



May 2006 Newsletter

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This Month's Meeting:

Simi Valley Library

Friday, May 26th, 7:30 PM

**Bring items for Show-n-Tell
Plan next event.**

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From The President:

The Electric Fun Fly and BBQ, May 20 was a great day and had a good turn out of our own club members as well as visitors. Seven non club members heard of our event and came out to fly and/or to have a hamburger or hot dog. Jeff Raven, did just about everything for this event, he was the event organizer, the person who mowed grass the day before, purchased the food and arranged for it not to rain until Sunday. Thanks to Cody Weir for selling raffle tickets. Thanks to Terry Messerer (Mike's wife) for the supper looking flyers. Thanks to Mike for posting the flyers, we had several people come from the Apollo XI field (Sepulveda Basin) because of the flyer there.

Thanks to the folks who helped out on the work party April 29th. It was the usual mowing, brush cleanup and tree trimming. Those helping were Mike Kane, Bob Fricke, Ken Fricke, Mike Reiber, Josh Fint and Shan Picard. After the work party, we shared a pizza and sodas.

Don't forget our 4th Friday meeting on the 26th. I have a DVD from Horizon Hobby on the Spektrum DX6. The Frequently Asked Questions (FAQ) and What the AMA thinks are interesting. We had at least one DX6 at the Electric Fun Fly. Garret said he would bring a video of simulated air and sea battle using model airplanes and model ships. I've seen the ship models with the ball bearing guns, but have never heard of mixing in model planes.

Calendar of Near Term Events:

Date	Event
May 26 th	Regular Meeting (4 th Friday)
June 13 th	Board Meeting (2 nd Tuesday)
June 23 rd	Regular Meeting (4 th Friday)
July 11 th	Board Meeting (2 nd Tuesday)

ON THE SAFE SIDE :

Safety: As Simple as ABC

by Don Lowe

From: AMA Insider May 2006

Hi! I've been in this hobby a long time (forever), and I guess I've seen about everything happen in model flying that's possible. However, I wonder if there is some method of operation that might help preclude crashes and unsafe operations.

I've written about safety many times in past columns for RCM and, of course, I chaired AMA's Safety Committee for many years. One thing I've learned is that you can have all the safety rules

that you want, but if fliers don't conscientiously observe these rules, then what good are the rules?

Fortunately most fliers exercise common sense in their flight operations, and their airplanes survive to fly another day.

Some say that man is a creature of habit. If you can, in some magical way, coach that creature to use common sense and to follow a set of safety guidelines, then you have accomplished something.

Models come in all shapes and sizes. Some have such low-energy content in their flight operations that they are not much of a threat. By and large, the typical model airplane flown by the average modeler is of a size, weight, speed, and complication that logical care in flight operations is mandatory otherwise serious damage can occur to people or property and none of us wants that to happen.

Several weeks ago a friend of mine crashed a gorgeous and expensive Aerobatics (Pattern) model at a contest because of a momentary lapse of attention and adherence to important safety practices. The model was a typical F3A Pattern aircraft with a plug-in wing and tail. In his haste to fly, he forgot to physically secure the wing halves into position and plug in the aileron servos.

This inattention to flight procedure was followed by a failure to exercise the control system prior to flight to observe normal operation. A takeoff and the resultant crash occurred. Fortunately no one was hit, but the beautiful aircraft—and his ego—were severely damaged.

How do we improve our chances of safe flight? In mulling over this on the way home I thought about our flight training in the Air Force. We used a check system prior to flight that was simple and easy to remember. Each check list was particular to an individual aircraft design; such check lists are used by full-scale pilots today.

The code I used at that time was CIGFTPR, and I will never forget it. It followed the usual walk-around—inspecting the exterior to see that everything was in place and kicking the tires. Then in the cockpit I went through the list. It goes something like this:

- C (controls): Operate the flight controls to observe for motion and direction

- I (instruments): Check the instruments to be sure all are functional
- G (gear): Landing gear lever down and locked
- F (flaps): Flaps are set to proper position
- T (trims): Control trims are set properly for takeoff
- P (propeller): Propeller controls are set for startup and takeoff
- R (run-up): Engine run-up to check proper operation

This system worked well and I'm sure the precheck saved many an aborted takeoff.

Okay, such a system works for full scale, but is there a system that is easy to use for model fliers that will be remembered and may be used to prevent disaster down the road? How about using ABC? It's simple and easy to remember. The check would go like this:

- A (assembly): Check that everything is in its proper place, controls are still intact as installed and securely fastened, and all assembly fasteners are in place.
- B (batteries): Must be fully charged—very critical to safe flying.
- C (controls): Controls checked for deflection, without evidence of servo malfunction, and operate in the proper direction.

Have you ever taken off with the ailerons running backwards? The average flier will not survive this error, and many models have been lost because of reversed ailerons. Remember, make sure they are operating and in the proper direction. Just stare at the aileron; did the right aileron deflect up when I commanded right aileron?

Simply observing motion is not enough; you must check direction. You probably would be unable to execute a takeoff if any other control is backward, but the ailerons are another story! When I taxi I am consciously flipping the ailerons to make sure they are working correctly. When I flew full scale I always checked controls one last time before initiating takeoff.

Will you do your ABCs? I sure hope so since it hurts to see a gorgeous airplane in pieces and maybe someone hurt. Let this little memory jogger help save your beautiful aircraft. Yes, safety is common sense, and for some it is habitual. Be sure and practice safe flight.

Happy flying!

Composite Fabrics:

From the Jet Pilot's Organization and AMA Insider Composite Materials: Kevlar
by Art Gajewski

This article will provide some insight into aramids commonly known as Kevlar. As jet modelers, most of us are familiar with the popular fabrics used in the construction of our aircraft. Certainly, we have all built or flown models made of fiberglass and even some with carbon fiber and Kevlar. However, have you ever wondered how these materials are made and what are some of the tricks to use them properly?

Introduced commercially in the 1970s, Kevlar aramid is an aromatic organic compound of carbon, hydrogen, oxygen, and nitrogen. Kevlar fiber is produced by spinning long-chain polyamide polymers using standard textile techniques. The low-density, high-tensile strength, low-cost fiber produces tough, impact-resistant structures. The compressive properties of Kevlar laminates are low (because of poor coupling of resin matrixes to the aramid fibers), so, applications are typically secondary structures or tension-critical applications.

Kevlar fiber, originally developed to replace steel in radial tires, has found increasing use in the belts of radial car and truck tires, where it saves weight and increases strength and durability compared to steel belts.

Two Common Kevlar Alloys

Kevlar 29 is a low-density, high-strength aramid fiber designed for ballistic protection, slash-and-cut resistance, ropes, cables, and coated fabrics for inflatable and architectural fabrics.

Kevlar 49 aramid fiber is characterized by low-density and high-tensile strength and modulus. These properties are the key to its successful use as reinforcement for plastic composites in aircraft, aerospace, marine, automotive, other industrial applications, and in sports equipment. It is available in continuous-filament yarns,

chopped fiber, woven and unidirectional fabrics, tissues or veils, and tapes for reinforcement applications.

Kevlar 49 aramid is used in high-performance composite applications where lightweight, high strength and stiffness, vibration damping and resistance to damage, fatigue, and stress rupture are key properties. Reinforced composites can save up to 40% of the weight of glass-fiber composites at equivalent stiffness. The aramid composites resist shattering upon impact, and the presence of the fiber inhibits propagation of cracks. Depending upon the selection of resin systems, aramid composites have a useful temperature range from -320° to 400° F (-196° to 204° C).

Kevlar 49 is not a carbonized or graphitized material. Unlike other organic materials, its stress-strain behavior is linear to ultimate failure in tension at 340 kips/square inch (2344 MPa) and 1.8% elongation. Toughness of the fiber composites is significantly higher than carbon graphite composites. Furthermore, the very low density of the fibers provides a higher specific strength than glass or carbon reinforcing fibers. The specific modulus is between four and five times higher than that of glass fiber. The usable strength of Kevlar 49 reinforced epoxy is about four times that of 7075T6 aluminum at less than half the density.

Kevlar—Getting the Most Out of Yours

Kevlar is lighter than fiberglass (for a given strength) and tougher than carbon fiber. Therefore, it sounds like the ideal composite, right? Well, yes and no. Let's see how to best use this aramid material.

First, cutting it can be a real pain. Special shears are required to cut Kevlar fabrics and tapes. These shears are designed to hold the fabric securely as the cutting blade does its job. If you look at these shear blades closely, you'll notice that there are serrations on the "holding" edge and a sharp edge on the cutter. These shears are a specialty item and are therefore somewhat expensive, but they are well worth the price in reduced aggravation and improved results. Don't try to cut Kevlar without them.

Second, use a compatible resin. Kevlar does not bond well with polyester resins. Keep it simple and use epoxy resins for the best results.

Last, use Kevlar for specific applications including reinforcements as opposed to entire structures,

predominantly tensile loads, vibration damping, or scuff resistance. Kevlar works well as reinforcement in fiberglass structures. Cost may become prohibitive when used as the only fabric in a composite structure and its compressive strength isn't as good as some other materials. I have seen Kevlar canoes, but I don't know how well they perform. Kevlar works really well as localized reinforcement in vibration-prone applications (e.g. engine-mount boxes in Giant Scale airplanes with gasoline engines). Scuff resistance is another good application—wing tips, fuselage bottoms, etc.

Always use high-quality, engineered resin. Some hobby resins may not have all of the strength properties we desire in our applications. I personally use and recommend WEST Systems 105 resin with fast or slow hardener. WEST Systems is competitive on a cost-per-ounce basis. This resin dries hard, is easy to sand, it's tough and not easily damaged compared to some other hobby resins intended for the same application.

Once again, a quick word about hybrid fabrics (carbon fiber and Kevlar)—these hybrid fabrics are popular because not only do they look attractive but they also can provide the best of both worlds. They provide the lightweight, high strength, and stiffness of carbon fibers with the lightweight, toughness, and abrasion-resistance of aramids. I have built hybrid composite landing gear using alternating layers of carbon fiber and Kevlar with excellent results. One would need to understand the application very well to select the right composite properly (fiberglass, carbon fiber, aramid, or a hybrid). Hybrids have their place.

Note: Information in the article is adapted from Composite Materials Handbook, M.M. Schwartz, McGraw-Hill Book Company, 1984.

Minutes:

A general meeting of the Simi Valley Flyers was called to order on Friday April 28, 2006 at 7:44 by President Alan Hoff. Jerry Simon moved to approve the minutes as published in the newsletter; the motion was seconded and passed by a voice vote.

The meeting opened with a guest speaker, Bill Stullick worked for Lockheed from 1959-1993 and spoke on projects such as the Dark Star and Have Blue. Bill spoke about his model building

career for Lockheed, and showed both pictures and examples of models that he has carved.

Andy Wier moved to approve 2 new members, Ray Douglas, and Steve Russel, the motion was seconded and passed by a voice vote. No other officer reports were given.

In old business the flags continue to have problems with the original mounting clips and a flag repair kit has been placed in the flight box so that anyone who sees a problem with the flags can attend to it. The AMA charter kit has been submitted and intro pilots have received their new AMA cards as well as instructions on how to properly execute the intro pilot program. Lastly the lease payment on the field is due by March 31, and it has been indicated by the county that the bill has been mailed.

Chairman Andy Wier reported that he has received no response or interest in the Harvey Bushong memorial Construction derby. Lightweight electric combat was removed from the agenda as the AMA has issued a definitive 'No'. The electric fun fly was rescheduled for 5/20/06 as the original date conflicts with the memorial for Nick Wyers.

In new business a bank switch over is still in our future as soon as non-profit paperwork arrives. The new AMA proposed "Park Flyer Program" was mentioned in case there were people who were not aware of the idea. We have been contacted by the cub scouts and requested to have another Cub Scout teaching day.

Rick Rupel moved that we pay Eddie Toledo \$412.50 to grade the road to the field. The motion was seconded as discussion followed. The motion passed by a voice vote.

Information regarding a raffle to send the 2006 U.S. scale team to competition in Sweden.

Donald brought up the need to make an improvement on our handicap flight box as well as possibly the rest of the flight boxes. Several ideas were discussed. Josh Fint moved that Donald do some further research and decide on the best course of action based on price and effectiveness, and that the club will pay to implement his recommendations. It was seconded and the motion passed by a voice vote.

Ken Fricke brought up the possibility of participating in the Simi Valley street fair, this was discussed and Curt Adams moved that Ken

head up our participation and coordinate the event. The motion was seconded and passed by a voice vote.

There were many items for show and tell, Jackson Fricke had an inexpensive RC airplane from Target, it was small enough for Jackson to give a flying demonstration at the meeting. Ken Milbret showed his .60 size P-47 which is powered by an e-flight power 60 electric motor. Jerry Simon had two airplanes, one was a Cox electric model with micro electronics, and the other was a Bill Stullick designed Zlin. Bob Fricke brought in two of the speed wings ordered earlier this year; both were covered in solortex which seemed to be superior to zagi tape in several ways. Ron Scott had an Electric extra 300 from Extreme Flight. This plane comes with the power system, a torque brushless motor combo, and is built extremely lightweight. Bill Stullick showed his U2 airplane, he has built a glider and a motor version.

The meeting was adjourned at 9:47 pm.

Respectfully Submitted
Josh Fint
Secretary
Simi Valley Flyers

Thank you, Mike and Terry Messerer for producing and help distributing the posters and flyers for the Fun Fly event on May 20th.

Electric Theory:

From the Albuquerque Radio Control Club,
Albuquerque NM and AMA Insider
Basics of Electric Flight
by Pat Tritle

I really enjoy getting together with clubs and speaking to the group about the basics of electric power. However, because there is so much information that needs to be passed along, it would be difficult, if not impossible, for those attending to remember much of the pertinent information. For that reason, it's better to write up the basic guidelines so that those who are interested in getting into electrics would have the information available for reference at a later date.

Here goes. I'll keep the numbers as simple as possible to avoid unnecessary confusion.

OK, here's how it all shakes out. The basic power required to fly an electric model is as follows:

Direct Drive Systems watts/pound	60
Gear Drive Systems watts/pound	50
Mild aerobatic performance watts/pound	70-80
For all-out aerobatics watts/pound	100-110
3-D performance watts/pound or more	150

The above numbers are based on models with wing loadings from 8-16 oz/square foot. As with gas models, higher wing loadings require more power since they must fly faster to support the added weight. By the same token, a lightly-loaded model with a wing loading in the 3-5 oz/square foot range will fly very well at 25 -30 watts/pound.

What's a 'watt'; and where can I get some?

Wattage is the term used in electric flight to relate the level of power that an electric drive system will produce. To relate it to terms we're familiar with, 746 watts = 1 horsepower. To calculate the wattage delivered by a given system looks like this: amps x volts = watts. So where do these numbers come from and how do I know how many volts and amps are needed to fly a given model?

Okay, let's say you want a mildly aerobatic sport model with a 14 oz/square foot wing loading that will weigh in at 2 pounds. We already know that the power requirement for a model like this is about 70 watts/pound, so we're going to need to generate about 140 watts. Let's assume that you are going to use an eight-cell Ni-Cd battery. At 1.2 volts per cell, eight cells will deliver 9.6 volts. To arrive at the necessary current draw to achieve 140 watts, simply divide 140 (watts) by 9.6 (volts) and you arrive at 14.58 amps.

Now, let's assume that you have a three-cell Li-Poly battery for the model, which is rated at 11.1 volts. The formula is the same; 140 (watts) divided by 11.1 (volts) = 12.6 amps. As you can see, as the available voltage increases, the lower the current draw needs to be to deliver the necessary wattage.

Now here's something to consider when selecting your system: the higher the current draw, the shorter the flight duration on any given battery. Therefore, the ideal setup would be to use a higher-voltage battery with lower current draw for maximum duration. On the downside, when using Ni-Cd and NiMH batteries, as the cell count goes up, the weight will increase significantly as well. It works that way with Lithium too, but Lithium batteries are dramatically lighter than the old "round" cells.

Okay, let's say we're going to use an 11.1 volt Li-Poly battery. All we need to do now is select a motor that will swing enough propeller at 12.6 amps to fly the model at a top speed of around 40-45 mph and we're in business. Now that you know the parameters, visit your local hobby shop and select a motor that fits that description.

Gear Drive vs. Direct Drive: Why is one better than the other?

Well, it all depends on the kind of performance you're looking for. If you're looking to go fast, go with direct drive. Going fast requires a high-pitch propeller turning high rpm. The formula to calculate propeller pitch speed is an easy one; it looks like this:

$$\text{rpm} \times \text{pitch (in inches)} / 1056 = \text{mph}$$

Let's say that you are turning a 7-6 propeller at 14,000 rpm. $14,000 \times 6 = 84,000 / 1056 = 79.55$ mph

Now, let's assume you are setting up a slow, relaxing park flyer with about a 5 oz/square foot wing loading. If we swing a 9-7 propeller at about 3,500 rpm, we'd be looking at a top speed of roughly 23 mph. To swing that much propeller with a small, light drive system, we would use a gear drive unit at a very low current draw and a small, light battery.

Again, to make a known comparison, we can relate all this to riding a 10-speed bicycle. A gear drive swinging a big propeller is like riding your bike in low gear. You pedal like mad with little effort, you don't go very fast, but you can climb steep hills with ease. The direct drive system could be compared to riding the bike in high gear. It'll really go fast, and even though you're pedaling slower, it requires considerably more effort.

What all this boils down to is "propeller disc loading." We all know what wing loading is: it's the amount of the model's weight that each square foot of wing must carry. Prop disc-loading works the same way. A large propeller will be

more lightly loaded, thus delivering more torque than a smaller propeller turning high rpm. The tradeoff, of course, will be speed.

One more thing to cover and we'll give you a rest. Batteries are rated in "voltage" and "amperage." Voltage dictates the amount of power the battery will deliver. The amperage rating dictates for how long the battery will deliver that power. To relate that to glow fuel, consider the voltage as nitro content. High voltage (nitro) means more power. The amperage is related to the quantity of fuel, or simply the "size of the tank."

To figure the size of battery needed, let's go back to our 140-watt sport airplane. If we're pulling 14 amps from a 1400 mAh (1.4 amp hour) battery, we will have full power duration of five to six minutes. In the real world, with proper throttle management, you'll see flight times of approximately eight minutes. These are common flight times, even with liquid-fueled models.

To arrive at that number, divide the battery amp rating by the current draw: $1.4 \text{ (amp hours)} / 14 \text{ (amps)} = 0.1$. Then take 60 (minutes per amp hour) $\times 0.1 = 6$ minutes. Now, to double the duration, you must either cut the current draw in half (to 7 amps), or double the battery size (to 2800 mAh or 2.8 amp hours)—again we see tradeoffs. To reduce the current draw, we can use a larger, higher-pitch propeller turning slower with very little weight penalty. If we double the size of the battery capacity, the weight penalty is quite high unless we go over to the new Lithium batteries in which we will discover we have benefited from a tremendous weight reduction, but at a higher price than conventional batteries.

Okay, I promise I'll quit before we all end up in "system overload." Once again, there's a tremendous amount of information here for a newcomer to electrics to digest, so let's do this: if you have specific questions about setting up an electric model, please feel free to drop me a line and I'll do what I can to steer you in the right direction. For now, I'll offer up one last piece of advice. To get started, work with a known good design, and use the recommended equipment that has been proven to work. Talk to the people who are successful and copy what they're doing. The one thing I do know about modelers is that they are always willing to share their knowledge with those interested in what they are doing.