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R/C Radio controlled Soaring Digest

THE JOURNAL FOR R/C SOARING ENTHUSIASTS

R/C
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SOARING DIGEST
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R/C Soaring Digest (RCSD) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January, 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of all articles, model designs, press & news releases, etc., are the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author. *RCSD* was founded by Jim Gray, lecturer and technical consultant.

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Complete RCSD Index, 1984-2001

The Soaring Site

Cartoon Humor

Hope all of you enjoy the 'toons included in this issue of RCSD. Our thanks to the talented Gene Zika and Phil Bauer!

I'm still having quite a few computer problems, but neither rain, sleet, snow, or tornados have stopped us from enjoying this wonderful hobby and, with this issue, it catches us up another month!

Thanks for your patience and understanding! Enjoy!

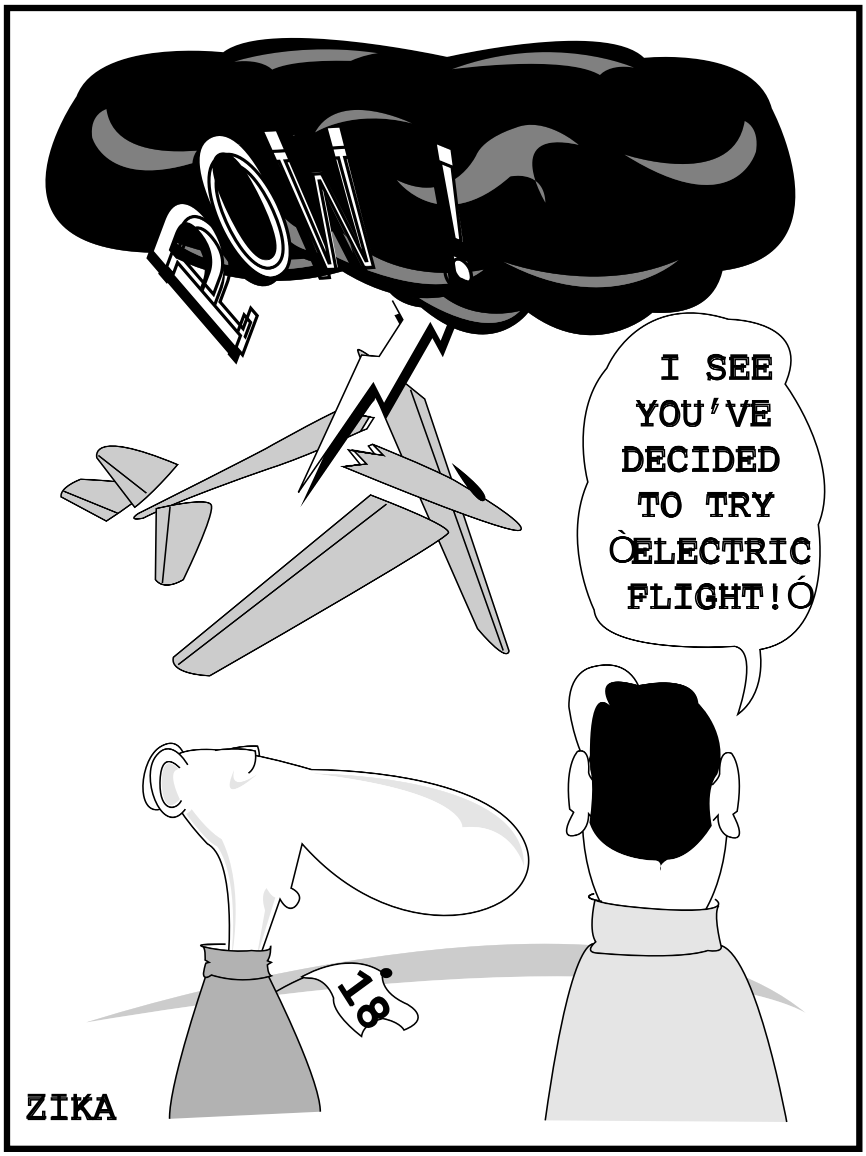
And, don't forget that cover photography is available in full color for downloading from our web pages.

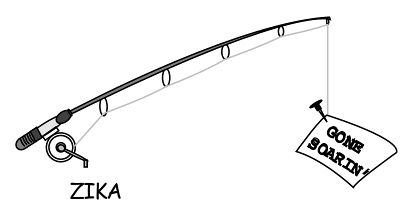
Happy Flying!
Judy Slates

Cajon 2002

Dan Sampson's Sukhoi Su-25 Frogfoot tank-killer. Built from Carl Maas molded fiberglass fuselage, balsa sheeted foam wings.

Photography by Dave Garwood, New York.





SCHEDULE OF SPECIAL EVENTS

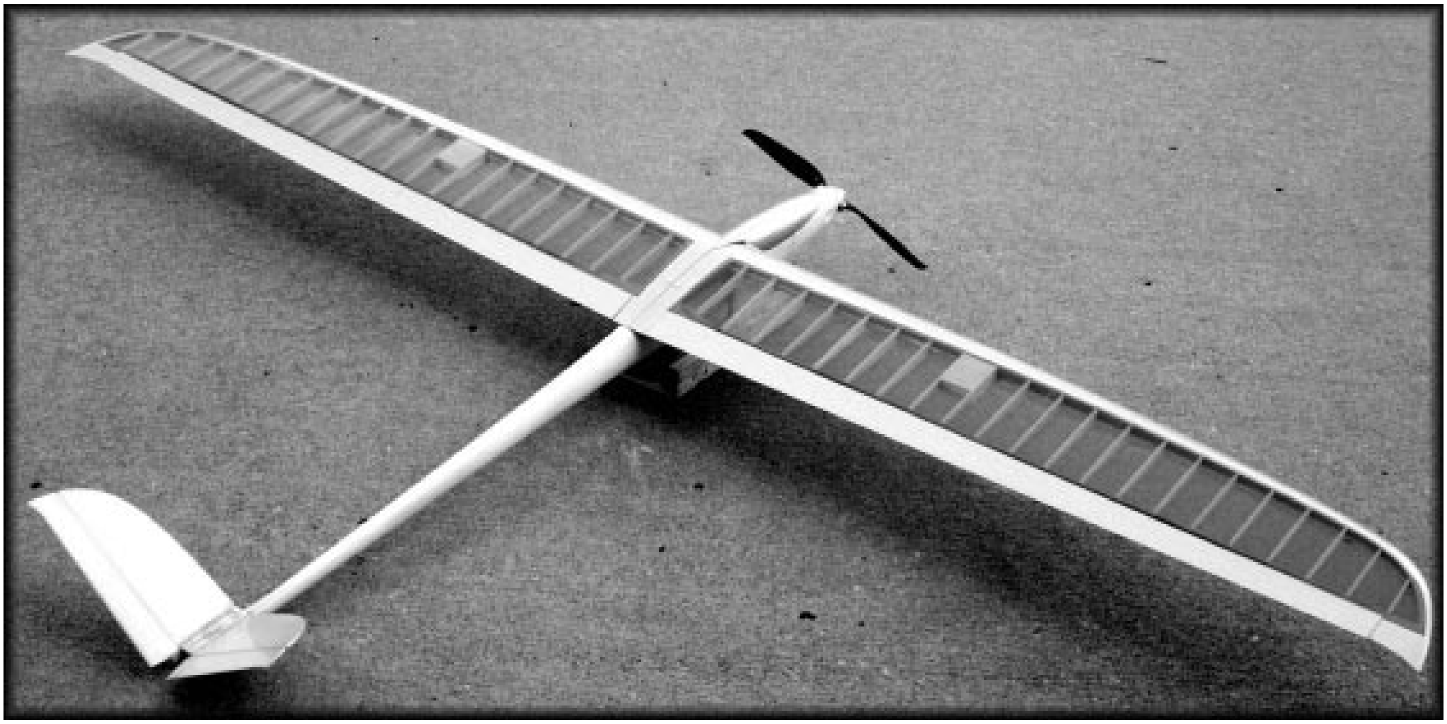
October 18-20, 2002
Deep South Soaring Championships — Houston, TX
http://home.houston.rr.com/kovacs/hawks/deepsouth.htm

February 1-2, 2003
Southwest Classic — Phoenix, AZ

Please send in your scheduled 2003 events as they become available!

Beautiful in full color, all cover photographs are available for downloading from the *RCSD* main web page.

TECH TOPICS



Dave Register
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Omen and Omega-E Electric Sailplanes

Over the past year there hasn't been much time for soaring at the Register household. When you don't have a lot of time to spare, HLG/DLG is a great way to get some exercise and stick time without a lot of paraphernalia. But after you've pranged your last DLG, or you'd like a few long flights after work, what's a soaring pilot to do? I'd highly recommend the new class of smaller electric sailplanes that run on geared Speed 400 motors. If you stick with a 500mAh, 7 or 8 cell pack, the cost is very affordable.

The beauty of these systems is that they are compact enough to fly safely in a decent athletic or soccer field (PLEASE have your AMA insurance just in case), they're nimble enough to jog around the occasional tree when landing and they're light enough to not be a serious threat if something goes awry. In addition, the onboard launch equipment and soaring ability of the more recent designs can give you 20 minutes or more of flight time. Since I rarely have more than about an hour to spare, one or two battery packs will fill the bill nicely.

Which leads us to a review of the Omen and Omega-E designs from Sal's shop (Northeast Sailplane Products). The way this all started was helping a young pilot (Andrew Geibel) put together the Omen and then realizing that this type of ship was a heck of a lot of fun to fly!

The Omen uses a geared Speed 400 with a 11 x 8 Graupner folding prop and a 7 or 8 cell Sanyo pack. A Sun 1000 unit provides the BEC/Throttle function. The Omen planform is polyhedral with ailerons and a V-tail. The planetary gearbox on the Speed 400 makes for a sleek front end and the overall performance was impressive.

After getting Andrew up and flying, I really wanted to give this a try but I also wanted flaperons for camber changing ability to help with the low end of the speed envelope. A quick look through Sal's website found that the Omega-E matched all my requirements.

Construction of both the Omen and Omega-E is very similar so I'll highlight the most recent experience (Omega-E) with notes where there are differences.

The fuselage is unpainted fiberglass with a gelcoated canopy. The trim and fit of the canopy was excellent and the fuselage finish was virtually free of pin holes and surface irregularities. A light rub down with solvent would probably be sufficient prep for any additional painting.

The push rod jackets are preinstalled and metal pushrods of more than sufficient length are supplied. A beefy plywood servo try is supplied with the accessories. The wing mounting plate is already installed, drilled and tapped. The Omen used metric nylon bolts, the Omega-E used English (8-32 panhead). I re-drilled and tapped the mounting plate for English 10-32 panhead.

The wings are pre-built and covered and a suitable length extension cable out to the servo wells is provided. All connectors, linkage and hardware are supplied. The V-tail is glass over foam (built up geodesic balsa in the case of the Omen) and uses the upper surface glass for the hinge (Omega-E only). This hinge is too brittle and won't stand up very well, so a strip of clear hinge tape was applied.

The V-tail is sufficiently light that CG balance is not a problem. For the Omega-E, I had to add weight to the tail to balance it out properly. On the

Omega-E, the rear of the fuselage has a molded in 100 degree slot. The tail surfaces are beveled so that they glue together at that angle with no extra fixtures needed. For the Omen, tubes are pre-drilled across the fuselage to accept the tail surface mounting rods. Alignment and decalage of the V-tail in both ships is excellent.

The power system (several options are recommended) is a Speed 400 with a planetary (in-line) 4.4:1 gear box. Prop is a Graupner 11 x 8 folding unit with a spinner. The speed control/BEC is a Sun 1000 and provides a JR style connector for power and throttle to Ch 3 of your receiver. Battery pack is a 7 or 8 cell 500 mAh Sanyo with a Deans power connector.

With all the prebuilt components, these ships should go together very quickly and they did. The only hiccup was setting up a template for the 4-hole pattern to mount the motor on the Omega-E. What worked well was to measure the mounting diameter and then set up a template in a CAD program and print it to size. Then tack the paper template on the flat at the front of the fuselage, drill the shaft hole and the bolt pattern and you're done.

Once the motor is mounted, solder on the speed control connectors (blue and green using the European convention) and then solder a capacitor across the power leads (supplied with the kit). I'd suggest using some insulation over the capacitor leads so you don't short something out by accident. I mounted the speed control circuit to the bottom of the fuselage with double-sided foam tape. It sits directly under the servos (fuselage depth is pretty good).

On the Omega-E, FMA S-60 servos were used for the fuselage to save nose weight. After a couple of adventures, I think I'd go a little beefier. Say S-90s or HS85s or CS21s. The S60s have plenty of torque but the gears strip easily if you tangle up the tail surface. For the Omen, Andrew used standard servos which fit in-line behind the battery. This was a bit of a chore to get them in there so I'd recommend something in the HS80 or 85 category for easier installation.

Aileron or Flaperon servos were S90s or CS21s. The wing wells are plenty wide and deep enough for the Omen but they are marginal in depth in the Omega-E. Servo mounting used my standard practice of wrapping with masking tape and then using Goop adhesive to glue the servo in place. (If you need to remove the servo, unwrap the masking tape and lift the servo out.) Then cover the outer surface with a stiff prismatic tape and it's locked down nice and tight.

Connection to the V-tail in both ships used a Z-bend at the tail surface and a standard clevis at the servo.

Radio set-up

Andrew used his Hitec 5 channel in the Omen. This allowed the use of channels 1 and 5 for ailerons and 2 and 4 for the V-tail. Channel 3 was the throttle control to the BEC.

For the Omega-E, my trusty Futaba 7UGFS was used. The complication here is that channel 7 is aileron while 5 is flap. Since I was using a 5 channel Rx (Hitec 535), a little programming was in order. In this case, the simple solution is to use Glid2F with 100% aileron to flap coupling. This has the benefit of putting camber control in its normal position. After some flight experience, a flap trim value of ~ 20% works well. (Note - since this first experience I've upgraded to a Futaba 9CHF and used the channel 5 option.)

Off to the field

The Omen was finished first so let's start here. The CG was set where recommended. Throws were adjusted to the suggested values. The motor control took a bit to set up on the Hitec namely because it's different than on the Futaba and we didn't have the manual at the field that day. But we dumb-thumbed our way around until we found it and got the reverse settings right.

In a fit of confidence, I decided to toss it and let Andrew see what he could do (he had become quite adept with his Razor). The first toss was supposed to be just a glide test. However, the setup was so right on the money that I told him to give it some throttle after it had cruised out a few dozen yards. And off it went just like that!

After the euphoria of this success wore off, we started looking more critically at the settings. You can get at least 4 decent climb-outs with the 7 cell pack. The thrust is adequate but not over-powering enough to haul it into the sky. If the climb angle is too steep, the plane will stall or mush. So you need to use a little down stick under power to keep the speed up. Flying the climb like this appears to be more efficient on power and altitude than just brute forcing it into the clouds.

Dive test showed that the CG could move back a bit, but for Andrew it was fine pretty much at the factory setting. Aileron differential also helps. This plane will NOT axial roll so just get the differential and rudder coupling where you want for coordinated flat turns. Barrel rolls are also a bit dicey unless you've got lots of altitude. Thermal turns are smooth and tight without dropping a tip. The wing loading comes in at ~ 11 oz/sq. ft. so you need to allow the plane some decent flying speed or you'll mush it. But it banks and cranks just fine when you core a good thermal.

15 - 20 minute flights are pretty typical for a climb and glide flying style with the Omen. You can zip around some more under power with a subsequent drop in flight time. Your choice.

The experience with the Omega-E was similar to the Omen. Factory settings, etc., and it climbed out nicely on the first flight. About two clicks of up trim were all that were needed. It became apparent that the CG was too far forward for me but even at that the first flight was 25 minutes.

Next flight looked at the flaperon setup a little more carefully. Although turns were very crisp, there was a tendency for the nose to drop into the turn. Loops tracked very well but rolls weren't very axial at all, again with the nose leading into the roll too hard. After about 22 minutes, it was time to come in.

Next step was to move the CG back about 0.5. The rudder coupling was eliminated and flaperon differential decreased (about 3:2). Next flight showed much better glide and turns. Rolls were nearly axial from a modest dive. At these settings the camber changing capability began to really pay off. With more sensitive thermal recognition from the rearward CG, cranking in camber at the first sign of lift really helped this ship take advantage of light, small thermals. Flights of 35 minutes or more are not hard to achieve!

As with the Omen, powered flight is not intended to haul this ship vertical. With the 7UGFS (or 9CHF) I've been able to use the Start preset for very nice climb capability. In this case, a touch of down is added and about 10% camber. This gives a little extra lift to the wing but with enough down elevator compensation to keep it from porpoising. At least 4 very nice climb outs are typical for the field where I fly.

Both the Omen and Omega-E have proven to be really fine designs that work well. Each is a bit different in performance but both provide their pilots a lot of enjoyment. Each has also had reconstruction opportunities. Andrew got a tree shot from a loose battery connector and I augured in inverted while trying to hot-dog without enough mustard. Both ships have proven to be remarkably robust and easy to repair!

At any given time, various suppliers have different designs in stock. But for fun and uncomplicated flying close to home, these smaller electric-assist sailplanes are a great way to get in some relaxing flying time with minimum of equipment. Give em a try some time!

■

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A MONTHLY LOOK INTO THE WORLD OF SAILPLANE ENTHUSIASTS EVERYWHERE

R/C Soaring Digest (RCSD) is a reader-written monthly publication for the R/C sailplane enthusiast. Published since 1984, *RCSD* is dedicated to the sharing of technical and educational information related to R/C soaring.

RCSD encourages new ideas, thereby creating a forum where modelers can exchange concepts and share findings, from theory to practical application. Article topics include design and construction of RC sailplanes, kit reviews, airfoil data, sources of hard to find items, and discussions of various flying techniques, to name just a few. Photos and illustrations are always in abundance.

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YOU GUYS UP FOR A LITTLE HAND LAUNCH?

HAVE SAILPLANE, WILL TRAVEL!

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Converting a Chrysalis HLG into a Park Flyer –

The Chrysl-Stick

Don Stackhouse and Joe Hahn are buddies of mine. They have been making world class sailplanes since before I ever stripped my first servo. A few years ago they introduced the Chrysalis HLG, intended to be an entry level, all-wood, easy to build, good performing HLG. That was before discus launch had ever been heard of, and back when I had a shoulder that could marginally launch a HLG.

Neither the Chrysalis HLG nor my shoulder are even marginally competitive anymore. The Chrysalis is still on the market and easy to build. This article explains how you can use left over Pico Stick parts to convert a Chrysalis to a ROG Park Flyer, in about twenty minutes.

This project started when one of my son's buddies stuffed our GWS Pico Stick in a thoroughly convincing manner, fracturing the wooden fuselage stick, cracking the wings and leaving me with a GWS motor, prop, flight pack and speed control, and a handful of styrofoam parts. I decided to find out if the little Pico Stick motor would fly a 60" HLG.

I consulted with my friend Bill Hoelcher who had been flying some electrics. He recommended using about 5 degrees of down thrust and a couple of degrees of left thrust on the motor mount. Then I consulted the DJ Aerotech plans for the Chrysalis HLG to find out where the center of gravity was supposed to be. That was the extent of my design work.

Step A:

Cut a piece of thick balsa sheet (1/4" if you have any) into a long thin triangle, with the skinny angle 5 degrees; and a right angle for the second corner (which mathematically leaves the third angle at 85 degrees). The short side of the triangle needs to be about _ inch long, which is the distance from your workbench surface to the center of the Chrysalis nose, when the fuse is on the bench. This is the guide for drilling holes in the nose block of the Chysalis for the motor mounting stick.

Step B:

Tape the triangle to the workbench, with the skinny angle at the edge of the bench, and tape the Chrysalis fuselage to the workbench right behind it. Using a long drill bit, drill a hole through the nose block of the Chrysalis, just a smidge off center. Move the fuse over one smidge, and drill a second hole parallel to the first. The diameter of the drill bit isn't too critical, as long as it is less than 3/16". Use a file and create a rectangular hole through the nose block, sized to accept a left over piece of Pico Stick fuselage stick. (Even after a thorough stuffing, I had a few pieces three or four inches long. The Pico Stick fuse stick is metric sized, but approx. 5/16 by 3/16". You can cut and sand one to fit the hole in the Pico Stick motor if you have to.) The Pico Stick motor sticks on this motor stick. I put it on so the motor was below the stick, and I used a clip-on aluminum heat sink, which had been on the Pico Stick.

Step C:

Drill a 3/16" hole (or thereabouts) through the plywood bottom of the fuse, right behind the nose block. Use a small file to open it up into an oval. The Pico Stick motor wire and plug go through this hole into the cockpit area, and connect to the speed control.

Step D:

Find a piece of threaded rod about 1 1/2" long; drill a hole the diameter of the rod through the plywood floor of the fuselage, just about a half inch in front of the first former (at the back end of the cockpit area, on the center line). I used a small piece of formica sample

(free samples from Home Depot left over from building RDS pockets) and glued a piece inside and outside the fuse, and drilled through that. This hole and threaded rod is the landing gear mount. Use a nut or two on the inside; slide the Pico Stick landing gear wire over the rod outside the fuse, and clamp it down with a small piece of thin ply, or formica or a big washer. I set mine up so the gear trailed behind the threaded rod, but it works OK either way.

Step E:

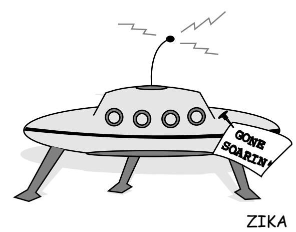
Stick a piece of velcro on the bottom of the fuselage behind the first former (under the wing). Initially I used a nicad 150mah seven cell pack, and got 8 minute flights in dead air. Whatever pack you use, velcro it down under the wing so that the CG is correct. (I fly mine with the CG almost three inches from the leading edge of the wing.) The battery connector can stick out on the front side of the former so you can re-charge without having to take the wing off.

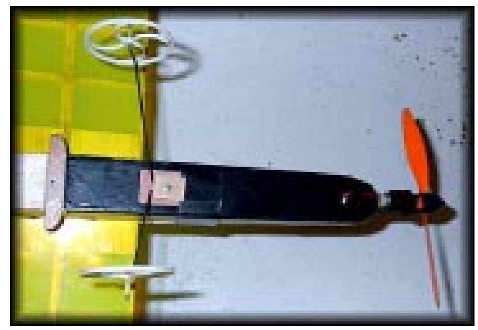
That's it. Done. You got a Chrysl-Stick. And while it is not a Speed 400, the little Pico Stick motor has plenty of power to fly the Chrysalis airframe.

Using the stock Pico Stick motor, GWS

receiver, landing gear and speed control, you should be able to ROG and fly long, high semi-thermal flights. If you use a GWS 0806 prop, you will be able to stop the motor and have the prop spin down to a stop while flying, so you can thermal; and you will have plenty of airspeed at full throttle to do loops. ROG takes a smooth surface and a 30 to 50 foot run, but is totally reliable. I eventually bought a 650 mah NIMH pack, a sort of carrot shaped thing with 4 cells and 3 cells attached end to end – it fit nicely between the Chrysl-Stick pushrods, under the wing, and I have had a couple of 20 + minute flights so far, without running out of power.

The conversion is about 99% reversible. Unbolt the landing gear, plug up two holes, and you are back to HLG. (As if.) I fly the Chrysl-Stick a whole lot more as a park flyer than I ever did as a HLG.





Comments on the 2002 LSF/AMA NATS

By Lee Murray
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lmurray@athenet.net

Jon Stone's Addiction fuse and MH-32 wing (custom).

Don Woelfel's Edge. "Gravity Sucks" on left wing...

Lenny Keer's Escape, convertable sailplane.

Ben Roberto & Stingray 7.

Lenny Keer's Escape w/ sailplane nose.

James Beck & Ernest Schlumberg's Eminar 100's.

After an 8-year absence, I returned to the NATS. One thing that was the same was the oppressive heat and humidity. Some of the things that I found different, I think readers will also find interesting. I'm not going to cover what you can download from the AMA site because much of that is excellent in coverage. The NATS results can be obtained at: http://www.modelaircraft.org/Comp/2002Natsfront.htm\.

I arrived Wednesday afternoon and, after unpacking, I headed out to see Hand Launch Golf at Cardinal Hills Golf Club. I shot some nice video on the 9th hole capturing the entire flights from tee to green. Seeing the discus launches was new to me. I would never have imagined that launches like that were possible by athletes and old timers alike. With some coaching on the green, modelers landed their models very close to the cup in a single flight. Following the golf task there was the task of knocking a plastic bottle off an inverted paper cup without knocking over the cup. Several people were able to do it and one even hand caught the model after being successful at the task.

Thursday was the start of the Unlimited event. The number of molded airplanes being entered surprised me: Edges, Icons, Emeralds plus some strange looking sailplanes, Mantises. These were long poles with a very small pod on the front for the electronics and the wing on tall pylons. A high percentage of the radio transmitters were computerized. I took a snapshot survey of what brands of radios were being used. This was during the contest so some were out and in use. The photograph of the transmitters being used in RES showed a much different distribution of older and lower cost radios.

Radios used for Unlimited Class:

Airtronics	32
JR	24
Futaba	10
Multiplex	5
Hitec	2

Some of the more artistic models are shown in the photographs. Jon Stone of Madison, Alabama designed his own. Jon said he used a number of programs including PC-Soar (my favorite design program - ljm).

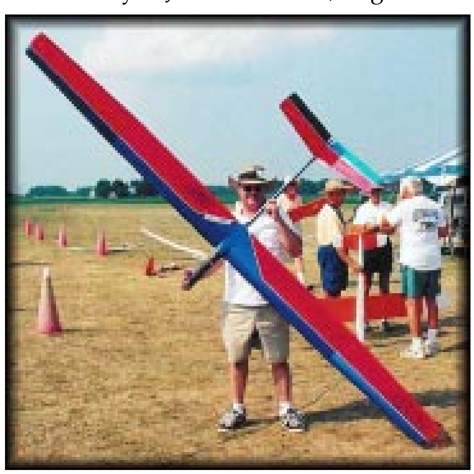
RES and Nostalgia were flown on Saturday with alternating rounds. These events were more relaxing for the competitors. Several were heard to say, "The pressure is off." One reason may have been that the landing task

Gerry & Jim Marcicki w/Edge.

RES radio sample.

was modified to increase the distance between the landing circle and the safety line. I believe it was doubled from 8 to 16. While I didn't violate the safety line, several people did including one LSF official who will remain nameless. Only one person in 2M and UNL (4 days of flying) was able to get a 100 point landing. The 100 point landing was earned by landing on a 4" disc. That would be about 1 perfect for 2000 tries. Some competitors felt like the landing circle met the goal of eliminating fly offs. Others felt like landings were too difficult and had a way of ruining an otherwise good performance, especially if you slid past the safety line. There was a suggestion that a plastic snow fence be provided next year to protect fliers and timers but end the problem of sliding past the safety line.

Many RES and Nostalgia models were overstressed on the launch equipment. It was possible to launch models safely but I believe many people just were



Mark's Esprit, Nostalgia.

not expecting the power that these winches were capable of producing. Utilizing the capability of the winches in zoom launching was very spectacular and I suspect was an important part in winning the UNL event if you had a heavy ship or needed more time to find some lift. People who could maximize the launch were 1/3 higher than those who had more conservative launching methods perhaps dictated by the durability of their models.

The LSF was balloting for 4 options for future NATS event schedules. Some events attract only a few competitors while others fill up. There is some pressure to give more time to RES and F3J. It is not clear how much support the new class will receive in registrants and volunteers to run it. President Jack Strother and the LSF crew did a great job of running the contest, communicating the goals of the LSF and planning for future NATS.

During the lunch break, there was a demonstration of a rocket-powered model glider. The model, a Stingray series 7, was designed to compete in the S8E FAI event, which includes a declared duration and a precision landing. The Stingray series was first designed by Kevin McKiou of Chicago. Versions 5, 6 and 7 had the additional design support of George Riebesehl and Ben Roberto. Ben is pictured in the photo holding the Stingray. Phil Barns was the pilot.

Three demonstration flights were performed with three sizes of motors. FAI motor limit for Impulse is 40 Newton-sec.; a combination of force produced and burn time. The rulebook says you're allowed +10% more power than the 40 N-sec, hence the 44 N-sec motor. The English equivalent of 40 N-sec would be 9.0 lbsec.

Phil demonstrated that the model could be pointed straight down to return it to earth without a problem. In the boost phase, the model was actually flying faster. Good engineering and a strong lightweight model are obvious essentials. Even with the all these requirements, the model would slow down for hand catches.

Ben describes the model's construction as follows:

> The Stingray series of rocket gliders was designed by Kevin McKiou (KMcKiou@aol.com, kmckiou@lucent.com) up here in Chicago. George Riebesehl and myself teamed up with Kevin to develop Stingrays 5, 6, with 7 being my notes for the next version. The Stingrays up to #6 featured parabolic dihedral scheme like the Hobie Hawk. This was done by bagging the wing while on a curved bed. The lay-up, from top to bottom: top core bed/ wing lay-up, pink foam core/ Mylars/ vacuum bag/bottom core bed/curved bed.
>
> Stingray 6 was a team effort of 12 models for the 98 World Championship. Kevin did the aero work including coming up with the wing and tail airfoil and cut the cores. George shaped the core leading edges and cut the fiberglass and carbon pieces. And I did the rest of the molding and bagging work including the fuselage plug.
>
> Stingray 7 featured a more conventional dihedral scheme with a flat center section to accommodate a full-span center section landing flap for the new precision duration rules. Stingray 7 also had a larger inverted v-tail tail. The original formula for the v-tail was based on projected area. The newer one took into account the v-tail angle as per Mark Drela www.charlesriverrc.org).
>
> Phil built several Stingray 7 using my notes and plans. He used Kevlar for the wing skins instead of 0.75 oz. glass and Japanese tissue as we used on #6. The same carbon spar was used. Phil also used my original fuselage plug/ mold combination for the pods. For the pods, I used 2 layers of 1.5 oz. Kevlar. Phil chose to use the hybrid Kevlar/carbon fabric. The tail boom is an Avia G-Force Standard Ultra-Light.

Motor Used	**Energy**	**Estimated Altitude Reached**
Aerotech D7 re-load	20 Newton-sec	500-600 Feet
Aerotech E6 re-load	40	1200
Aerotech E6 expendable	44	1300-1400 ~*limit of visibility*

Ben says that the 2002 World Championship event is now a precision duration event with a 6 minute task onto a landing strip scored man-on-man. The landing strip is 50 meters long to accommodate up to 5 pilots. Landing within 0.5 meters on either side gives you 100 points, 1 meter on either side gives you 50 points anything outside of that but within an overall landing boundary gives you 25 points. (A big contrast to the 4" 100 point circle of this year's NATS - ljm.) Ben believes that the working time is 12 minutes to get your transmitter and make a flight. The Spacemodeling organizers will probably adopt the procedures used for F3B or F3J duration, but still limit it to 3 mandatory rounds, and 2 flyoff rounds. At the World Championships Phil will use Aerotech E6 expendable/40N-sec ignited by an electrical system. Details of available systems can be seen at http://www.aerotech-rocketry.com/.

A full size ASW-27 glider was assembled in the parking lot and was admired by all. The detail on the full size glider was very impressive. A modeler or two was commandeered to help set up the glider.

Saturday evening, the night before the electric competition, I watched some of the competitors limbering up with park fliers. Even these flights were impressive for the length of time in the air and the variety of aerobatics performed. In another field the free flight modelers were making test flights of their limited motor run models, towline gliders, and hand launch gliders.

On Sunday morning I went out to the field to scavenge information from the Class A and 1/2 -A electric competitors. Lenny Keer showed me his molded Escape sailplane. Some modelers feel that this may be the best fiberglass fit and finish of all the molded ships. The model was quite versatile. That one could change power plants by exchanging nosepieces. Even a glider nosepiece was an option. Lenny was partial to Hacker motors because he felt they gave the best performance for the dollar. I saw models where the pilots would not spend all their motor run time at the start of a flight for visibility reasons. I was also impressed with James Beck and Ernest Schlumbergs "Eminar" 100 for limited motor runs. They each had a one-piece 100" wing that they vacuum bagged. They were generous in giving me information about low cost - good performing systems. Before I left I saw an official Class A electric flight that was very impressive. I'm thinking that I have some work to do in matching my components to get that kind of performance.

■

A View from Base B: The US F3B Team Trials

by Glenn Dean
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(Originally appearing on RCSE, reprinted with Glenn's kind permission.)

The US F3B Team Selection Trials continued today with 15 of the hottest soaring pilots in the US competing for the three coveted slots on "TEAM USA". Five rounds are complete; rounds six and seven are expected to finish Monday and we will name the team for next year's world championships.

The day's flying started before 8 AM with challenging conditions. Pilots flew two rounds of duration first, under heavily overcast skies and temperatures in the low-to-mid 60s. Lift was sparse, and many pilots scratched their flights out between treetop height and launch level. Winds all day were about 8 knots out of the east, with little slope lift to be found on the tree lines. Still, the skills of our best pilots showed — they still maxed their times, even with heavy F3B planes in conditions that would have your average thermal pilot on the ground in under 3 minutes.

Two rounds of distance followed under the same conditions — extremely difficult with lift spotty on course, but the occasional thermal drifted through to make things exciting. About noon the skies cleared to bright blue with cumulus clouds, and conditions became strongly cycling, and a third round of distance (the fifth for the weekend) was flown after lunch. Gavin Botha put up the high lap count for the weekend with 25 laps.

Two rounds of speed followed. Slightly variable winds and cycling conditions on course caused many pilots to elect to relaunch to try and maximize their conditions. Times were generally in the 18-22 second range, with the fast time of the contest thus far set by Darrell Zaballos on Saturday with 16.9 seconds. Despite the close-in tree lines providing a psychological hazard for the pilots, everyone finished speed without incident.

We flew two more rounds of duration after speed, starting round six with the last duration task. Lift cycles had evened out some, and several flight groups had very light and spotty lift, resulting in some very impressive and tactical flying. Round 6 speed and distance will be flown in the morning, followed by round 7 and then the final results and identification of Team USA.

Lessons Learned

I've had the distinct pleasure as serving as an official timer and punching laps down at Base B in the hot Georgia sun, and have seen a lot of the action. So what did an average thermal flier learn from watching F3B? Well, like one of our club members Buddy Roos said, it's like getting free sailplane lessons all day long. It's not every day you can watch the best of the best compete up close. Here's some of the general things I observed:

1. It's all about TEAM.

I was surprised to see how much a great team makes or breaks a pilot. The whole group has to be functioning flawlessly to put a good round together, and the winch guys are really humping, especially when they are switching drums, changing lines, and running back and forth for multiple reflights. West coast team Botha/Zaballos/Jennings, and East coast team Lachowski/Kiesling/Lawless seemed to have particularly well-practiced techniques and procedures. It may be individuals who get selected for Team USA, but these guys are knocking themselves out to make each others' flights the best they can be.

2. Ya gotta be smooth.

Smooth, consistent flying is the name of the game. Inconsistent fliers will put up one hot flight only to bomb the next, and low-level pilot-induced oscillation cost more seconds on speed runs than any bad launch (AKA too LOW too FAST). One of the most memorable speed runs, for me, was flown by Gordon Jennings. It wasn't the fastest, but the plane looked like it was on rails from the start of the launch to the end of the speed run — smooth, steady, consistent.

3. Know your limits — and use 'em.

These guys know exactly what their airplane is capable of, and fly right up to the outer limits. They aren't extreme planes — they're actually quite predictable. The pilot has to know exactly how much to expect from a launch, or how far he can search under what conditions, in case he has to bail across a field of sink to find the one patch of rising air on the field.

4. Check small things.

Attention to detail is where it's at. The F3B guys here obsess over the exact fit and finish of their airplanes, and have them trimmed to perfection. They have intricate systems to keep track of what winches and batteries have launched how many times, with what line, so they know when to change out a line that's about to go. All those little things add up to a big increase in performance.

5. Know when t' hold 'em; know when t' fold 'em.

The best teams/fliers have figured out their go/no go criteria before they launch, and talk about it during flight. "Past relight point, fly what you got," you hear. If conditions don't meet their criteria, they come down NOW, decisively. Indecision on relaunch loses precious seconds that you may not have. I saw teams relaunch three times during a speed round — three launches in under four minutes! — to get what they wanted. That whole team had to move like clockwork to make that happen.

6. Good enough is all you need.

I noticed this watching some of the less-experienced F3B hands. Some pilots will bail from lift that is weak — but will get them their 10 minutes — to go after something that looks stronger, only to have it fall apart on them. Other relighted after an OK — but not ballistic — launch, only to get a launch that was worse than the first, or get sink on course.

7. CONFIDENCE, BABY!

The fliers who grabbed victory from the jaws of defeat in marginal lift on a long flight stayed confident the whole time, and their crews were always positive. I won't say they made their own lift — but the mental edge had to help. I know I've been more often defeated by sinking feelings than sinking air, myself.

What were the hot planes?

The ones flown by the hot pilots, of course! Heck, from Base B I can tell you there were 14 V-tails and one cruciform tail — what more do you need?

OK, there were a few planes that caught my eye among the Ellipses, Cobras, and Tragis.

- The "SP1", an original design flown by Botha and Zaballos.

From down at the turnaround, it looked like these planes were consistently outlaunching the rest of the field. Of course, I'm sure the pilots helped, as did the unique super-special construction winches with the double-bearing extra-long drums. These planes seemed to range well, hang well, go fast, and go slow. The planform looks unique, probably specially tailored. Gavin said the plane was designed specifically to launch well, and that it definitely does.

- The Icon.

Of course it stood out; it was the only conventional-tailed airplane on the field. It's a BIG plane, and flew like it was on rails. Its pilot (Jennings, I think) put up some very consistent flying.

- The Caracho (sp?).

Lachowski & Kiesling flew this design, and possibly some others. Has a pretty unique look — pylon mounted wing, unique planform, wide-chord ailerons & flaps. These seemed very fast & maneuverable — quite impressive in speed & distance.

- Brian Agnew's plane — a Warp (I think).

Clean lines, nice handling — a lot of potential there. Someone told me Agnew hadn't flown much F3B — you could have fooled me!

Day 3 ...

Flying began just after 8 am today after the mist lifted, revealing clear, cloudless skies and virtually dead calm conditions. We flew round 6 Speed in almost completely dead air, with the high times in the 19 second range. Light thermals began to cycle onto the course by 0930 as we started round 7 speed, and course times improved to a fast time of just over 17 seconds, not quite beating the course record set on Saturday. We lost one plane — which fortunately was not severely damaged — to a radio failure during one speed run, when the radio shut off just as the dive onto course began. The plane pulled out, circled, and landed all on its own with some minor cracks and a delam. Oleg Golovidov finished the contest flying his backup Stratos.

Following speed we flew round 6 and 7 distance. Lift conditions continued to improve with cumulus formations over the field, leading to strong cycles of lift and sink. Several flight groups were able to turn in fast courses with strong thermals on course -- high lap count set at around 24 laps. Several other flight groups were treated to heavy sink, and rushed to relaunch into better air.

Following the two distance rounds and a lunch break, we flew round 7 duration, which saw two flight groups launch into booming thermals, and the other two flight groups launch into marginal lift that resulted in scratching to make times. One pilot fought for air time at treetop height way downwind, and clipped a tree, luckily recovering just above the ground and recovering the plane back to the field.

Despite a few thought of putting in round eight, we ended the contest after round seven, at about 1300, and had the field cleared by 1530.

The combination of good conditions, thorough preparation, herculean work by the CD and his assistants, great club support, and outstanding flying and cooperation by the attending pilots and crews combined to make this a great event.

I'm glad I came and helped out. I had a lot of fun, and learned a lot watching a lot of great fliers.

Who made the team?

Congratulations to: Gavin Botha, Mike Lachowski, Darrell Zaballos, and Tom Keisling (alt) for their great flying.

These pilots will be representing the USA at the World's in Germany next year. GO TEAM USA!

Here are the final scores, after throwout. The closeness of the scores will give you the idea of the kind of flying we saw over seven rounds:

1.	Gavin Botha	17652
2.	Mike Lachowski	17566
3.	Darrell Zaballos	17545
4.	Tom Keisling	17437
5.	Gordon Jennings	16948
6.	Ben Lawless	16898
7.	Rich Burnoski	16760
8.	Phil Renaud	16632
9.	Brian Agnew	16400
10.	Dennis Phelan	16355
11.	Oleg Golovidov	16114
12.	Jeff Stiefel	15332
13.	Mike Leal	15064
14.	Don Sciegel	14642
15.	Bill Wingstedt	14244

Flying Technique Observations

What follows are the specific observations about flying techniques that I found from watching pilots at the F3B finals. For those familiar with F3B, this is probably old hat, but I find that even reinforcing things I know can be useful.

1. Launching

If there is one absolutely critical must-have skill for F3B, it seems to be launching. Heck, that's probably true of any sailplane flying — barring good air, you only have the energy you put into the plane at launch, so you'd better make the most of it.

I saw a lot of different launching techniques and styles at the finals. The highest, most consistent launchers seemed to have the following in common:

- They know their equipment. The plane is trimmed for a hard pull and quick rotation on launch — a carefully tuned mix of CG, hook position, flap settings, and elevator preset. They know what their winches are capable of, and adjust both line and drums to suit conditions. Teams were running mono as narrow as 1.05 mm and 1.11 mm, changing out entire spools as needed if the line got nicked or over-stressed. They had those procedures down, and had their winch-area set up just so, to maximize their launch effectiveness — marking winches and batteries based on number of launches, keeping equipment clear in case of a winch backlash, and that sort of thing.

- The whole team drilled the same technique over and over, and the launch was a team event. Pilot checks airplane; winch master confirms correct winch is selected and winch is on. Timer indicates ready. Spotter checks the air, and confirms the pilot's flight plan. Pilot tells launcher when to go (on the horn, or wait). Pilot: "Ready." Launcher: "Set," braces, and gets arm back into throwing position. Pilot: "Go." — Launcher (or winchmaster) stands on the pedal, building tension until the winch starts to stall. Then the launcher leans back and throws the plane for all he's worth. The well set up planes are flying the second they leave the launcher's hands, already rotated for maximum climb. Less proficient crews had a jerk or waggle as the plane stalled on launch, losing some potential as the plane got back to flying speed.

- The launch is consistent. I saw a number of pilots that circle-towed, doing big S-turns on the line to build line tension before climbing and zooming. Except in the cases where they used this for a slight adjustment to get into the wind, though, I never saw this pay off. The highest launches all seemed to come from pilots who climbed straight and smooth into the wind with minimal heading correction before the zoom. Of course, they also got the best setup, tension, and throw, too.

- **Zooms**. That monofilament zoom is amazing. The consistent teams would have a signal when the line was at max tension, and would tell the pilot when to zoom. This wasn't really that far up the climb — maybe 60-70 degrees up from the turnaround, no where near as far as we tend to do on braided line with thermal winches. They didn't dive too deep to start the zoom, and immediately rotated smoothly and pinged off into a climb. I saw all sorts of climbs, from shallow to vertical, and even past vertical. I guess in theory vertical is probably best, but the best zooms seemed to come from about a 70-degree climb. Too many of the fliers doing vertical climbs pulled past vertical, climbing inverted, or pushed/rolled out too late, losing altitude at the top because they had no airspeed.

- The pilots immediately started to execute the task at hand. They had a plan beforehand — if they were going to abort based on the launch, they aborted right then, otherwise they went into their plan. You could tell the indecisive pilots — they would kind of float around a bit off of launch, losing altitude without accomplishing anything.

2. Landing

- Unlike TD, F3B is not a landing contest — or else it is, and everyone is just too good at it. It's a big spot, 1 meter per 5 points, and I saw very few landings under 95 points. Crews helped by laying the tape out into the wind, and counting down time until the plane was right close to the end of the tape.

- Also unlike a TD contest — where you see every kind of landing technique imaginable, from the wallow-stall-splat to the speed-dork-spike — everyone used a very similar technique. They used their flaps early in the approach, to get down to one approach speed — fast for control, but not too fast. Then (unlike me) they came in with a clean airplane on a steady glide path (about two spans up at 15 seconds and 75m out), applying flaps right at the end to stop the plane over the spot, either settling in or with a slight nose push to stop the plane on the spot. I didn't see too many AMA "spikes".

3. Duration

- Not too much different here, except that F3B guys fly heavy airplanes for 10 minute tasks every round, and we'd rather have our 3-5-7 landing contest with 57 oz. airplanes. The pilots had a good plan at launch, adjusted for the conditions, and weren't afraid to bail to cross the field or run way downwind if necessary. They turned perfectly smooth, whether it was a slow, wide, 10 degree bank circle, or a tight, spinning 45 degree bank circle. And they weren't afraid to circle at treetop level a quarter mile downwind if that's where the lift was. Know you airplane is the name of the game here.

- A good team helps here — the best were giving constant, positive feedback about where the lift was, how to adjust the thermal circle, when to stick with it, and when to bail. I found myself thinking: "Where are the guys like this when I need a timer?"

4. Distance

- I thought this was the best event. (Partly because I got to fly a lot of it leading up to the event when we were training the officials. It's a LOT harder than it looks!) It's not as pure-adrenaline ballistic as speed; it's much more tactical, combining good air reading skills with good turning and racing skills. Except for the number of people needed to run it, it would be a great event all by itself.

- These guys know a lot about ballast, and have tried all different settings at all different conditions. They're constantly adjusting to suit conditions, and comparing notes with each other about how much lead they're adding.

- It's tactical flying. Sometimes its best to cover the top guy in the group, flying in his air, so at worst he beats you by a lap or so. Other times, your read on the air is best — we had a couple of rounds where there was one guy on one side of the course, and the other three on the other. Sometimes the lone wolf buried everyone; sometimes he got buried; once it even looked like the lone wolf was in worse air but tricked the other three into coming down and relaunching into his air. Definitely a thinking man's game.

- Smooth flying pays. The high lap counts not only usually had good air, but every turn looked the same. Know when to speed up, and when to slow down. Denis Phelan was explaining how to get consistent — by timing every lap until you get each two-lap upwind/downwind combo to the same rhythm. It looked like the team helped out here, too — the turn indication system worked on both light and audio signal, but since when several planes turned at once the audio could get slightly delayed, the guys turning on the light wasted less time than those turning on audio only.

- Have your relight drill down. 'Nuff said.

5. Speed

- You've got to be ready. The start of your working time is no time to find out that something on your plane

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Bending-Moments

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I think most wings are over-built. This doesn't mean that they can't be broken, just that they are built too strong where they don't need to be, and not strong enough where they could be. Rather than guess, a modeler needs to know how strong the wing needs to be, and where that strength is needed. The simple answer is they can be weak at the tip, and strong at the root. The more complete answer is how much stronger.

It should be obvious that a little upward force near the wingtip creates a much larger force near the root if the fuselage is held still. This force is called a *bending moment*. It is actually trying to pull the bottom spar cap, putting it in *tension*, and is *compressing* the upper spar cap. Both of these forces are greatest near the top and bottom, and decrease to zero near the middle of the spar.

The bending moment at any point is calculated by multiplying a force by the distance between that point and the force. Figure-1 shows these forces on a wing where the tip is on the left, and the root on the right. The 3 ounce force at the tip is shown with the upward arrow. The moment arm is 40". The bending-moment is shown with the clockwise arc on the right, and is 120 oz-in.

The same force produces a bending-moment all along the wing. Figure-2 shows the bending-moment due to the same 3 oz. force at a point closer to the tip. In this case, it produces a bending-moment of only 90 oz-in, 30" from the tip. Any force on the wing contributes to the bending-moment at all locations from the point of the force toward the root. Similarly, the bending moment at any point on the wing is due to all the forces outward of that location on the wing.

While a wing is generating lift, there is not a single force near the tip, but an upward force distributed all along the wing. The bending-moment at the root is due to the entire force on the halfspan. If the lift is (unrealistically) assumed to be evenly distributed

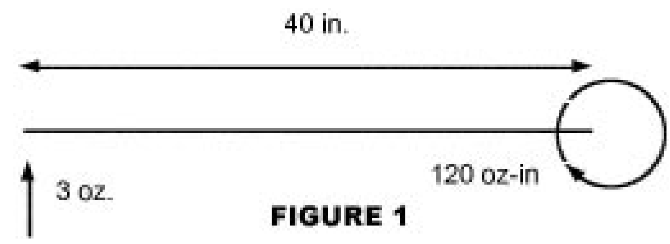

FIGURE 1

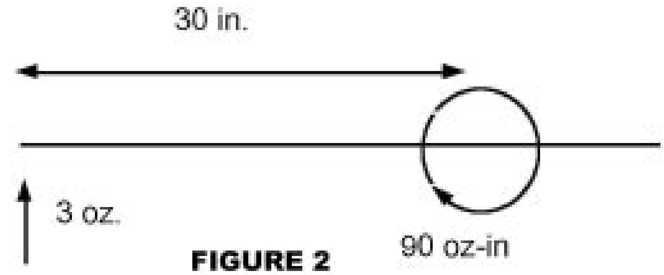

FIGURE 2

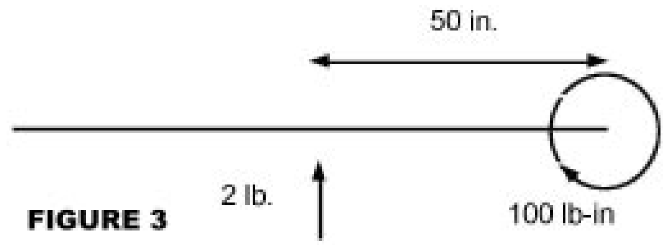

FIGURE 3

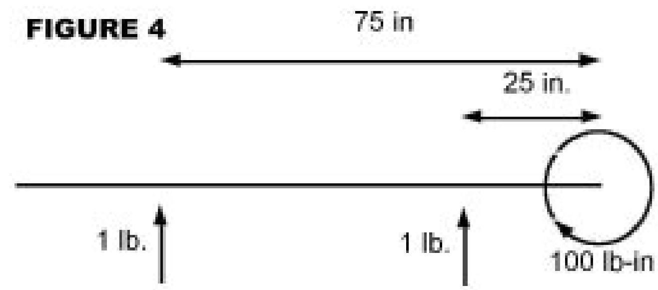

FIGURE 4

(constant) across a rectangular wing, then the entire force of each halfspan can be approximated by a single force midway between the root and tip. For a plane with a 200" wingspan and weighing 4 pounds, each halfspan is 100" and supports 2 pounds. This results in a bending moment of 100 pound-inches (lb-in) at the root. See figure-3.

Another way to come to the same result is to split each half-span, with each quarter-span supporting one quarter the weight of the plane, 1 lb. The inner quarter supports 1 lb. at its midpoint which is 25" from the root, producing a moment of 25 lb-in. Likewise, the outer quarter supports 1 lb. at its midpoint which is 75" from the root, producing a moment of 75 lb-in. The combined moment for the halfspan is still 100 lb-in. (See Figure-4.)

This example emphasizes how much more the outer portions of the wing contribute to the total bending moment at the root. It also seems to suggest how the moment may be calculated for multiple tapered wings by multiplying the force generated by each section by the distance from the root to where that force is effectively centered. But these examples assumed a uniform lift distribution.

To precisely determine the bending

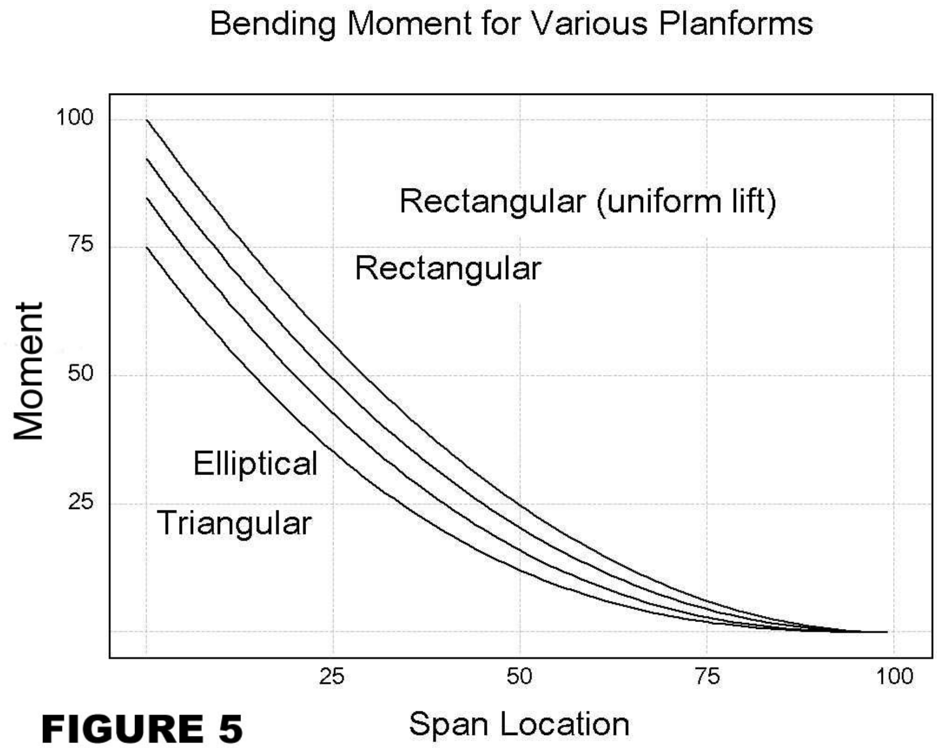

FIGURE 5

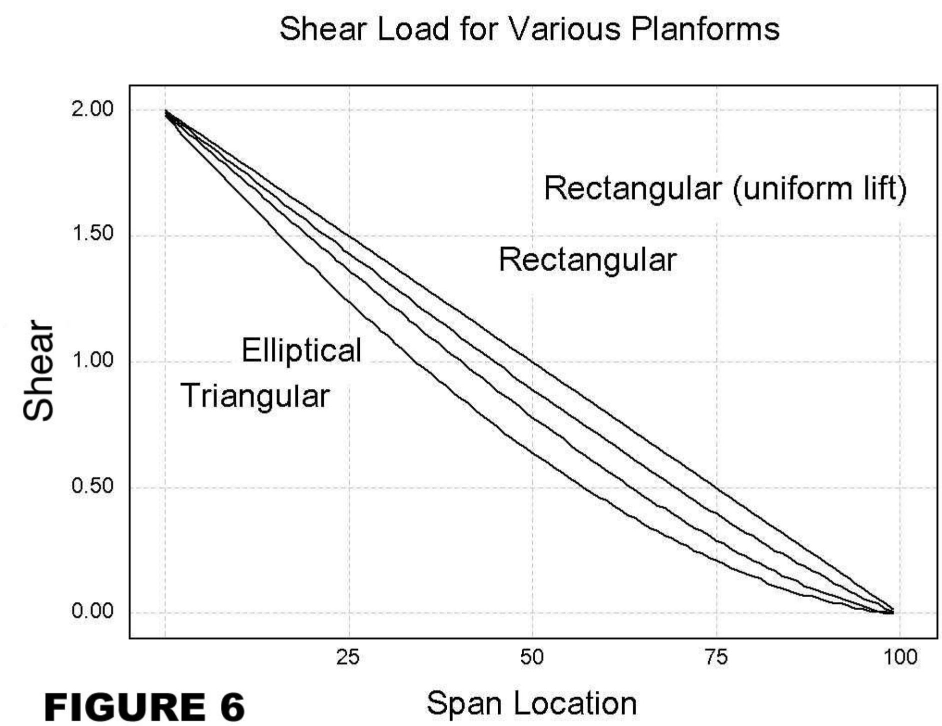

FIGURE 6

moment, requires an accurate lift distribution for the planform being considered. Even a rectangular planform has a more elliptical than uniform lift distribution. This means that the wing loading across the span varies with span location for all but truly elliptical planforms. Accurate bending moment calculations not only require an accurate lift distribution, but more methodical accounting by dividing the wing into many small sections. This is more easily accomplished today than when Martin Simons discussed bending moments in a short series of articles entitled *Elementary Stress*, in the Nov-Dec 1996 issues of *RC Soaring Digest*. But you might be surprised how little variation there actually is between the too extremes, a rectangular wing with uniform lift distribution, and a triangular planform.

Figure-5 shows the bending moments from root to tip for several representative wing planforms. While we've only discussed the total bending moment at the root, it's important to know the total bending moment at each location on the wing to properly design the spar at that location.

There are two plots for a rectangular wing. The 1st and uppermost plot, is a plot assuming a constant lift distribution across the entire span, from root to tip. This is the same as the example illustrated by figure-3. The 2nd is a rectangular wing using a more realistic lift distribution. The 3rd is an elliptical wing with an ideal elliptical lift distribution. The 4th, and bottom-most plot is for a triangular wing with a somewhat realistic lift distribution. The rectangular and triangular wings represent the two extremes. Any other wing planform should be somewhere between the two.

All of the plots are for wings of the same area generating the same amount of lift, but because of their shape, the center of lift may be closer to the root. The rectangular wing has the center of its lift force furthest from the root at midspan, and therefore has the highest bending-moment. The triangular planform has the center of its lift closest to the root, and therefore the smallest bending moment.

The most important thing to see in these plots is that the bending moment decreases very quickly. For the rectangular planform, it is has decreased 25%, roughly 1/8 of the distance from the root to the tip. It is nearly half at approximately 1/3 the distance to the tip. And is approximately a 1/4 at 1/2 the distance to the root. From a different perspective, a wing needs to be twice as strong at the root as it is at 1/3 the distance from root to tip. The outer half need only be half as strong as it is at 1/3 the halfspan. And these ratios are basically the same for all planforms.

The bending moment at the root is four times greater than at midspan. Making the wing twice as strong at the root than at midspan is not enough. It will still break at the root, before it breaks at midspan. While adding weight in the wings doesn't make the problem any worse, it does make the plane heavier, and adding weight to the outer parts of the wings makes it more difficult to roll the plane, and less sensitive to thermals. While bending moments are an important consideration in designing wing spars, *shear strength* is another.

Shear affects wings in the vertical direction, and is simply the strength needed to support the load on the wings. The bending-moment causes horizontal forces putting the lower spar in *tension* and the upper spar in *compression*. Shear force affects the entire spar from top to bottom, unlike the bending-moment which has maximum affect on the top and bottom of the spar and zero affect in the middle. Webbing can significantly increase the shear strength of the spar. Like the bending-moment, shear strength is maximum at the root, where the entire lift generated by the wing supports the plane, and is zero at the tip.

For the example in figure-4, with a rectangular wing having a constant lift distribution, the shear strength at the root is 2 lb. At midspan, it is half, or 1 lb. At 25" from the tip, it is 1/2 lb. It is simply the total lift from the tip to that point on the span. With an accurate lift distribution, the shear strength across the span can be accurately determined using the same methods used to calculate bending-moment. Figure-6 shows the shear strengths for the wing planforms shown in figure-5.

To simplify construction, it seems common to use the same spar design (dimensions and material) for large portions of the wing. This note shows that the bending moment decreases rapidly. If the wing fails, it will most likely fail for a given spar design at the point closest to the root. If a wing does fail away from the root, most likely it will fail where the spar design changes (e.g. no webbing). Since the bending moment reduces quickly, even some moderate strengthening near the root can help tremendously. But it's also important to recognize that material and weight can be removed from the spar further from the root. While this does weaken the spar where it doesn't need to be as strong, it makes the wing lighter and more sensitive to lift.

It is very important to recognize that the numbers used in this note are for illustration only. A 200" sailplane supporting only 4 lb. has both a halfspan and bending moment of 100 which is easy to discuss in terms of percentages. However, it's not weight but maximum load that must be considered, and this typically occurs during a winch launch. The breaking strength of the winch line is often used, and values of 180 to 220 lb. are not unusual.

Knowing the bending moment and shear strength, and how they vary across the span, are important in wing spar design. Spar design is a lengthy discussion and whole books have been written on the subject (Strojnik, Alex, <u>Low Power Laminar Aircraft Structures</u>, 1984). Spar design has also become very sophisticated with the use of various composite materials and structures. And of course, Mark Drela's *Allegro* is an excellent example. Thanks Ollie for all your help.

■

...continued from page 15

doesn't work. (Finding out when you enter the course is even worse!)

- The consistent runs started at the launch. The speed run really started at the push -over from the zoom, with a steady dive toward base A followed by a quick vertical dive and smooth pull into the course. The guys who "floated" off the line generally seemed to lose more altitude and start with less speed than those who were aggressive at entry. The initial dive onto the course looked really hard to judge — a perfect dive meant coming on course at maximum velocity. Dive too short, and you lose velocity pulling out; dive too long, and you waste altitude without gaining any more speed. The fastest had a fairly constant altitude usage through the first three laps of the course, with of course extremely smooth consistent turns.

- A few pilots did split-S's mid course, instead of the tight pylon turns most of the others did. I never figured out if this was better — it looked like they not only bled off speed turning, but sacrificed altitude in the process. I don't recall a run where it looked like this tactic paid off.

- It's not for the faint of heart. Any altitude left at the end of the run is wasted, and we saw a lot of potentially really fast runs blown in the last lap because there was altitude that wasn't used; or there was altitude wasted early on in the run; or because the elevator was over-controlled and the plane bled off a good bunch of air-speed.

My hat's off to the guys that fly F3B. I'm really impressed with their piloting skills, and the amount of things they have to master to fly one round — let alone fly well and be competitive. Even if you never want to be any more than a run-of-the-mill TD pilot, if you get a chance to go sit and guard a turnaround for a day at an F3B contest you should jump at it. It will give you a lot to think about.

Congrats again to the winners; I'm glad I got to help out. It was definitely worth my time! Good luck at the World's! (And to the rest of the world ... Watch out for those Americans ... They can launch!)

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PARACHUTES: $12.50 (includes S&H U.S.A.) Send check or money order to Dale King, 1111 Highridge Drive, Wylie, TX 75098; (972) 475-8093.

Reference Material

Summary of Low-Speed Airfoil Data - Volume 3 is really two volumes in one book. Michael Selig and his students couldn't complete the book on series 3 before series 4 was well along, so decided to combine the two series in a single volume of 444 pages. This issue contains much that is new and interesting. The wind tunnel has been improved significantly and pitching moment measurement was added to its capability. 37 airfoils were tested. Many had multiple tests with flaps or turbulation of various configurations. All now have the tested pitching moment data included. Vol 3 is available for $35. Shipping in the USA add $6 for the postage and packaging costs. The international postal surcharge is $8 for surface mail to anywhere, air mail to Europe $20, Asia/Africa $25, and the Pacific Rim $27. Volumes 1 (1995) and 2 (1996) are also available, as are computer disks containing the tabulated data from each test series. For more information contact: SoarTech, Herk Stokely, 1504 N. Horseshoe Circle, Virginia Beach, VA 23451 U.S.A., phone (757) 428-8064, e-mail <herkstok@aol.com>.

BBS/Internet

Internet soaring mailing listserve linking hundreds of soaring pilots worldwide. Send msg. containing the word "subscribe" to soaring-request@airage.com. The "digestified" version that combines all msgs. each day into one msg. is recommended for dial-up users on the Internet, AOL, CIS, etc. Subscribe using soaring-digest-request@airage.com. Post msgs. to soaring@airage.com. For more info., contact Michael Lachowski at mikel@airage.com.

International Scale Soaring Association

There is a growing interest in scale soaring in the U.S. We are dedicated to all aspects of scale soaring. Scale soaring festivals and competitions all year. Source for information on plans, kits, accessories and other people interested in scale. For more information:

web site: www.soaringissa.org

Books by Martin Simons: "World's Vintage Sailplanes, 1908-45", "Slingsby Sailplanes", "German Air Attaché", "Sailplanes by Schweizer". Send inquiries to: Raul Blacksten, P.O. Box 307, Maywood, CA 90270, <raulb@earthlink.net>. To view summary of book info.: http://home.earthlink.net/~raulb

T.W.I.T.T.

(The Wing Is The Thing)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $20.00 (US) or $30.00 (Foreign) per year for 12 issues.

T.W.I.T.T., P.O. Box 20430
El Cajon, CA 92021

Sailplane Homebuilders Association (SHA)

A Division of the Soaring Society of America

The purpose of the Sailplane Homebuilders Association is to stimulate interest in full-size sailplane design and construction by homebuilders. To establish classes, standards, categories, where applicable. To desiminate information relating to construction techniques, materials, theory and related topics. To give recognition for noteworthy designs and accomplishments.

SHA publishes the bi-monthly **Sailplane Builder** newsletter. Membership cost: $15 U.S. Student (3rd Class Mail), $21 U.S. Regular Membership (3rd Class Mail), $30 U.S. Regular Membership (1st Class Mail), $29 for All Other Countries (Surface Mail).

Sailplane Homebuilders Association
Dan Armstrong, Sec./Treas.
21100 Angel Street
Tehachapi, CA 93561 U.S.A.

The League of Silent Flight (LSF) is an international fraternity of RC Soaring pilots who have earned the right to become members by achieving specific goals in soaring flight. There are no dues. Once you qualify for membership you are in for life.

The LSF program consists of five "Achievement Levels". These levels contain specific soaring tasks to be completed prior to advancement to the next level.

Send for your aspirant form, today:

League of Silent Flight
c/o AMA
P.O. Box 3028
Muncie, IN 47302-1028 U.S.A.

http://www.silentflight.org

The Vintage Sailplane Association

Soaring from the past into the future! The VSA is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. The VSA publishes the quarterly BUNGEE CORD newsletter. Sample issues are $2.00. Membership is $15 per year. For more information, write to the:

Vintage Sailplane Association
1709 Baron Court
Daytona, FL 32124 USA

ESL

The Eastern Soaring League (ESL) is a confederation of Soaring Clubs, spread across the Mid-Atlantic and New England areas, committed to high-quality R/C Soaring competition.

AMA Sanctioned soaring competitions provide the basis for ESL contests. Further guidelines are continuously developed and applied in a drive to achieve the highest quality competitions possible.

Typical ESL competition weekends feature 7, or more, rounds per day with separate contests on Saturday and Sunday. Year-end champions are crowned in a two-class pilot skill structure providing competition opportunities for a large spectrum of pilots. Additionally, the ESL offers a Rookie Of The Year program for introduction of new flyers to the joys of R/C Soaring competition.

Continuing with the 20+ year tradition of extremely enjoyable flying, the 1999 season will include 14 weekend competitions in HLG, 2-M, F3J, F3B, and Unlimited soaring events. Come on out and try the ESL, make some new friends and enjoy camaraderie that can only be found amongst R/C Soaring enthusiasts!

ESL Web Site: http://www.e-s-l.org

ESL President (99-00): Tom Kiesling (814) 255-7418 or kiesling@ctc.com

HERE HE COMES... START FLAPPING!