightssoaring.org/club_indoor_flying.htm

Central Penn Aeromodellers / Lebanon
Flea Market

March 9
At the Lebanon Fairgrounds

Regular Club Flying

At Moore and Sleighton Fields

Daily 10 am til Dusk
Saturday 10 am til Dusk
Sunday 12 p.m. till Dusk

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Propstopper's Web Site;
www.propstoppers.org

Check the web site for back issues of the newsletter, pictures of club events and the calendar of future events.

Pictures courtesy of Bob Kuhn and Dave Harding

The President's Message

Mike Black

The building season is quickly coming to a close. I anticipate a lot of great show and tell at the next couple of meetings.

I'm also planning for my annual pilgrimage to the flea market in Lebanon next month. Many of us make the trip yearly and make an enjoyable day of it. Several of our members have had tables in the past. Please look for great deals from fellow members Warren Barrick, Marty Bakalorz, and Ed Goretzka. Sorry if I missed anyone. Everyone is welcome to join the caravan and car pools. We will make final arrangements at the meeting.

Please plan to volunteer to help with one of our yearly events. We will need a committee to run the picnic, electric fun fly, night flight, and any other activities you wish to plan. Please bring your calendars to the meeting so we can select dates. Please plan to attend the meeting if at all possible, so that we can select function dates that will maximize attendance.

Speaking of volunteers, the AMA has given all sanctioned clubs a year to revise their by-laws to more closely conform to AMA requirements. We currently have by-laws, however, these need to be reviewed in light of AMA's requirements and revised as/if necessary. Volunteers are needed for this effort too.

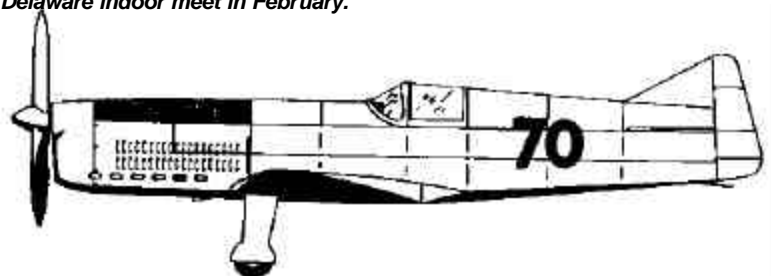
I have three gallons of fuel left from the club sale. I am not planning on a fuel sale this year. It seems that many members have several gallons in storage. If you want fuel e-mail or call me and I will bring it to the meeting. *(Perhaps we should have a club battery sale instead! - Ed.)*

Hope to see you all at the last of our indoor fun flies on March 1. They have been a hoot with a wide variety of aircraft types. See you at the meeting, gym, field or at all three.

Mike



"Gee, Doctor Groft, I don't know how the glue got into my servo". "Maybe the dog spilled it". Propstoppers President Mike Black and Silent Knights of Delaware's Bill Groft perform surgery on Mike's Mini IFO servo at the Delaware indoor meet in February.



February 4th Meeting Minutes

Rusty Neithammer - Secretary

President Mike Black called the meeting to order at 7:00 PM at the Marple Library. There were approximately 20 members present.

The minutes of the January 8, 2002 meeting, as published in the February 2002 newsletter, were approved by the membership.

Treasurer **Al Gurewicz** gave the treasurer's report with income of \$1729.05, expenses of \$133.48 and a new balance of \$5069.62 reported.

There are still club hats available - \$6.00 each.

Old Business

Field Search: Field Search chairman **Chris Catania** has discussed with Rick Slossberg the relocating of our runway along Valley Road as has been previously discussed at club meetings. Otherwise, there is no new news on any potential new fields. One issue for consideration is, that if we are successful in obtaining a field on the Elwyn property, the proximity to Moore field may require some sort of frequency coordination.

Indoor flying; this past Friday's event brought a father and son team from the Willow Grove area. They had modified IFO's with rudder control and were able to hover these quite well. The remaining event on our indoor schedule is Friday, March 1, 6:30 to 8:30, at the Tinicum Elementary School Gym.

Directions to Tinicum Elementary School (repeated from last month's minutes): I-95 north to the Essington exit, go to the first light and turn left onto 291 (Industrial Highway), go to the next light and turn left on Jansen Avenue, go to the first stop sign and turn right on Seneca, go three blocks to the school on the left.

Other indoor flying opportunities: Silent Knights Soaring Society at the Jewish Community Center off Rt. 202. There is also a group in New Jersey, but no dates have been set.

List-serve: The controversy that resulted from a series of off-topic posts appears to have been resolved. In the future, members are requested to insure that all posts pertain to RC and related topics. Please consider that recipients of list messages are of varying ages and backgrounds – i.e., anything that would not be suitable for the front page of the Inquirer is not suitable for the list. At present, the list is not moderated, and we would like to keep it that way. Central Penn Aeromodellers / Lebanon flea market – will be held Mach 9 at the Lebanon Fairgrounds. As usual, plan on convoying with other club members.

Any Members having material to send to Kenya should get these to President **Mike Black** by Friday.

Next month, **Dave Harding** will present a demonstration on battery pack soldering.

Send classified ads for sale items or items wanted, to newsletter editor **Dave Harding**, for free publication in the newsletter.

Newsletter editor **Dave Harding** asks members to provide him with reports of events they have attended. This can be done in any way that is convenient, including a simple phone call. Pictures are also most welcome.

New Business

Mike Black was asked to provide an RC aircraft demo for the Interboro High School, Wednesday, March 20, 7 – 9:00 PM. Volunteers are needed to bring planes to display and answer questions on. It is possible that the gym (which is 3 times the size of the one at Tinicum) will be available for indoor flying.

We have had a request from another club to provide letters in support of their effort to re-acquire a flying site that is on federal land. A sample letter will be added to the propstoppers.org website, so that members can download it to modify or use as is. This brought up discussion that we should re-initiate our efforts to obtain a site in Ridley Creek State Park.

The AMA "Walk of Fame" was vetoed by the membership.

The AMA has given all sanctioned clubs a year to revise their by-laws to more closely conform to AMA requirements. We currently have by-laws, however, these need to be reviewed in light of AMA's requirements and revised as/if necessary. Volunteers are needed for this effort.

There was no 50-50 or show and tell, due to the auction.

Auction

Auctionmeister **Al Tamburro** did his usual superb and entertaining job in pumping up the bids and making those sales. Items auctioned included a nearly completed and very attractive F14 Tamecat trainer, an Elaxaco ARF kit, a Global B2, and other great buys. Many bargains were available on the sale table, as well.

Rusty Neithammer



This is a shot of the cockpit of Marty Zeller's Fokker D VII that he showed at show and tell at the January meeting. Awesome detail.



Fokker D VII

Editorial, 3D and Fun Fliers in San Diego continued from page 1.

What is an Aerobat, or Fun Fly? Well, I think that answer is found in how they fly and what maneuver capability they possess.

Un-stalled maneuvers such as loops, rolls, and stall turns from upright and inverted attitude and continuous knife-edge flight are performed by most maneuverable airplanes with reasonable power margin. But it is probably the stalled maneuvers that begin to define them. Spins and snaps from various entry conditions and attitudes are essential and these lead to the exotic Lomcevak type of tumbling maneuvers. Finally unlimited vertical, hovering torque-rolls and tail dragging separate these airplanes from all the others.

Fun Fliers add some unique maneuvers such as continuous powered flat autorotation. They have lower wing loading than the CAP/Extra type of aerobat and perform their maneuvers at lower speeds, close in.

OK, we all knew that but what does a design need to be able to accomplish this, and why is it possible for "heavy" electrics to achieve this level of performance?

The first requirement is Thrust / Weight greater than 1.0. Note, it is not Power / Weight and this is the first clue on why electrics make the grade.

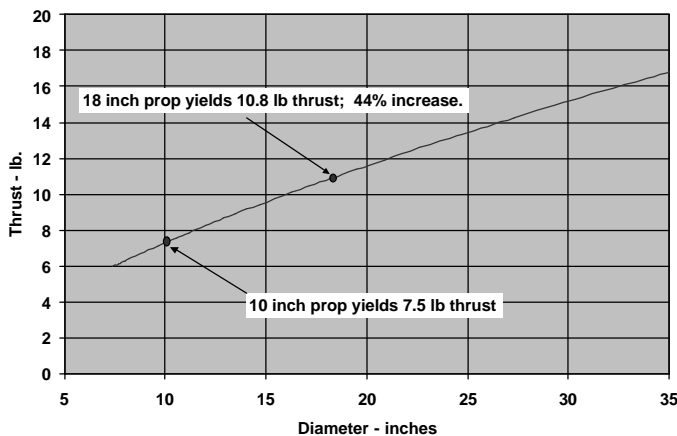
These models are built very lightly and since they have low wing loading the landing loads are low and the model are designed to withstand the flight loads, and in the case of the gas-powered models, engine vibration.

Since they rotate rapidly about all axes these models are compact in all dimensions. Furthermore the aerodynamics necessary to produce high lift in both directions and smooth entry and departure from stall results in very thick low aspect ratio wings with large flaps. Consequently, the wings can be built very light with built-up structures featuring deep spars. The high drag from these airfoils also limits top speed.

The thrust from a propeller is a function of input power and disk loading. For a given power, the bigger the propeller, the greater the thrust. This is why helicopters have large rotors. The downside is that large fine-pitch props lose thrust with forward speed faster than smaller higher pitch props but in this application there is no need for high-speed flight.

Electric motors are easily geared-down to multiply their output torque and drive large props. Unlike gas engines, electric motors have smooth constant torque output allowing the gearbox to be smaller, lighter and durable.

Theoretical static thrust of a 70% efficient one horsepower propeller as a function of diskloading (diameter)



Secondly, the development of brushless motors has improved the motor efficiency from about 70% for the typical ferrite brushed motor to about 90%.

The limits of electric motor power are usually overheating of the coil or armature and armature speed. The heat comes from the copper losses and brush losses of the motor. If a 240 watt motor (8 cells, 8 volts under load of 30 amps) is 70% efficient then 30% of the energy goes to heat; 72 watts worth. This is just like the heat from a 70-watt bulb. If the

motor is 90% efficient then the heat rejection is only 24 watts.

Generally this means that a brushless motor the same physical size as a ferrite brushed one can stand maybe double the current continuously to stay within the same temperature limit.

In the brushless motor the copper windings stay stationary and the magnets rotate in the rotor. This means that the armature is stronger and can run at much higher speeds than a brushed motor. The brushless is a three-phase motor that has higher torque.

So high power brushless motors are much smaller and lighter than the ferrite of cobalt motors with the same output power. Their higher efficiency means that the run time is longer or smaller lower capacity batteries may be used further reducing the propulsion system weight.

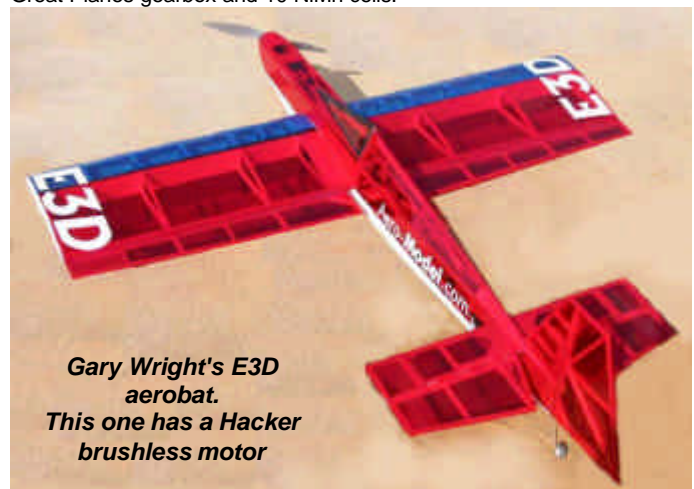


This Hacker brushless motor and 6.7:1 planetary gearbox weighs just 9oz and handles 700 watts, or 1 horsepower. The rotor turns up to 80,000 rpm.

The third factor in effective electric propulsion in this application is the battery weight and capacity. Fortunately, the cordless power tool industry is forcing the development of lightweight high capacity, quickly rechargeable batteries. Sanyo has recently introduced a new family of such batteries for this market and they are now available to us. The CP2400 cells are the same size and weight as the 1300 of ten years ago and the 1700's of five years ago.

So in summary; today's brushless electric motors using efficient gearboxes and new cells, turning large propellers produce the necessary thrust for powering aerobats; at weights competitive with the gas engine.

Actually, even with inexpensive ferrite motors the propeller efficiency from using a gearbox and the new cells allow adequate 3D performance. Garry Wright demonstrated just such a model at the NEAT Fair in New York last fall. He sells the laser cut kit for the model that he calls the E3D. It uses a \$19 Kyosho Endoplasma car motor, Great Planes gearbox and 10 NiMh cells.



Garry Wright's E3D aerobat. This one has a Hacker brushless motor



The two electric Fun Fly models flown in San Diego and depicted here show some of these features. First is the French Diablotin (Diabolical) above, and the second Gary Wright's E3D. Notice the very light structure in the wings, tail group and fuselage. Also notice the very thick wing section and large control surfaces with extreme travel.

I explained the aerodynamics of thick, flapped wings in a prior issue of Tech Notes some months ago.

The chart on the right shows the maximum lift coefficient as a function of section thickness ratio, t/c or thickness divided by chord, with and without flaps. Notice the maximum lift coefficient without flaps is 1.6 at about 12% t/c, which is what we build most of the time. However, if you really want lift you pick the 18% thick flapped airfoil and get a lift coefficient of 2.8; almost double the un-flapped section.

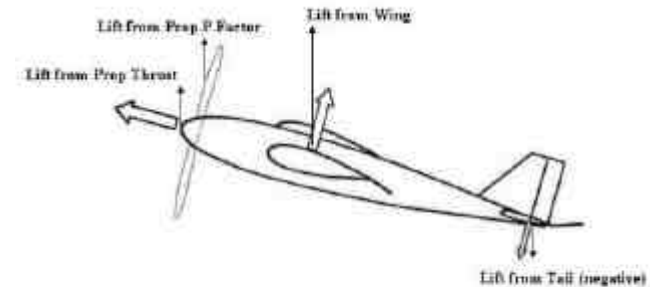
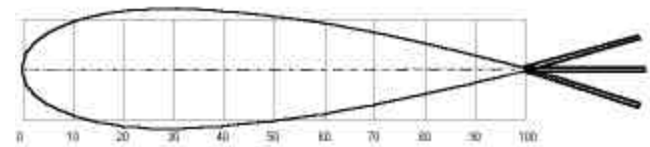
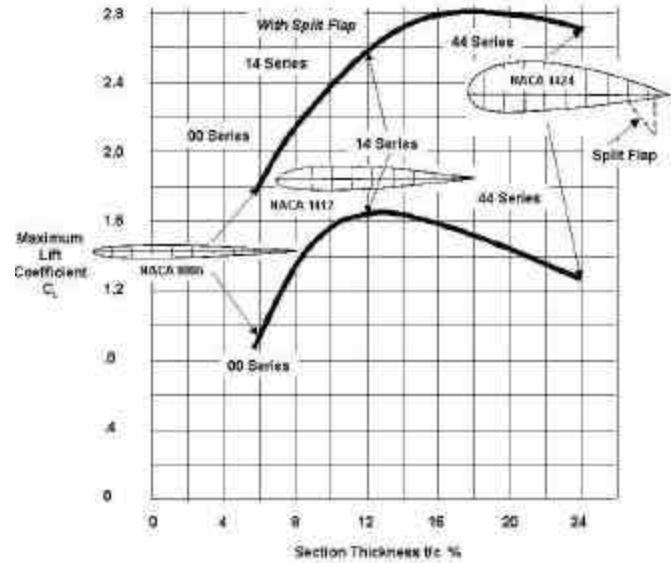
The typical Fun Fly wing section is shown too, it is always symmetrical so you can have the same performance in both directions.

In the fun fly the flaps are coupled with the elevator so that when you command up you get the maximum lift coefficient and the same when you command down. Prop effects also help a lot.

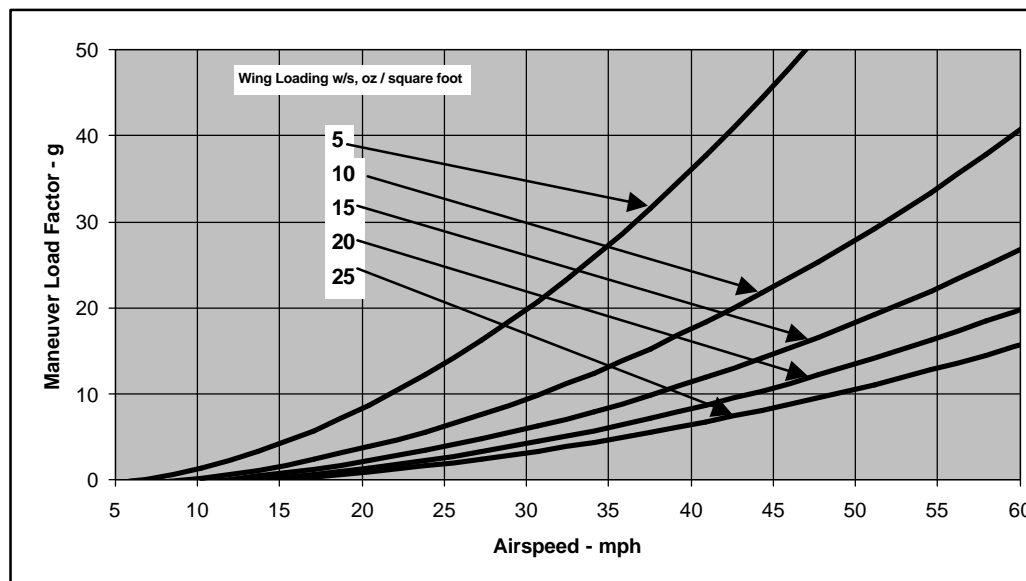
The actual lift on the wing is a function of the lift coefficient, the wing loading and airspeed squared, but a better way of looking at it is to examine what "g" loading, or even better the maneuver load factor you can generate at a given speed;

$$\text{Maneuver load factor, } g = \frac{\{1/2\rho \times v^2 \times Cl\} - 1}{w/s}$$

Where ρ is the air density in slugs per cubic foot
 V is the airspeed in feet per second
 Cl is the lift coefficient and
 w/s is the wing loading in pounds per square foot.



Fun-Fly Aerobats gain a good deal of lift from prop thrust and P factor effects

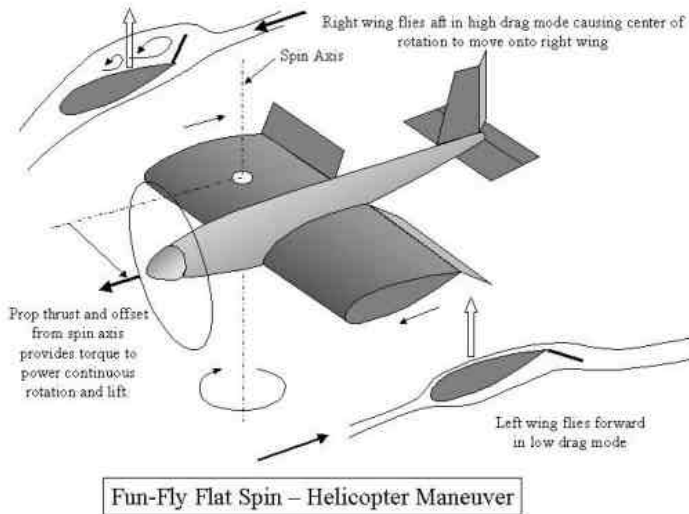


This is a plot of the Maneuver Load Factor in g's as a function of Wing Loading and Airspeed for a thick, flapped wing with a Lift Coefficient of 2.8.

Note, zero g's corresponds to the condition of minimum wing-born level flight although with these models the prop thrust adds to the wing lift so minimum speed is lower. Indeed, with enough thrust minimum speed is zero!

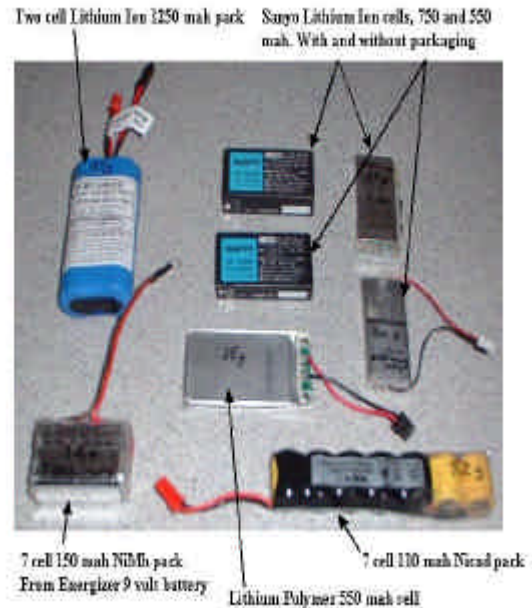
The Diablotin shown previously has a wing loading of 10-oz/ft sq. and of course, the thrust to hover. It weighs 88 oz with a Hacker motor and gearbox and 14 CP2400 cells. Turns an APC 18x10 prop.

At 30 mph it would pull about 10 g's so the wing lift would be 10 x 88 / 16 or 55 lb. Better build it light but strong. Pass the graphite.



Yeh, club batteries instead of fuel, I like that. How many do you want?

Dave Harding



Tech Note; Lithium Batteries

We have discussed the new advances in Ni Cad batteries in this month's editorial but with the indoor season in full swing there are other battery technologies coming into play.



Sanyo's new CP series NiCad. Prices are from Diversity Models

Lithium Ion, Lithium metal and Lithium polymer batteries developed for the cell phone, camcorder and laptop computer market are being used in models. Some of these cells and our current NiCad and NiMH batteries are shown below.

The energy density comparisons in several forms are shown in the table below. Suffice to say the capacity per ounce of the Lithium cells is substantially greater than either NiCad or NiMH. However, this level of performance comes with several drawbacks.

The maximum current capability is lower than Nicads so you are not going to use these cells to power motors much larger than the smaller park flyers. On the other hand they should be fine for radio receiver transmitter and servo packs although these cells produce between 4.2 and 3.6 volts. Using them with regular receivers and servos will require you to use two cells then reduce the nominal 8 volts to 5 with a regulator like the big boys use with 5 cell NiCad Rx packs.

In the indoor community suppliers are beginning to produce receivers and other related equipment that will run on 3.6 volts so you will be able to fly on just one cell!

The next problem is that they require a special charger and they cannot be charged as quickly as Nicads. Some of the high end chargers are set up to handle Lithium batteries and there are several low cost dedicated Lithium chargers to be had for as little as \$30.

Now for the big one. You must avoid loading them to the current limit and you must not discharge them below a certain voltage. Either will damage the cell. As you buy them from the consumer market they come with built-in circuits **that shut them down when they reach these limits!** Not the best of events when they are powering your radio. However, these circuits can be disabled allowing you to fly to your own limits where you take responsibility to avoid disaster and protect the cells.

Are they worth it? Judge for yourself but I am flying my LiteStick forever without charging, well, half an hour anyway.

Dave Harding

Battery / Cell	Capacity milliamp hours - mah	# Cells	Wt / 8.4 v - grams	Weight Ounces per 1000 mah, 8.4 volt pack	Specific Weight grams /amp hour / volt	Specific Energy Watt-hours / gram	Specific Weight / Nicad	Approximate Current limit - Amps for this cell
Nicad 110	110	7	52	16.9	56.3	0.018	1.0	5.0 +
NiMH 150	150	7	36	8.6	28.6	0.035	2.0	3.0
Lithium Polymer 550	550	2	30	1.9	6.5	0.154	8.7	2.0
Lithium Ion 550	550	2	40	2.6	8.7	0.116	6.5	1.5
Lithium Ion 750	750	2	50	2.4	7.9	0.126	7.1	1.7
Lithium Ion twin cell 1250	1250	2	85	2.4	8.1	0.124	7.0	3.0

Comparison of the small capacity cells and batteries that we are using in our indoor models (photo above). Note that the NiCad point of comparison is an old technology cell. The current technology is twice as good so the benefits of the alternate cells is about half that shown but still impressive.

**CENTRAL PENN
AEROMODELERS ASSOC.
22nd Annual Radio Control
FLEA MARKET**

**Date: Saturday, March 9, 2002
(Regardless of weather)**



TIME:

9 am - Gen. Admission
7 am - Table Renters Only

Info...Call Les (717) 960-8170

Admission: \$6.00 Donation (Under 12 Free)
Tables: . . . \$10.00 each (5 ft. long)
Wall Tables: \$14.00 each (5 ft. long)

Place: LEBANON FAIRGROUNDS
Intersection of Cornwall Road
and Rocherty Road, Lebanon, PA

*Call for
Map*



The Propstoppers usually convoy to this great event so if you want to tag along or offer to drive some of your buddies come to the next club meeting and get in on the plans.



Your humble servant and editor with Dave Brown, President of AMA at the AMA Aeromodeler Conference in Pasadena this year.

I am holding the torch of the Propstoppers and complaining about our officials screwing up the FAI classes during my absence from the hobby from 1970 to 1995. Us seniors used to have international competitions for Wakefield, A-2 gliders, FAI free flight power, FAI C/L Team Racing etc. Now we have F#A, F#B, F#C and nobody knows what they are. They all look and sound the same. Even Dave didn't know what they all mean.

Seems that it was done because the FAI officials couldn't keep track of all the things *they* do such as full scale aerobatics, helicopter competitions, rocketry and model airplanes. So to satisfy these old guys they added unique letters to each class of event. Probably didn't occur to them that we are only interested in models and it does *us* no good to add an "F" in front of everything we do!

Oh well, as Dave says, it was done so long ago that there are now few who know what a Wakefield is any more. Its tough getting old, guys.

Dave

Dave Harding – Editor
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