

the

Ampeer

July		The EFO Officers		2005	
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Ampeer subscriptions are \$10 a year US & Canada and \$17 a year worldwide	The Next Meeting: Date: Sat. & Sun., July 9 & 10 Mid-Am Time: 8:30 a.m. Place: Midwest RC Society 5 Mi. Rd. Flying Field – Mid-Am				

What's In This Issue:
Upcoming Mid-Am Info - What Information Should Be In Plane Reviews? - A Little 4-Star & Vacuum Pump - A Follow-up on the HL Mini Telemaster - Comments on the May Issue - Thanks for a Great Meeting - Comments on Li-Po versus Ni-MH - May EFO Meeting & MISS Aviation Day – Adhesives – Upcoming E-vents

Upcoming Mid-America Electric Flies
AMA Sanctioned

Saturday, July 9 & Sunday, July 10,
2005

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 (810) 679-3238 or
KMyersEFO@aol.com –
Web site:
<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

Registration: 9 A.M. both days
Flying from 10 A.M. - 5 P.M. (Sat.) &
10 A.M. – 3 P.M. (Sun.)

Narrowband Transmitters are required -
Channels 00 through 60, the 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 – any size motor)
- Pilots' Choice
- Best Scale
- Most Beautiful
- Best Ducted Fan
- Best Sport Plane
- CD's Choice

Sunday's Events

- 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 potluck 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**

What Information Should Be In Plane Reviews?

From Jim Young tnjyoung@sbcglobal.net

Hi Ken,

Long time no see. Can you please add me to the Ampeer emailing list again? I've been away too long.

(Reminder to all who like to get the notice that the Ampeer has been posted, please let me know of any new email address, otherwise when the notice bounces back, I have no idea where to reach you. KM)

I had fun at the Skymasters' meeting; it was nice to see you, Jack, and Keith again.

You got me thinking about some of the reviews on the E-zone, and it is hard to get consistent reviews from all of the different authors. I can relay your input to the powers that be, and we can try to do a better job on the future. You mentioned the review quality in Fly R/C, what do they do that makes them so good? Any suggestions?

Thanks,
Jim Young

What Ken thinks makes for a GREAT review of an electrically powered aircraft:

All of the following data should be provided:
Type and Mission of the plane; i.e. RTF, ARF, kit, plans, park flyer, sport, sport scale, E-3D, trainer, etc.
Materials used to create the aircraft
Experience required to "create" the aircraft
Experience required to fly the aircraft
Type and size of recommended flying area

Surface required for ROG (if possible)

Weather (temperature & winds) on day(s) of test flight(s)

High and low speed flight characteristics as well as maneuvers the aircraft is capable of.

What was good about the aircraft and what needs improving.

All of the following should also include the manufacturer, specific supplier/distributor and links to manufacturer and supplier's Web sites.

Power System:

Motor: Mfg name and motor designation, weight w/wires and connectors, Kv, Rm, Io, timing and rotation (if applicable – see also ESC), shaft size

Gearing: (if applicable) Mfg name and designation, weight, ratio, material used for construction, special mounting notes, shaft size

Prop: Weight, size, power factor for use with Calc programs or spreadsheets

Prop/Spinner Mounting: Mfg Name and designation, weight, shaft size

ESC: Mfg Name and ESC designation, weight w/wires & connectors, resistance, max cells, max current, BEC notes regarding number of servos (if so equipped), programming notes (if applicable), cut off voltage (if applicable)

Power System Battery: Mfg name and battery designation, total battery weight w/wires & connectors, cell weight, cell capacity, max discharge rate, cell impedance/resistance

Full Throttle Measurements for:

RPM: with specified motor/battery/ESC/Prop

Watts in: with specified motor/battery/ESC/Prop

Amps in: with specified motor/battery/ESC/Prop

Volts in: with specified motor/battery/ESC/Prop

Connectors: Mfg name and designation, resistance per connection

Wire: Mfg or Supplier, gauge, total length, resistance, type and coating

Motor Mounting: how it was done and notes on commercial mount including weight (if used)

Radio System:

Transmitter: Mfg name, designation, number of channels used, special notes

Receiver: Mfg name and designation, number of channels, weight, shift, antenna, special notes

Servos: Mfg name(s) and designation(s), used for which functions, weight(s), torque, connector notes

Power for Onboard Radio System: battery – weight, number of cells, capacity or BEC/UBEC info.

Measured surface throws used on tested model**Airframe:**

Wing Span, Fuselage Length, Wing Area, RTF weight (as tested), Finished Airframe Weight (that is weight without all of the power system and onboard radio components), **Wing loading, Cubic Wing Loading, Watts in per pound, Typical Duration using the specified equipment, Approx. Stall Speed, Approx. Top Speed, Wheel Diameter** (if applicable)

The reason that I feel that *Fly RC* is so good, is that in most of the reviews, they give most of the data I am looking for. Unfortunately, they are still having some editing issues and allowing things like the wrong wing loading and wrong input watts to make it into print.

I still subscribe to *Quiet Flyer*, but feel that the majority of there reviews fall short in providing the required information.

The reviews at the Ezone Magazine online (<http://www.ezonemag.com>) generally are lacking in the most basic aspects of usable data including prop, amp and rpm data. Steve Horney's recent "Hangar 9's Twist 40 ARF E-Conversion Review" is a shining exception!

I purchased the June 2005 issue of *Model Airplane News* because Mark Rittinger's BF-109 construction plan was featured in it. I'd not seen a *MAN* in quite a while and was very disappointed in the reviews. They have dropped their "Hits and Misses" section from the reviews. Dave Kemper's review of the Electrify Super Sportster EP ARF was typical of the rest of the reviews. It was full of "mixed" signals and omissions. One thing that was omitted was the surface the plane was flown from. It has been my experience that the relatively small wheels with wheel pants are not suited to typical grass flying fields. I would have liked to have known how these faired in this application. The photos showed what appears to be "piano wire" landing gear but Dave said on p.40, "At first, I had concerns about this setup, but I found that the landing gear is not made of the typical flimsy aluminum used in other models, ..." I guess I'm out of the loop, as I had never heard of using aluminum wire on landing gear before. Mixed signals, p37 "The semisymmetrical airfoil aids in maintaining low-speed stability, and the low-wing design and full length ailerons facilitate crisp aerobatics, ..." p.40 "... while the ailerons, due to their smaller size, limit roll authority and make rolling

maneuvers a bit slow." p.40 "... wing loading of only 19.5 ounces per square foot." p.40 "... with its light wing loading, the plane seems to glide forever." Need I say more?

A Little 4-Star & Vacuum Pump

From Jim Halbert hal@interlinc.net

Ken,

Thanks much for the file. (*I told him about a Steve Neu article on the small KAN high discharge NiMH cells in the Quiet Flyer archive. KM*) I subscribe to *Quiet Flyer* but never thought to check the archives. Duh.

There is too much game playing, in my humble opinion, by writers. I don't know if they really don't know or are messing with the troops.

Everything in Electric seems to be a big argument. One can make a good case that brushed motors are better than brushless. It has to be a given however the gear we talk about is top of the line. KISS

I made a lot of mistakes and wasted a lot of money following the advice of "experts" who must have been game playing before I figured the electric thing out. I have a real problem with bad info by "experts".

Attached is a picture of my scaled down Four Star 40. It's been re-engineered so much it doesn't have much in common any more. Even the airfoil was changed to a non -stall S8036/S8037. The wing is Obechi over foam, which is my favorite construction. Obechi is very hard to find but I found a good source.



Jim's Vacuum Pump system for composite wing. About \$150 in parts.

Do you have a DIY equipment file? I made a pro type vacuum pump system for composite wings. It's also used for work in my cabinet shop. It is a lot better then the CST system and a lot cheaper to build. If you are interested I could work up article on it.

Thanks,
Jim

Thank you Jim. We'll be looking forward to the article. Jim also included the following information. KM



Airplane Design Calculations
(From Aug, 04 issue of Quiet Flyer)

My new scratch built 3.5 Star E is used as an example. Some numbers are rounded off.

The 3.5 Star E is a 4 Star 40 reduced 20% at Kinko's. Note: reducing the print 20% results in reducing the wing area about 30%.

(To find the reduction in wing area, use the square root. Square root of 604 is 24.576411, square root of 432 is 20.78461, 20.78461 / 24.576411 = 0.8457138, therefore the plans were only reduced about 15.5% KM)

Basic specifications stock 4 Star 40 Glo Powered
Wing area= 604 sq. in.
Weight= 4.75 lbs. (76oz.)
Wing Loading= 18 oz/sq.ft
Cubic wing loading = 8.85 oz/cubic ft

Basic Specifications 3.5 Star E
Wing area = 432 sq in.
Weight = 2.4 lbs (38 oz) with battery
Wing Loading = 12.6 oz/sq ft.
Cubic Wing Loading = 7.4 oz/cubic ft.
Motor AXI 2820/12
Prop APC 12/6
Battery LiPo 2450

Wing Loading

Wing area in sq inches divided by 144 = Sq ft area
Divide weight in oz by sq ft.
Typical = 7-14" per Sq ft.

Example, (9) (48) = 432 sq. in. divided by 144 = 3 sq. ft.
38 oz divided by 3 sq ft = 12.6 oz per sq ft wing loading.

WL gives a very rough idea how a plane will fly but depends on the relative size of the airplane. High numbers require the plane to fly faster to stay airborne. This method is not recommended as a guide even though the magazines use it.

Stall speed

MPH = 4 x Square root of the wing loading
Example, Square Root of 12.6 for 3 Star E. (4) (3.54) = 14 MPH (rounded off).

Cubic Wing Loading

This number is better than WL to determine the airplanes flying qualities. The CWL number is independent of the size of the airplane big or little. A full size Cessna 154 has a CWL of 13 oz but a WL of 167 oz. A small model with a WL of 167 could not fly! But with a CWL between 7-20 would fly very well.

Typical CWL run from 5 for a sailplane to 30 for a pylon racer. The size of the airplane has no effect unlike WL. My 3.5 Star E at 7.4 oz/cubic ft should fly easier then a stock 4 Star at 8.85 oz/cubic ft.

(But handle less wind. KM)

To find the CWL, divide weight in oz. by wing area in sq ft raised to 1.5.
Example, wing area 432 sq in. divided by 144 = 3 sq. ft.
Cube the wing area in sq.ft. 3x3x3= 27. Then take the sq root. = 5.196. Divide the weight, 38 oz by 5.196 = 7.3 cubic wing loading.

(Note that Jim stated one formula and then used another to solve. Either will work. KM)

Go to www.members.cox.net/moorman1/apr.htm for more info and auto calculation.

Selecting Prop

Use the manufactures' recommendation for diameter and pitch. Then go to www.flydma.com select p-calc and try different size props to fit battery used and speed of airplane.

The use of a direct drive, high speed motor like the Mega's is not recommended for low or medium speed airplanes, i.e. a slow flyer vs a Zagi. My Zagi uses a Mega brushless direct drive with a 6x3 Glow

prop. Very noisy and very fast. This combination would not work on my slow Yellow 400. So a 3.8 gearbox with an 11x6 prop is used here. An AXI out runner would also work very well here with a smaller prop.

Jim Halbert

A Follow-up on the HL Mini Telemaster

From Joe Morgan j_morgan@mindspring.com

I gave Joe some information about powering this plane in the April 2005 Ampeer. Here is his follow-up. KM

Ken,

After your help in finding some answers about an AXI motor and a Mini Telemaster model I thought I would pass along to you the results.

But first, do you know of a reasonably priced frequency meter that would indicate a frequency in use or perhaps interference? I almost lost the model I will describe late yesterday evening and I think it was interference. I say almost since I think I got lucky for once. I mentioned "reasonably priced" in connection with the frequency meter and felt I had to add that I don't "buy cheap and buy twice" as you quoted Keith Shaw to me before but at this stage of my life I do have to pay attention to where my money goes.

Sorry, I have no idea where to get a reasonably priced frequency meter. Here's what I'd do. First, I would get someone to help me do a very good range check, including with the motor on. If all goes well, before I flew, I would turn on the plane, without turning the transmitter on and carry it to various points of the flying field, always being mindful of the prop! If everything checks out, I'd probably fly it. I'd also hop in the car when the weather is nice and try and check out other possible "flying sites" within a mile or so of where I'm flying.

You didn't say what receiver you are using, but if the problem still exists, and you can't find interference, then you might want to try a different receiver, like the FMA Direct M-5.

This is the result of your guidance in selecting props, amperage etc for the Mini Telemaster - wingspan 45", area 315 sq in, weight complete w 2 Hi Tech HS 55 servos 11.2 oz. Airplane complete except for radio, motor and battery.

AXI 2212/20 with Aero-naut carbon fibre prop 8.5x5
Phoenix 25 ESC
Kokam HC1500 2s LiPo pack
With a freshly charged pack input is 59 watts at 8040 rpm

Obviously this is not a definitive group of figures but should tell you something. The model will break ground in 6-8 feet and climb at 45-50 deg till you get too high to follow it well. It will loop continuously from level flight, if that is what you want, and the acceleration is very rapid. The model is a pleasure to fly and very easy to land. That being said, I broke two props the first two times I flew it. I attribute that to the fact that I have only been flying slow sticks and similar the past 2-3 years and have grown used to not having to maintain much airspeed on landing. I have made 20-30 take offs and landings the past few evenings with no further prop breakage. This model is exactly what I was looking for. With the power setup I have, it will do probably everything the slow stick will do plus so much more. Even though it is light, it should be able to handle some wind without too much problem. I am really impressed with the power provided by the AXI and it is sooooo quiet.

I also have a Cutie with SR's power package but I am not impressed with the power pack, especially the noise from the motor/gear box, although I am proud of the airplane/kit. It is the first laser cut kit that I ever assembled and they really did a super job on the kit. I have been building and flying models since around the beginning of WWII. I would hope that we live to see in the future the manufacturers adopting a consistent and reasonable method of identifying their motors (electrics). I hope I haven't taken too much of your time but thanks again for your assistance.

Joe

Comments on the May Issue

From Bernard Cawley bernard.e.cawley@boeing.com

Ken,

Just skimmed the May *Ampeer*.....and as is often the case I have some comments (I'll leave the quotes without comment uncommented).

First: That's a lovely Switchback! I'm sure James will have a ball with the airplane. If he's already flying the SmoothE with the same sort of power

system he'll be surprised, I think, at how much "lighter" the SB will feel, and how much more it can be slowed down, as well as having a much softer stall. I would suggest a 10x7SF rather than the 11x4.7SF as both airplanes, but especially the SmoothE really like having more maneuvering speed margin. Static draw will be a bit higher, but I'll bet cruise flight will happen at lower throttle settings with that prop. As you know I fly the Switchback's first cousin, the Dandy Sport (the airplanes share the same wing) on the same Axi motor, and I also have flown my SmoothE that way very satisfactorily. The SmoothE, BTW, now has a Castle Creations Mamba 2054 in it on a Cobri gearbox at a bit over 8:1 turning that 10x7SF. Will be about 130W in on a plane right at 1 lb. Zoom!

BTW, the Castle Mambas are now (or will soon be) released for general airplane use. They're 20mm motors like so many others and come in even Kvs (3600, 4200, 5400, 6800 and 8000(!)) but unlike the others they are cobalt rather than neo and so both run cooler and can tolerate more heat at the cost of slightly lower initial power compared to the similarly sized Himax 2015s, for example.

Which leads to..... Even numbered Kv values for these mass-marketed motors. I've never measured the Kv of a brushless motor (though I've been told you can do it exactly the same way as with brushed - put a voltmeter across two of the three phases and drive the motor at a known speed, then read the voltage). But I think those numbers are just marketing numbers or specification numbers given to the OEMs who actually make the motors. Why the heck so many different motor resellers want 20mm motors with a Kv of 4200 (for example) I don't know, but so it would seem. I would imagine measuring them would yield numbers that are close but not exact and would show some variation from sample to sample.

On Tom Hunt's results with Kokam 1500s...part of what's going on there is that while Kokam 1500s are claimed to be 8C cells, they're really out of breath at less than 5C (by that I mean under 3V per cell under a greater than about 5C load). Up until the latest generation Kokams (and with the exception of the 340s) I've been disappointed in the gap between claimed performance and actual performance. The new 15C and 20C cells, on the other hand, are amazing. Their voltage under load is outstanding (and, if anything, is a little better than your Motocalc examples using them) and they deliver about 90% of

the rated capacity AT the rated load. The tradeoff is that they're heavier. For example, the Kokam 15C 910s are the same weight as Etec 1200s or Thunderpower 1300s, but under a reasonable load (say 9-10A) they show much higher voltage and delivered capacity.

Some of the NiMH cells have been similarly oversold - remember the much-hyped HECells? Those things were under 1V per cell at less than half their claimed discharge rate. So sure, maybe you could take current out of them at the claimed rate without them physically failing (at first, anyway) but was it efficient, or even useful? No.

Personally, I questioned the need/desire for 20C capable LiPoly cells simply because I LIKE being able to fly for 15-25 minutes at a time and 20C is 3 minutes. But I REALLY like the higher voltage under load and consistent capacity delivery from 1C to the rated discharge rate of these new Kokams. Time will tell how they hold up, but if I run these cells in applications that don't push the ratings (to get my 20 minute flights) I expect they'll last a long time. I have the most use (and not much of that, really, yet) on the 15C rated 2000s. I've also tested them with the CamLight setup I reviewed in the Ezone (<http://www.rcgroups.com/links/index.php?id=4609>) to verify the voltage and capacity under load. I've more recently received some 910s, 1250s and 3200s and am putting them into service as I can. In static motor testing they're holding voltage under load like the new 2000s do.

In any case, 2s packs of these cells can be used to replace 7 cell NiMH packs one would use in the same airplanes, and the 3s ones have more punch than 10 NiMH cells used that way.

I've also just learned the "don't discharge them too low" lesson personally. I recently received several of these Kokam packs and left one (3s 1250) hooked up to my Hyperion E-meter for about three days - just as an oversight, really. This meant that the battery was charging the little battery in the Emeter for that whole time. I went to do a test and the LVC kicked off immediately. A look at the meter said "6.0V" - and this was a 3s pack! So, it was down to 2V per cell. I slow charged it (about 0.3C) and over three charge cycles of my 109 timing out in stage 2, put back in about 1260 mAh. But discharging it either with my CamLight discharger (at 7A) or the discharger in my 109 (about 1.2A) I am only getting about 815 mAh out of it now. A second identical pack

I got at the same time is delivering over 1100 mAh. So, it only takes ONE deep discharge to really reduce capacity. I will cautiously continue to use it (though a 3s "800" pack that weighs 4 ounces is kinda heavy) to see what happens in the long term.

The Hyperion E-meter (http://www.aircraft-world.com/prod_datasheets/hp/emeter/emeter.htm), by the way, is a neat combination Whatt meter and tach that can store 5 snapshots of data with the press of two buttons and retain that data until you can write it down. It's also smaller and lighter than a Whattmeter. But the tach is very sensitive to artificial light (both fluorescent AND incandescent) which makes using the tach kind of a pain. But having volts, amps, watts and RPM captured at the same instant and stored makes it worth it to have to have a flashlight handy. More later as I use it more. A computer interface, ala Medusa Power Analyzer Plus, is coming. The E-meter also doubles as a programmer for the "Titan" series of brushless controllers. It's even easier than the Phoenix-Link.

Lessee.....Sombra. I now have three of them - two Shadow-1s and one Shadow-3. The Shadow-3 is currently in my Kadet EP-42 (which will be an Ezone review soon) and one of the -1s is in my Stevens Aero SquiRT (which did some beach plane duty a couple of weeks ago while we were on the Oregon coast for a week). The other -1 is going in my SmoothE before the meet this coming weekend. I love 'em so far. I've tested the first -1 on Airtronics (my REALLY old XL), Multiplex (Evo 9 synth, Cockpit and Pico), HiTec (Flash 4x) and GWS (Dreamstarter II negative shift version) transmitters - a mix of positive and negative shifts - and so far they're flawless. This coming weekend is the 15th annual Celebration of Silent flight and there they will get a chance to operate in a rather more crowded RF environment than they've seen before. But based on bench tests with an interfering transmitter on the SAME channel as the one locked into the Rx, I expect they'll be rock steady. I'm really anxious to get my hands on the upcoming Shadow-2 (a 4-channel smaller than a Berg microstamp).

The combination of Sombra Shadows and my Evo 9 synth Tx should make it possible to fly whenever I can get a flight station, even at the biggest of meets <G>. I need to make up a blank frequency placard for my Tx antenna and bring a Vis-a-Vis pen along to show the channel I'm using at the time.....

Gee, this got long didn't it? Take care.

Thanks for a Great Meeting

From Greg Cardillo greg@skymasters.org



Joe Hass, President of Skymasters, introduces Jack Lemon, Jim Young, Keith Shaw and Ken Myers



Jim Young's Big Wendall-Williams is Li-Po powered.



"Did Ken REALLY just say that!?"

Ken,

A big thank you to yourself, Keith Shaw, Jack Lemon, and Jim Young for joining us for the Skymasters April 27 meeting. The wealth of knowledge shared at that meeting (and the electric projects we got to see up close!) was tremendous. We had over 65 Skymasters and Guests attend the session and comments that night and since have been great.

Hopefully we not only answered the questions of existing electric pilots, but also sparked some interest to come out and see what can be done with today's technology - and hopefully try it for themselves.

Enclosed are some pictures of the evening - feel free to use as you see fit. Some will be on our website and in our newsletter shortly...

Hope to see you at our Skymasters Small Fry, Electric, and Sailplane event on June 18th. (Flyer at <http://www.skymasters.org/events/flyers/smallfryelectricsail.gif> or <http://www.skymasters.org/events/flyers/smallfryelectricsail.pdf>).

Looking forward to this year's Mid-Am Electric Fly as well in July!

Thanks again!
Greg Cardillo
Skymasters R/C
greg@skymasters.org
<http://www.skymasters.org>



Our friend, and well-known designer, Mark Rittinger, showed up at the meeting with his latest design, a BF-109, which is featured in the June 2005 Model Airplane News.

Comments on Li-Po versus Ni-MH

From Pierre Audette pfaudette@videotron.ca

Ken, your article on Li-Po Cells versus NiMH was quite informative. However in comparing data I think it would be better to relate the numbers to performance attributes. Namely 'Watts per pound' between Li-Po and NiMH cells. As you stated, the weight loss with Li-Po cells can be quite an offsetting factor to the loss of RPM's and Watts. For that reason, I favor at times a power setup with 2S packs with a high Kv motor.

Keep up the good work.

Regards,
Pierre Audette

May EFO Meeting & MISS Aviation Day

May 7 was a beautiful day at the Midwest RC Society flying field. Many of the EFO members showed up and took advantage of the great weather.

The MISS (Michigan International Soaring Society) Aviation Day at Lyon Oaks Park in Wixom, MI was a very great success. Sailplanes sailed, kites kited, free flights flew and electrics zoomed through the park. The weather was perfect, except for the kites. Tom Blaszak, the organizer of the event for MISS was very pleased with the turnout and what was happening. Many families were there to enjoy the

day, and there were a lot of very young children introduced to many aspects of aviation.

I'd like to thank Richard Utkan, Tom Bacsanyi and Steve Elwell for joining me and showing off what electrics can do. Thank you very much gentlemen!

Adhesives

By Keith Shaw of Ann Arbor, MI

Whether we design our own planes, build from plans or kits, assemble ARFs, or do the occasional dreaded repair, we use adhesives. Like any tool, there are right and wrong choices. A pair of pliers CAN be used to pound in a nail, but a hammer works SO much better. The right glue is equally as important.

I will go through the various types of glues with a description of how they work and their appropriate uses.



Cellulose

These are the original model airplane glues like Ambroid, Siment, Testor's or Duco. They are sticky solids dissolved in a solvent such as acetone, toluene or MEK (methyl ethyl ketone). When applied the glue can flow into the nooks and crannies of the wood, but when the solvents evaporate (dry) the 'solids' hold the parts together, mostly by mechanical interference. These glues are okay for small models, but are not strong enough for bigger planes. You can increase the bond strength by 'double-gluing'. Often the glue will wick so far into the wood grain that it leaves the joint interface dry and weak. Double gluing is the practice of applying some glue to both joint faces and letting it sit for a few minutes, then putting on another coat of glue before assembling the parts.



Casein

Derived from milk casein, these are 'white' glues such as Borden's or Elmer's Glue-all. Ever wonder

why there is a cow on the label? Now you know! If you would look at milk casein under an electron microscope, it resembles a bunch of balls with barbed hairy arms. When the casein solids are suspended in water, these arms can flow and slide along each other, but when the water evaporates, the arms become hopelessly tangled. The glue flows into the wood grain, dries, and becomes a matrix to hold the parts together. These glues can be quite strong for wood and paper, but do have one major disadvantage, water resistance. If exposed to water or even high humidity, the casein particles can flow once again and the joint lets go. Not good for flying on a rainy day!



Aliphatics

These are the 'yellow' or carpenter glues like Titebond, Wilhold, and ProBond. Aliphatic describes a zig-zag molecular structure (~~~~~). If short chains fuse together to form one long chain it is called polymerizing. When the glue is in the bottle, these chains are short and so have good mobility and can wander deep into pores and wood grain. In this case the water serves two functions, aiding the flow of the short chain segments, and acting as an inhibitor to prevent the chains from growing longer. When the water evaporates, the chains grow and permanently make a tangled matrix to bond the parts together. Water added after the 'cure' has little effect on the bond strength since the chain formation can't easily be broken.

Aliphatics are excellent glues for balsa, spruce, hardwood, and plywood. They have the added advantage of being safe for your health, the environment, and spills or overflows are easy to clean up with water.

Coming up next, epoxies and 'crazy' glues.

ARVADA ASSOCIATED AIRPARK FIRST ANNUAL ROCKY MOUNTAIN ELECTRIC FUN FLY

Saturday, July 30th, 9 am to 4 pm

Hosted by the Rocky Mountain Electric Flyers in cooperation with the Arvada Associated Modellers

Site; Arvada Air Park, SH 93, Golden, Colorado West Field.

EVENTS

Speed 400 7 cell LMR Sailplane, AMA Event 610 except 45 second motor run, 5 minute glide, no spot landing. 7 cell NiMH or NiCad only, brushed 400 only, gear drive and folders OK. 3 Rounds.

Limbo- Any plane, motor, battery. Starting height 10 feet. 25 points each lower pass, double points for inverted limbo pass. 2 attempts per contestant at each pole height.

Helicopter Pad Hop (4 pads, 10 foot square layout). 2 attempts per contestant, lowest single elapsed time wins.

GWS SLO STIK Precision Flight. Any Motor and Battery. Aircraft must be GWS "Slo Stik". R.O.G., 3 Loops, 3 Touch-and-Go's, Spot Landing, 2 minute flight.

Each second over/under, 1 point lost. Maximum Flight score 120 Points.

Landing (10 Foot circle) 10 Points; Inner (5 Foot Circle) 20 Points. Entire Aircraft must be stopped in circle. 2 Attempts per contestant.

FUN FLYS ALL DAY!

ALL ELECTRICS WELCOME! SUPPORT E-POWER IN COLORADO

AWARDS

Best Finish/Covering (static), Pilots Choice (overall), Best Original Design.

ENTRY

AMA License required to fly, \$ 10.00 Entry fee (includes one event) \$ 5.00 each additional event.

No age categories (open only). Spectators FREE. Raffles too! No pre-entry, registration starts 8:00 a.m. Cash only. Contest Director George Baxter
Flying Demonstrations- E-Helicopters, Hotliners, 3D, Ducted Fans, E- Vintage and E-Oldtimer.

Contact Information:

<http://www.rmeflyers.org/funfly2005.htm> or;
mefrbe@aol.com (720) 220 3384

**Upcoming E-vents
2005**

June 24-25-26 MARCEE 2005 Electric Fly, 3M Club R/C Flyers' Field, St. Paul, Minnesota, Contact Steven Mundt mundt@mninter.net Web site: www.marcee.org See marcee.org for details.

July 9 & 10 Mid-America Fun Flies 2005, Northville Twp., MI for information contact Ken Myers via email at kmyersefo@aol.com or phone: 810.679.3238

July 23-24 Phantom Flyers 5th Annual E-Fly-In, Phantom Flyers R/C field near St. Charles, MO. No landing fee again this year! AMA is required. Flyer @: phantomflyersrc.com

July 30 Rocky Mountain Electric Flyers "Fun Fly" 9am to 4pm at the Arvada Associated Airpark, State Highway 93, Golden, Co. Map, rules, info at www.rmeflyers.org or www.amadistrict-ix.org.

July 30 - Aug 2 Electric Nationals, AMA Headquarters, Muncie, IN contact: lonniee@modelaircraft.org Visit the AMA site for more info at www.modelaircraft.org

August 6 Fort Wayne Flying Circuits 10th Annual Electric Fly, Flying Circuits Field, New Haven, IN, 1702 Webster Rd., \$5.00 landing fee, flying starts at 9 a.m., CD Clay Benjamin 260-627-2760, clbenjamin@yahoo.com or Pat Mattes, 260-478-7302 or pat-ingrid-mattes@juno.com

August 6 & 7 Cedar Rapids (IOWA) Skyhawks 2nd Annual E Fun Fly, info at: www.foxcoins.com/skyhawks/funfly/, contact Plenny Bates, 2505 White Eagle Trail SE, Cedar Rapids IA 52403-1547, 319-362-2969

August 13 & 14 Sharks All Electric Fun Fly #2, Sheboygan Falls, WI, Web site www.mcallisterdesigns.com/elec05.htm for map and updated information.

August 27 Battle Creek Balsa Bees 2ND Annual Electric Fly, Flying Site just south of Battle Creek, Rain Date 28th. Contact: David Sootsman, email: NScaleNuts@aol.com, info 269-275-9272 Cell phone help will be 269-275-9272

Please get event info to Ken Myers ASAP for 2005



The Ampeer/Ken Myers

5256 Wildcat

Crosswell, MI 48422

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

The Next Flying Meeting:

Date: Saturday, July 9 & 10 **Time:** 8:30 a.m.

Place: Midwest RC Society 5 Mi Rd. Flying Field
Mid-America Electric Flies