

Silent Knights Soaring News

Editors Note. With the reintroduction of a printed Newsletter, I'd appreciate hearing from you about items you'd like to see published herein. Send me an email at robertB578@aol.com or call me at (302) 376-7517. If you have something you'd like to share, send it to me, maybe we can include it as an article. Bob Bickerton

President's Corner

“ Welcome everyone to a brand new year of soaring with the Silent Knights. Once again we have two ESL soaring contests, as well as our regular monthly contests. *[See the ESL calendar at the end of the newsletter. Ed]* Of course we're going to continue flying on Wednesday evenings as well as whenever you want to. Of course, that's the beauty of being a Silent Knight. You get a beautiful field and the Birdhouse, as well as the great camaraderie of your fellow flyers. We may call on you to help out a little. In the spring, we're going clean up the batteries and winches. And, during our ESL contests, we're going to need you to help out. If we all pitch in, it should be a breeze. And, of course there's the flying. Whether you're new to the sport and need some expert advice, or you've been around the block a couple of times, I predict beautiful sunny days with lift every day and battery packs that have never propelled your electric higher and faster. So come on out and show your support for the club, use your beautiful facilities, and have a great new year.” Terry Lisansky

Safety/courtesy at the

The Big Pond field is large but as our membership grows we find more and more mixed airplane types flying simultaneously and all of us want the airspace. There's room for all of us but remember some basic rules. Sailplanes have priority from 10AM until 3 PM so if there's a frequency conflict us guys with electric powered planes will have to wait (sailplane guys have to remember to wait at our Wednesday night fun fly). Or we could ask the sailplane pilot if he/she would share the frequency pin and then fly electric power in the proper electric zones (they're posted at the Birdhouse). And e-pilots should please make sure you use those Zones and the traffic pattern. All pilots must use the appropriate runway AND fly from the runway NOT the longer grass near the trees or the Birdhouse. Just because there's a lot of space between the Birdhouse and the runway doesn't mean you should fly from or land there! Common sense tells you it isn't right or safe to takeoff, fly over or land behind someone who IS being responsible. Very important, be sure you have the proper frequency pin before you turn on your transmitter to fly any plane.

Sailplanes and

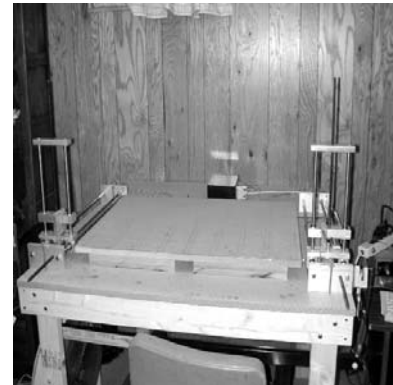
Sailplanes usually have long

Silent Knights Soaring Society

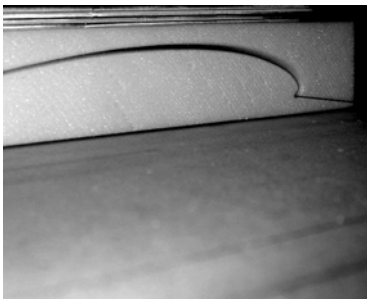
President -	Terry Lisansky
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News Editor -	Bob Bickerton

AMA Chartered Club No. 950

slender, high aspect ratio, wings and if you want to fly a sailplane you need one of those wings. Generally, smaller sailplanes can use the traditional wing of built up balsa and iron-on covering but if you want a sailplane that can withstand the rigors of a full pedal winch launch you need a much stronger wing. Today, most competition sailplanes use wings made either of hollow molded or composite material construction techniques. Hollow molded means that a sheet balsa (usually) and fiberglass laminate are formed over a precision male mold under pressure with a strong spar epoxied in place. The male mold is then removed. The result is a very strong, hollow and light construction to be sure but just think about the effort to make the male mold. And, repair is difficult at best. Composite wings, though, are usually formed over an easily cut foam core; carbon or Kevlar cloth, or both, are epoxy laminated to the foam then placed under a vacuum to secure the composite to the foam. A strong carbon fiber tube is inserted into the core for a spar and the foam core remains as part of the wing. But, how do you make that foam core? You use the hot wire technique. If you have ever cut foam cores you know how time consuming and tedious it can be to make the



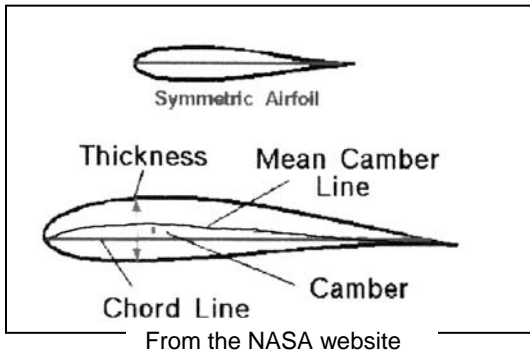
CNC foam cutting machine. Four Stepper motors guide a heated wire through the x and y axes.



required templates; at least four are required to complete a panel and 6 to complete a three panel wing core. Bill Groft, Bob Muma and John Jenks have collaborated in making a CNC (computer numerical control) foam wing core-cutting machine (see picture). Now, with the use of a computer driving four stepper motors that move the heated wire through the foam, cores can be cut without any templates. Computer files containing the co-ordinates for the root and tip profiles are used by the computer to cut precise cores. The co-ordinates for the airfoil profile can be generated by a program called "Compufoil" or imported from *.dxf (drawing exchange format) files. Tapered wing cores or mixed airfoils (e.g. One airfoil at the root and another at the tip) are as easily cut as a constant cord one. Importantly the ever important leading edge is cut more accurately than by the usual hand cut method (see picture). It even makes the cut out to accept the spar! It has taken quite a lot of experimentation working to the current product, particularly in temperature control of the cutting wire. The software driving the stepper motors can compensate to some extent by adjusting the rate of cut but if the wire is too hot or too cool, the cutting wire either melts the foam or drags as it cuts. These problems occur in the hand cut method also. Even

having sorted out the temperature problems, there are others to overcome like leverage in bearings, wire length for cutting tapers and so on. In its current state it makes beautiful foam cores that are very precise. Of course, once you have the core you still have to cover, paint, laminate and vacuum bag it to make a finished wing. Rumor has it that Bill Groft is going to experiment with Mark Drela's new sailplane airfoils. Perhaps we'll see a Mantis with a Drela airfoil this season. But for now, back to study the pictures and video of the workshop on wing vacuum bagging that Phil Barnes did for us over a year ago! Rumor also has it that John Jenks' vacuum bagging equipment is in for a real workout.

And, talking about sailplane wings, I have really learned a lot over the past couple of years. I've built many airplanes over the years, most were powered and some were free flight and some had under cambered wings. Never gave that a thought except for how difficult it was to get the tissue to stick to the concave curved bottoms of the ribs. Camber to me meant under camber like the Wright brothers airfoil. T'ain t so! If you watch a competition



sailplane pilot flying a 'full house' sailplane you'll notice that prior to launch they set both ailerons and flaps to 'droop' about 10 to 20 degrees – it's called launch camber. And if you would closely watch Bill Groft, John Lane, Jim Faassen or other expert while they're in a thermal you'd notice that they droop the full trailing edge of the wing just a little to improve lift – it's called thermal

camber. How much is just a little and just

what is camber? Just a little depends on the airfoil of the wing and how much inherent camber it has. Airfoils with a lot of inherent camber require less 'droop' than a wing with less inherent camber in the airfoil. Almost all airfoils have camber; a fully symmetrical airfoil does not. Camber is defined by a line

The heated wired is just completing the leading edge cut.

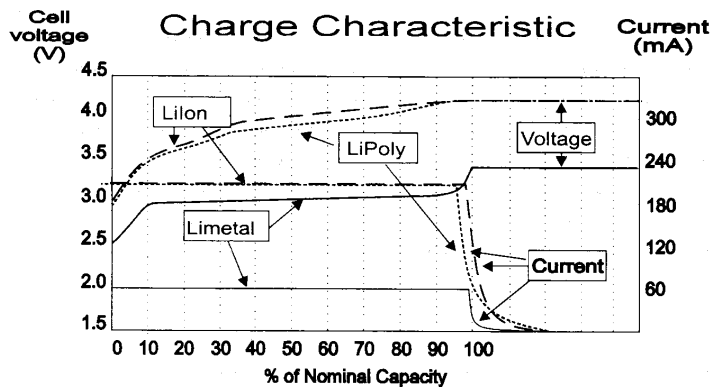
drawn through the mean thickness of the airfoil from the leading edge to the trailing edge and it is

expressed as a percentage of the chord length at the point where the line is at its maximum from the chord line; the chord line being a straight line drawn perpendicular to the leading edge and ending at the trailing edge. A glance at the drawing will clear it all up. It should be obvious that 'drooping' the trailing edge just a little can change the camber quite a lot. How much camber is ideal? Depends on whom you talk to and which airfoil they like best, and like the man said, "You can't get there from here". Also, if you watch closely you'll notice that when searching for a thermal experts often raise the entire trailing edge a little- that's called 'reflex' and allows an increase in speed (really a change in lift to drag ratio) but maybe more about that later.

ELECTRIC

There is real growth in electric power for model airplanes as judged by our Wednesday evening fun-fly's. Electric power has advanced dramatically over the last 30 years (I first tried it in the 70's). People did get models to fly with electric power but they couldn't compare in performance to their glow powered counterparts. About 20 years ago that began to change. Electric motors for our models have improved dramatically as have the power sources we need. Twenty years ago Nickel Cadmium batteries were the only game in town. Today we have the option of Nickel Cadmium (NiCd), Nickel Metal Hydride (NiMh) and Lithium (metal, ion, and polymer). These suppliers of electrons for our high performance motors presage a real evolution in electric powered flight so there is a lot to learn and talk about. Let's start with the very new rechargeable Lithium technology (non-rechargeable lithium batteries have been around for a number of years). Lithium metal, most electric guys know them as Tadiran™, batteries are the earliest (to me) very high energy density rechargeable batteries, and were available to modelers but because they could explode if mistreated (overcharged!) I believe they are no longer available. I know they have been used safely but I shied away from them (Chuck Yeager I'm not!!) so can't report on first hand use. Lithium Ion have been around for a couple of years or so and are reported to be safer to handle than Lithium Metal but they have been relatively expensive (\$50 for a two cell pack for a Park flyer is expensive I think). Many surplus cell phone lithium ion batteries have recently become available and are much less expensive (really fairly inexpensive). Such cells as the Qualcomm 830 mAh cells have been used in electric powered flight. They come with cell protection circuits attached to prevent over charging or over discharging. Again, I have no first hand experience that I can report but will experiment shortly thanks to a gift of lithium ion batteries from a fellow club member and a new charger I bought. Lithium polymer (LithiumPolys or LiPo's) batteries are the newest arrival and they are reported to be safer to use (they don't explode!!). LiPo's currently come in a variety of capacities from 40 mAh to 3270 mAh. I have a couple of the Kokam™ 145 mAh ones. They are housed in an aluminum foil pouch and each weighs 3.8 grams with wire and connector and supplies a nominal 3.7 volts. Each can replace a three cell (3.6 volt), 150 mAh NiMh or NiCd pack which weighs over 15 grams with wire and connector; a great savings in weight especially for small airplanes. Two of them in series can replace a six or seven cell NiCd or NiMh pack! There are some limitations though. One, the manufacturer recommends that the existing range of LiPo's be discharged at no more than 3 times their mAh rate (do we ever listen to the manufacturer?) and two, they cannot be discharged below 2.5V/cell or charged to over 4.2 V/cell with out damaging the cells and so they require special charging techniques. As to the first, this limits their practical

usefulness to 'speed 400' and smaller motors – LiPo's just can't take the current drawn by the larger motors. Your 6V speed 400 Zagi probably draws about 10 Amps at full throttle – about 20 times the capacity of those 500 mAh NiCd's and it fly's great for four minutes or so. One can connect the higher capacity LiPo cells in series then in parallel to permit powering our larger motors but cost becomes a real factor = how about \$200.00 or more for a battery pack? Our suppliers are addressing issue number two, the need for special charging techniques There are several available already; for example, one by Potensky from Hobby Lobby, one by Bob Selman of Bob Selman Designs and one by WesTechnic available from Radical/RC.com. The problem with many of the currently available chargers is the limitation to charging just 1 or 2 of the smaller cells in series. The new Great Planes Triton™ charger and a soon to be released Kokam™ charger from FMA Direct will charge up to three LiPo cells in series and many more when connected in parallel. With the Triton, maximum charge rate is limited to 2.5 amps for LiPo's so expect long charge times for the larger batteries; with maximum charge rate limited to 1C even smaller batteries can take an hour or longer. Don't try to use your NiCd/NiMh charger for lithium!!! The problem arises because of how they must be charged. The charging algorithm is referred to as CC/CV or constant current then constant voltage (NiCd's and NiMh use only constant current until a peak voltage is reached). Look at the graph (taken from my Potensky charger instructions) and you'll notice for LiPo's, that a constant current is applied until the voltage reaches 4.2 volts then that



constant voltage is maintained until the current drops to 0.1xcapacity at which point the cell is fully charged. Despite these problems LiPo's offer a lot, particularly for smaller models/motors. At the 2002 NEAT Fair I watched Dave Thacker

(www.radicalrc.com) fly his little Hacker B20 18S powered Edge 540 with continuous aerobatics for over 30 minutes on one charge; he was still able to hover just before he landed. He was using LiPo's!!! Rumors circulating on the Ezone are that we will soon see LiPo's that will handle discharge currents of 10 or more times their capacity. FMA Direct (www.FMADirect.com) has lots of information about Kokam™ LiPo's in their application notes which can be found at their website. Check it out!

How To! Channel

I found this on the EZone posted by someone I can't remember so I can't

give proper attribution but it's clever! O.K., so you had a midair with the ground and need to replace your receiver crystal and you have that little box of crystals sitting there - all without channel numbers but with the RF frequency clearly stated. You know your transmitter is on channel 14 but can't remember the transmitter frequency to which Channel 14 corresponds. Well here's how to sort that all out:

Double the transmitter channel No. $14 \times 2 = 28$

Subtract 21 $28 - 21 = 07$

Convert the integer to a decimal $07 = 0.07$

Add the 0.07 as the fractional part to 72 MHz $72 + 0.07 = 72.070$

Viola! You know the frequency for Channel 14 is 72.070 MHz.

And conversely, if you know the transmitter frequency and want to know what Channel number it represents:

Take the fractional part of the frequency I.e. 72.070, the fractional part is .070

Convert that to an integer $.07 = 7$

Add 21 $7 + 21 = 28$

Divide by 2 $28 / 2 = 14$ Viola, your Channel number. Can't

life be simple

sometime!!

ESL 2003 Contest Calendar

DATE	CONTEST	LOCATION	CONTACT
May 3-4	BASS HLG	Baltimore, MD area	John Appling 410-374-2463
May 17-18	SKSS 1	Newark, DE	Bob Muma 610-363-1631
May 31-June 1	LASS	Lancaster, PA	John Murr 717-394-3399
June 14-15	BRASS	Waynesboro, VA	Tom Broeski 540-943-3356
June 21-22	BARCS HL (not ESL)		
June 27-28	LISF 1	Soyossett, Long Island	John Hauff 718-767-1369
July 12-13	DBSF	Reading, PA	Dale Hart 610-821-0977
July 19-26	AMA/LSF NATS		
Aug 2-3	SKSS 2	Newark, DE	Bill Groft 610-255-4844
Aug 9-10	CRRRC Soar-In	Sudbury, MA	Anker Berg-Sonne 978-897-1750
Aug 16-17	South Jersey (not ESL)		
Aug 23-24	BASS Open	Baltimore, MD area	John Appling 410-374-2463
Sept 6-7	CASA Open	Warrenton, VA	Skip Schow 301-916-9574
Sept 13-14	South Jersey (not ESL)		

Sept 20-21	LISF 2	Syossett, Long Island	John Hauff 718-767-1369
Sept 27-28	CASA HL (not ESL)		
Oct 4-5	ESL End of Season	Reading, PA	Tom Kiesling 814-255-7418