R/C Soaring DIGEST

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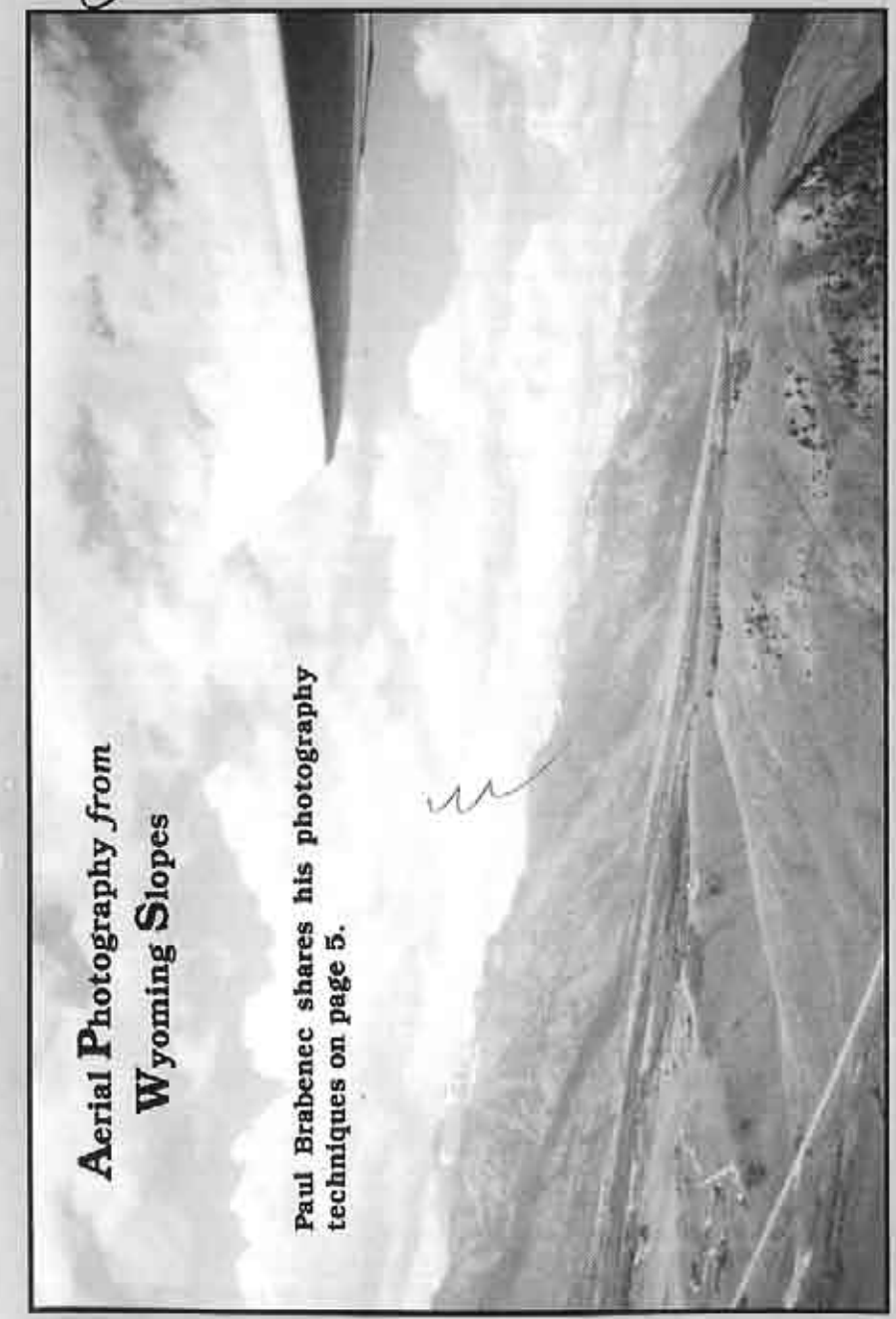

Aerial Photography *from* Wyoming Slopes

Paul Brabenec shares his photography techniques on page 5.

R/C Soaring Digest

A publication for the R/C sailplane enthusiast!

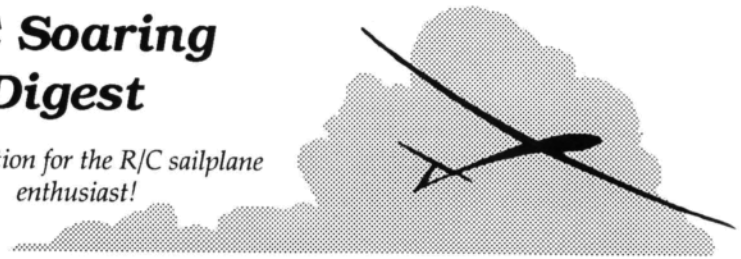

Table of Contents

Other Sections/Information

Advertising

Special Interest Groups & Contacts

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. He can be reached at: 210 East Chateau Circle, Payson, AZ 85541; (602) 474-5015.

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The Soaring Site

Christmas Cards & Notes

For those of you that sent in special notes (both FAX and mail) and Christmas cards over the holidays, a special thanks. Your thoughtfulness was most appreciated. One gift that arrived we absolutely have to share with everyone, because it is a fun one-of-a-kind gift that many sailplane enthusiasts can appreciate; it is a glass jar containing one of the most sought after accessories necessary to achieve a good flight: Thermal Air! It was bottled by Rick Palmer of Springerville, Arizona, and the label said that it is "Arizona's finest". The directions say to heat and serve with HLG, two meter, open class, F3J, F3B, and Unlimited. No adjustment is necessary for high altitude, and a mini-buzzard is available to spot thermals! Thanks, Rick! Neat! *Now if the readers hide this information from their friends, many folks will receive a bottle of hot air next year for Christmas...*

Another unusual, unexpected gift contained two 1994 soaring calendars done by Gene Zika, Arvada, Colorado. You guessed it. They are fully illustrated with Gene's special cartoon work. Thanks, Gene! Neat! If any of you have an interest in talking Gene into doing this for you, send in your requests via *RCSD* and we will see that he gets them.

If any of you either gave or received an unusual present that you would like to share, please jot down the details or send in a photo. Finding appropriate gifts for glider fliers is not easy!

An Update on the WSJ

According to Wil Byers, "Prof. Michael Selig and Joe Wurts will be participating in the World Soaring Jamboree. Prof. Selig is currently scheduled to be a speaker on Sunday, May 29."

A mailing containing registration information, etc. for the WSJ will have been

made by the time you read this announcement. If you have not received one, or have not yet written to obtain the registration information, please contact the World Soaring Jamboree, P.O. Box 4267, W. Richland, WA 99352. This issue also includes the current schedule for the WSJ.

A Reader Survey

This issue of *RCSD* contains an informal survey done by Wildey Johnson of Boca Raton, Florida; the last issue of *RCSD* included some topics of interest by George Siposs of Costa Mesa, California. And, we have had several readers ask questions recently that have either been included in their articles or in the "Soaring Site" column.

For those of you that write frequently, you know how easy it is to submit material; you just put it on a 3 1/2" disk (MAC or IBM compatible), type it, or write it out in long hand and send it in. For those of you that are new or have never written but would like to give it a try, here is a chance to test the process.

"Rick Palmer of Springerville, Arizona launching his Larry Jolly Models Icarus, 2 meter, V-tail." (1993 Phoenix Winter Contest - Taylor Collins, Albuquerque, New Mexico, photo.)

"Bob Von Hellens, noted full size Ventus driver from Phoenix, prepares to launch his venerable White Trash, a 1972 Rick Walter's design, for the last flight. A winch hang-up caused the wing to fold. Perhaps it's time to move up to something more modern? Like a Bird of Time?" (1993 Phoenix Winter Contest - Taylor Collins, Albuquerque, New Mexico, photo.)

"Tosha Norlander, 14 year old from Albuquerque, New Mexico, prepares to launch her 2 meter Gnome. Buzz Averill launching." (1993 Phoenix Winter Contest - Taylor Collins, Albuquerque, New Mexico, photo.)

"Old Buzzard, hisself, Dave Thornburg, checks out that proverbial River of Air above Gilbert, Arizona." (1993 Phoenix Winter Contest - Taylor Collins, Albuquerque, New Mexico, photo.)

"Go West Young Girl... Go West! Buzz Averill coaches 14 year old Tosha Norlander through a Triatholon Flight." (1993 Phoenix Winter Contest - Taylor Collins, Albuquerque, New Mexico, photo.)

RCSD has just celebrated its 10 year anniversary; we have begun our 11th year. Many of you remember when Jim and Peggy Gray started *RCSD* in January of 1984, as a reader written publication dedicated to sharing technical and educational information on the subject of R/C sailplanes/gliders. Well, we have attempted to continue in the same direction that Jim established so many years ago. While we are still a staff of two, and work out of our home, desktop publishing has allowed us to increase the size and the amount of material that is included in *RCSD*, today. If you would like to see some changes, drop us a note and, if we receive enough requests to change anything, we will probably do another survey later this year.

From notes we receive periodically, it would appear that the contacts listed under the "R/C Soaring Resources" section work quite well. It saves us quite a bit of time as we receive numerous requests for club and/or contact information every month. Of course, we only list in *RCSD* those folks that have requested a listing, so we still find ourselves digging out club or contact telephone numbers several times a week. While we don't mind doing this, a lot of you would probably like this information but didn't ask. So, we plan on including a list soon in *RCSD*, with addresses and telephone numbers, of all the clubs we <u>currently</u> receive newsletters from. If any of you find that your club <u>wherever you may be</u> (U.S.A., England, etc.) does not send us your newsletter, or if your club does not do a regular newsletter but would like to be added to the list, please send in the

details and we will add you to the list. Who wants this type of information? The requests come from people who are: moving from one state in the U.S.A. to another, moving from one country to another, on vacation, planning their vacations around soaring sites; many folks have jobs where they travel a lot. For example, Jack Sile of England says, "BARCS has a contest every Sunday during the season, and anyone wishing to fly can contact me for details, information, etc. I have enough folks available to help if a thermal soarer drops in at Heathrow (London's Airport). That's not quite unusual because I have had a few calls since I have been the editor *(SOARER)*." *We're adding information on how to contact Jack in the resource section.*

Corrections & Things

Well, we did it, again. There is a printing error on page 17 in the January issue; the photo was reversed in the printing process. Our apologies to Fred and the folks in the photograph!

As you can see, *RCSD* is not reproduced on a regular copier, but rather is prepared by off-set printing process. So, occasionally, a few copies are not bound properly: too many pages - not enough pages. If you receive one of these copies, just let us know and we'll replace it quickly via first class or airmail. We try to catch this sort of thing, but it is not easy and unfortunately a few sneak through.

RCSD is usually mailed the first week of the month. Copies that are lost or damaged by the postal system are replaced at no charge to you. While we have a high regard for the postal workers and are amazed by the volume of mail they must handle every day all over the world, every month their machines eat or shred copies, or some third class U.S.A. copies for some reason just doesn't get delivered; some copies with good addresses even get returned to us and we have to go through the expense of sending them out all over again. When does this happen? Well, in one case, the post office box was listed to a business. The envelope was addressed to an individual; a new postal employee thought it was a bad address, so sent the copy back as undeliverable. We knew the subscriber had been with us a long time, so we mailed a note to the same address. This one got through, and the subscriber found out what had happened. In another instance, the post office had changed routes and there was some confusion. First class mail with a perfectly good address was returned to us.

The front of your envelope contains a statement which is addressed to the post office. It says that "Forwarding and Return Postage is Guaranteed", which means they are to forward the mail to you if you have an address change on file or return the mail to us if it is undeliverable and we will pay to get it back if necessary. Unfortunately, they frequently don't do this. "Address Correction Requested" means that we want them to send us a xeroxed copy of the envelope showing your new address, and we will pay $.35. It keeps our records current and for those of you that have more important things to do what with, for example, moving, etc., it can give you one less thing to worry about. So, please remember to send us your address changes, but if you find we already have your new address, this is why. By the way, if you have moved recently and have mail being forwarded, check the information closely. If it is not complete or something is wrong, did you know that you can go into your new post office and they can access the computer at your old address and make the correction? We discovered this the hard way when we moved from California to Texas. It was so easy for us to do. Anyway, please check your address on the mailing label and make sure that it is correct.

Happy Flying!
Jerry & Judy

Aerial Photography from Wyoming Slopes

Photo 1

...by Paul Brabenec
Box 793
Wilson, Wyoming 83014

These photos are from (and of) some great soaring slopes in Jackson Hole, Wyoming. Photo 1 is of yours truly and my Toyota GTV (glider transport vehicle) at the launching area on the West Gros Ventre (grow vont) Butte, looking north at the Teton Mountains. Mostly, I fly the evening "glass-off" period of smooth, steady lift, getting hour-plus flights lasting until dark. This place is about two miles from my '53 Terracruiser mobile home. I fly after work a lot (the slope).

Photo 2 is the same location, same flight. This shows the 250 foot slope, the hay field below for smooth landings, highway 22 and the Snake River in the upper left corner. It also shows the encroaching development which will soon end our flying FOREVER. This slope is frequented by numerous "locals": osprey, redtail & Swainson's hawks, ravens, night hawks, and the occasional bald eagle.

Photo 2

Photo 3 (on the cover) shows the same West Gros Ventre Butte at lower left with houses and road. Lower right is what the paragliders call Butte 22, a great place to fly FAST with a good south breeze. It's where a Swainson's hawk shredded my

Photo 4

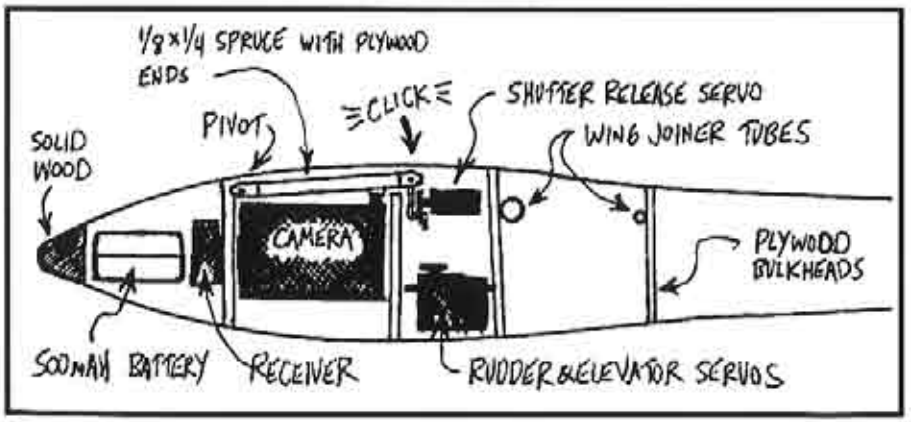
a slim 'glass fuselage, which I replaced with a balsa box-type one designed around an Olympus "Trip Junior" which happened to be the cheapest autowind 35mm camera at our local discount store ($30). The new fuselage carries the 9 oz. camera in the enlarged cockpit area, and has its tail lengthened about 4 inches with the stock stabilator employed. A simple wooden lever depresses the shutter release when I push my left transmitter stick sideways. Other controls on the four channel radio are rudder, elevator, and flaps. See the diagram for the cockpit layout.

Oly 650 and where an ASW-22 disappeared high overhead. Landings are on the flattish top or in the hayfields below.

Photo 4 shows the town of Jackson and the East Gros Ventre Butte, especially the large bowl facing southwest prevailing winds directly. The paragliders regularly fly butte-to-butte and beyond. After launching on top, I've spent an hour down-climbing while flying to the landing fields. All the buttes are thought to be ancient mountains which have sunk 15,000 feet into the earth while the valley floor filled with glacial till, burying them neck-deep. They've also been covered by glacial ice.

I'm flying bigger and bigger models on these slopes as smaller ones tend to disappear in the distance. The polyhedral right wing so prominently displayed in the photos is from a Dynaflite Sensor 117. The ten foot span model comes with

With the camera looking out the right side of the cockpit (through a hole in the balsa), I get a photo of whatever the right wing is pointed at. Also, I wanted a pilot's eye viewpoint, so the camera shoots horizontally. I arranged the various components on a 1/8 x 4 x 36 inch piece of balsa, then drew the fuselage shape around them. By chance or luck, the balance point was fine without ballast. This glider is very smooth with the balance point at 25% of chord and has a nice speed range and low lift capabilities. The flaps make landing pretty easy.



While I enjoy showing off these flying sites, I must confess they are all considered private property. I've gotten permission for some of the take-off and landing sites, but am primarily enjoying the lack of any use most of them get, the fact I haven't been chased off yet, and the way my van looks probably broken down when parked on the roadside. Those highly visible paragliders have recently assaulted these areas with attendant cars, spectators, traffic obstruction, and occasional body damage (their own bodies). They've been chased off some slopes and I fear we'll all lose these wonderful sites soon. There are probably less than ten model soarers in the county (or the state for that matter).

Aerial Photography has been very affordable and enjoyable. I recommend it highly. ■

Fear of Landing

...by Pancho Morris
Mesquite, Texas

Landing is a necessary part of each flight and can be a dangerous and critical part of the flight. Ironically, it is the fear of landing that causes the greatest potential for disaster. The very things that people do to avoid disaster are the things that cause it. People are afraid of the ground because it is hard, so they try to keep the plane off the ground. They know they don't want to hit the ground hard when they do touch down. In trying not to hit the ground at all, and to do it very softly if they must, beginning fliers will hold the plane up with the elevator and fly slower and slower until they land or something happens which is often the case. The plane will usually stall at about 6 feet off the ground and come in hard in a bad attitude; or a gust of wind will grab the plane and throw it into the ground in an ugly manner. The pilot will protest that he had no control over it and he will be absolutely right though he does not know why.

In order for your plane to fly, it must have air speed. If the speed gets too low, the wing will stop working and the plane will fall like a rock until it gets going fast enough to start flying, again. At 10 feet of altitude, it doesn't have enough room to recover. To have control over the plane, you must have air speed so that there is air flowing over the control surfaces with enough force to make them effective. If the plane is not moving, it does not matter how big the surfaces are or how far you throw them; they will do nothing to control the plane.

Landing tasks at a contest are often a deciding factor in the score. You have much better control of your plane and accuracy of your landing if you maintain good airspeed during the landing. If you come floating in to the tape on the edge of a stall, you are very likely to get upset by any gust of wind and miss your target or at least not do as well as you might have.

The secret of better landings, either for a beginner just trying to get down in one piece, or a contest flier trying to get all important points, is to keep your speed up all the way to the ground. It is better to land a little hot than to stall in. This is especially true in windy weather. ■

Understanding Sailplanes

...By Martin Simons

13 Loch Street, Stepney,
South Australia 5069

The Cross Country Sailplane
(Notes prepared for the MARCS Symposium, October 1992.)

The sailplane

We are now in a position to consider the design of a good cross country model sailplane.

Not necessarily in the order of greatest importance, the model:

(1) Must be large and colorful with distinctive shape
(2) Must have capacity for large batteries, instruments etc.
(3) Must be strong
(4) Needs powerful air brakes
(5) Should be stable in circling flight
(6) Must be stable in pitch
(7) Must be capable of wide range of trims without 'stick pressure'
(8) Needs a low minimum sink rate and good handling in turns
(9) Must have good penetration

We may now expand on each of these.

Size, color and shape

Build up to the largest wing area considered feasible. This gives very definite improvements in performance because of Reynolds number increases all round. Probably more importantly, a large model will be more visible at great heights and at large distances.

A two color scheme is useful - dark below, different above. Dark green and bright 'rescue orange' make a good combination. The model 'blinks' as it turns, which helps orientation and recognition. Some fluorescent paint is helpful. It is not wise use too many differing colors in patches, even if these are bright. The effect can become like the 'dazzle' system used on First World War ships to mislead U boats. The dazzle paint caused the U Boat skippers to mistake the size, speed and course of the target - just the thing we have to avoid in flight.

Small panels of highly reflective material in a few carefully chosen places, help with orientation.

One of the worst colors is all over white, so we should not imitate full-scale plastic sailplanes in this respect for serious cross country flying. White is a good color if one is above another aircraft looking down on it. White shows up well against any surface other than snow, but head or tail on and level with the horizon or in hazy skies, such aircraft virtually disappear. Probably worse than white for a model, is light grey, matching the clouds.

Models with 'character' are easier to manage at a distance than 'bland' shapes. Small losses of efficiency are acceptable if the result is a model easier to identify and control. Polyhedral or tip dihedral, gull wings, pod fuselages, "Bird of Time" wings, etc., are easier to see and interpret than very slender, straight shapes.

Capacity

A slightly fatter fuselage loses very little in drag. Plenty of room inside is more important, but use a good streamlined shape. The best place for ballast is inside the wings and provision should be made for this.

Strength

The wing spars at least should be stressed for bending by calculation or practical test. High accuracy is not necessary when supported by common sense and experience, but even a rough stressing calculation will enable the wings to be made strong enough and yet light at the tips, which is desirable. Most engineers know how to make the calculations that are required.

The model will often fly very fast, so wing torsion becomes very important, for both strength and stiffness. Probably wing skins will be wood veneer (e.g. obechi). Glass fibre is somewhat elastic, which is good in many situations, but strips of unidirectional carbon fibre, laid diagonally, will assist torsional stiffness if the wings are skinned with glass instead of veneer. Practical tests of wing stiffness in torsion are not difficult to do, although nothing of this kind has ever been reported in the modelling press, so far as I know.

Wings should be thicker at root than outboard. This will follow automatically if the wing is tapered, but the taper in planform should not be allowed to dictate the taper in thickness. To deepen the wing root will help wing strength and stiffness and the outer panels of the wing can be thinner. There will be negligible or nil aerodynamic penalty.

Tailplane/stabilizer loads should also be considered since at high flight speeds tail loads are severe. Stiffness in the fuselage rear end is also important to prevent tail flutter. Slender glass tail booms are not the safest in this respect.

Mass balancing of control surfaces will almost certainly prove necessary, to prevent flutter.

Air brakes

The model will sometimes have to be dived very steeply to get down out of strong lift. Spoilers and 'crow' flaps tend to be blown back and can even be blown off altogether. Vertical 'Schempp Hirth' brakes (as on full scale sailplanes) are almost essential and are relatively easy to design and install. Alternatively, trailing edge brakes, center pivoted and balanced are effective. They make it more difficult to fit camber flaps, but this problem has been overcome in some full scale sailplanes (e.g., the Mosquito). Tail parachute air brakes are excellent but they can be deployed only once in a flight and have to be jettisoned if not required after deployment. This can be embarrassing.

The brakes, whatever type they are, must be large! It should be possible to use them proportionately, partly open, fully open, etc. so their full, drastic effects may not be needed for ordinary landing approaches. But for rapid descent out of strong thermal lift into a cloud, it is almost impossible to have brakes that are too big.

A full spin is a slow speed manoeuvre and can be used to bring a model down safely from a great height. Many model sailplanes, however, will not spin but tend to dive out into a spiral. If out of control this can destroy even a strong sailplane. It is important to distinguish in flight between genuine spinning and spiral diving.

Stability in turns

Practical tests and adjustments to the design of the model are better here than calculations. Rule of thumb methods, based on experience, seem to yield reasonably good results. The requirement is for a sailplane that, once trimmed for a desired angle of bank and airspeed, will tend to hold that rate of turn despite minor turbulence. (Major turbulence, within or on the edges of a thermal, will throw the glider about anyway.)

Usually, for a large sailplane, the required trim for a steady rate of turn at minimum sink is slightly up on the elevator. The bank angle controls the rate of turn and the turn radius. The up elevator keeps the turn going as long as the bank is on.

Some 'hold off' aileron against the turn is usually necessary. In a turn, especially with a high aspect ratio, the inner wing moves through the air more slowly than the outer wing, so tends to develop less lift. This wing then tends to go down more, tightening the turn. The ailerons are used to prevent this. The effect is not to roll the model out of the turn, but to **equalize** the lift on the two sides, so allowing the model to hold a constant bank angle. With a 'rudder elevator' model, top rudder can be used to create the same effect.

A small degree of spiral instability is

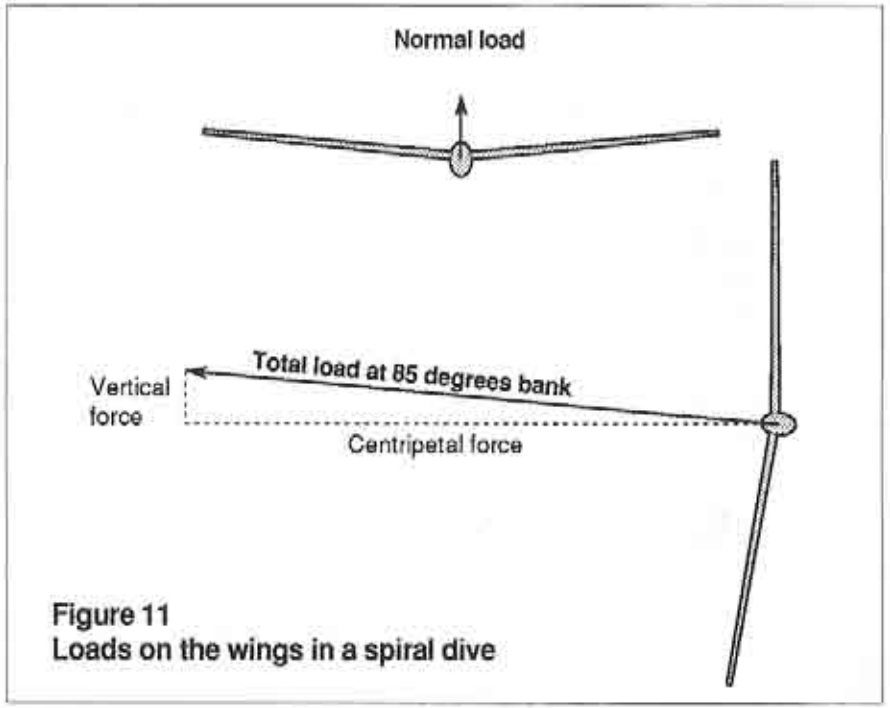
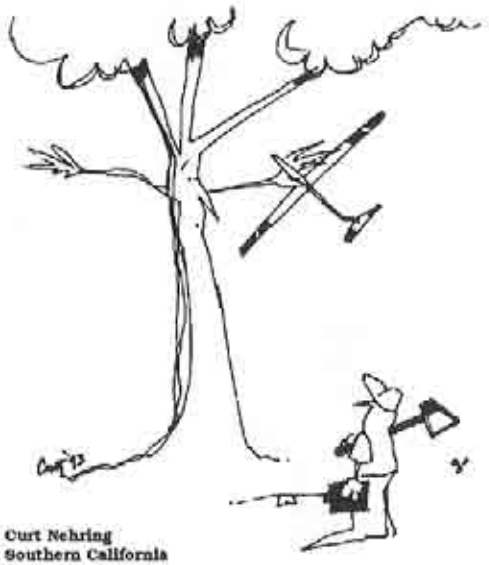


Figure 11
Loads on the wings in a spiral dive

not necessarily a serious fault, although when a model is far away it becomes very difficult to see what is happening and a spiral dive may develop quickly if not corrected. Hence it is worth doing a lot of testing and adjustment of vertical tail and dihedral to achieve genuine spiral stability.

The most likely result of allowing a spiral dive to continue too long, is to destroy the model. Under these conditions the airspeed rises and at the same time the 'g' loads on the wing build up to such an extent that in the end something is almost sure to collapse. Even at slow airspeeds, a bank of about eighty-five degrees applies a load of about 11 g (that is, eleven times the normal load) to the wings **(Figure 11)**. At high speeds, too, the tailplane comes under very severe down loads and may collapse. Fortunately, it is fairly easy to recognize and stop a spiral dive before it goes too far, providing the model is in sight. If there is any doubt, open the air brakes, progressively rather than suddenly, to limit the airspeed. ■



Curt Nehring
Southern California

Jer's Workbench

Lead Ballast

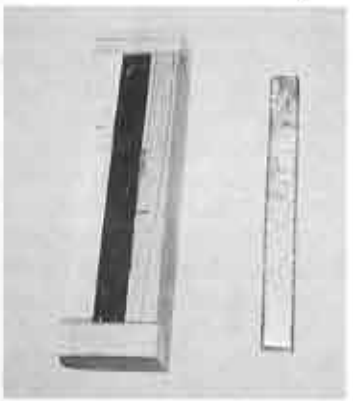
WARNING: Lead can be harmful to your health, don't touch, eat, drink or breathe lead.

OK, you still want a lead ballast bar for your glider? There are a few items that you will need. A propane torch, mold, tin can, vice grips, gloves, goggles or face shield, a dust mask would be nice, some lead and a well ventilated work area.

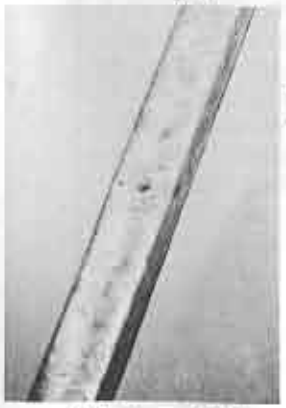
Let's start with the mold. As you can see in the picture, my mold is made of wood, cut to size and glued together with 5 minute epoxy. Now let's go outside into the back yard and melt the lead. Don't do this in the house, as the fumes can be very bad. Drop a few ounces of lead into the tin can and, using your propane torch, melt the lead; this will only take a few minutes to do. Now very carefully, using your vice grips, pick up the can of molten lead and very slowly pour it into the mold. Let it cool for about one hour, and then you can knock it out of the mold. As you can see, the wooden mold is burnt on the inside but can be used again. After your lead bar has cooled, you can drill and install a "T" nut to bolt your ballast bar inside of the fuselage.

If you are still fearful of handling lead, you can paint your ballast bar using a non-lead paint. ■

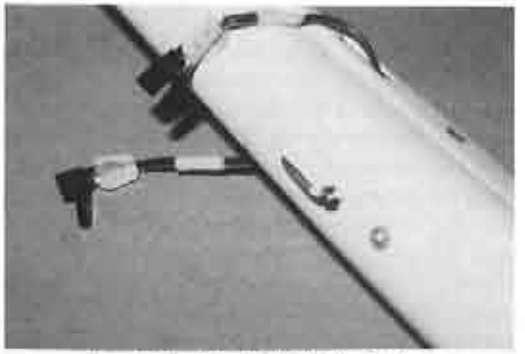
Items used in making your lead ballast bar: propane tourch, mold, tin can, vice grips and lead.



Lead bar after cooled and removed from mold.



"T" nut installed in lead ballast bar.



Lead ballast bar installed in fuselage.

On The Air With Cornfed

Fred Rettig
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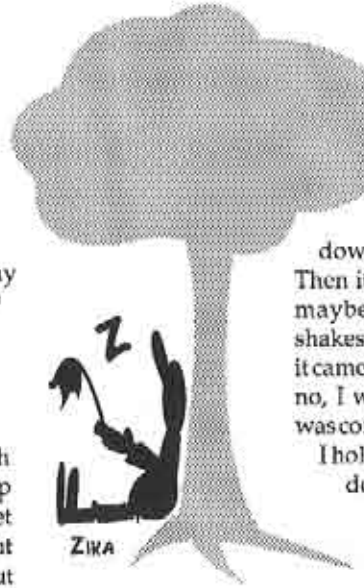


"It's all in the thumb!"

I went to the Mid-South Soaring championship this past summer. I met some really nice folks, but one who really stuck out in my mind was this fellow by the name of Troy Lawicki. I had heard that he invented the 2 meter Duck, and about his ability to fly it. I thought maybe I could learn more about thermal flying by watching him.

Well, it was a little after noon when he and Mike Stump pulled up the day before the contest. They looked like they had drove cross-country on the outside, but on the inside you could tell they had come to compete. They jumped out, looked the field over, spoke to a few of the early birds, and then started pulling the planes out. Man, they looked like kids tearing their closet up to get to that one toy. Out of that well packed car came the ones they wanted.

"My, it sure is hot," I remember thinking. Sipping on my ice tea, I got up and eased over to the winch to see this man fly that Duck. It was his turn up to the winch. He hooked up, looked around, and then stepped up to the pedal. That man wound that thing, and wound, and wound. The old winch was just grunting and 'bout to quit. The string was banjo tight. Then, he released the plane. Straight up it went with the winch full bore. I kept waiting to see that Duck blow up. It didn't. The plane leveled off, then went full bore, again. Off the line went the plane. It was out of control. Wing over wing, then upside down, then spinning down. Then it leveled off. I thought maybe he had early flight shakes. I don't know, but here it came... I rubbed my eyes and, no, I wasn't seeing things. It was coming back upside down! I hollered, "Hey! It's upside down!" I mean, he was flying this thing about five feet off the deck. Troy said dryly, "Oh, thanks." He sounded like maybe I had insulted him. He pulled up about a hundred feet or more and stalled the plane. I knew right then that somebody had told me a lie. That man could not see, and he was no thermal flyer.

He stalled the plane again; then it fell over on its side kinda like he was going to drive a nail with the wing tip. Then, Troy landed the plane. Yep, slid right up to his feet. I guess he should be able to land. The man must not ever get any air time with such short flights. He gets plenty of landing practice.

Here we go again; full bore launch rolling off the top, screaming by... I was in a full sweat with my nerves standing on end waiting for him to crash. He had that fowl all over the sky. You should have seen his thumb! His flying style was not like us here in the South. That thumb was all over the box. To the left, up, down... Man, he looked like my Aunt the day she tried to kill that snake that crawled up into that rat hole. She took her broom and poked it into the hole and jiggled it all around. That's how Troy's thumb looked! To top it off, here he came, upside down, again! Seemed like he would have thanked me for saving the plane as I yelled, "Hey, Troy! You're upside down, again!" "Oh," he said. He bounced the top of the plane off the ground, then rolled it upright.

Now, that man can land on a dime. So, at his feet it lay. I walked away thinking, "I'm glad I'm from the South where slow and easy is a southern tradition, and ice tea at night is just right, and slow, smooth thermal turns make for a long flight. Poor 'ol Troy must have a nervous disorder. Maybe they should call him Tricky Lawicki.

Troy, maybe next time I see ya we can sit under the shade trees and sip some ice tea. I'll talk real slow. They tell me rest is good for the nerves.

Signing Off,
Cornfed

Per request, next month I will tell you about my new Super-V that Santa brought me.

P.S. Say your prayers, and tell your Mother you love her.

Attention: Ron Swinehart. You didn't happen to find a partial set of teeth in the field this summer, did you? I misplaced mine. You will know them by the initial "C" in the gold filling on the front tooth. ■

Readers' Preference

...by Wildey E. Johnson
954 Lakeside Blvd.
Boca Raton, Florida 33434

A number of R/C hobby magazines have at least some soaring coverage. However this space is usually devoted to product announcements and some form of reprint. (Possibly because this is the only information they receive.) This got me wondering just what my flying friends like to read. So, I decided to conduct an informal survey.

By going through several issues of the *RCSD*, I came up with thirteen topics that were being addressed in one form or another. I placed the name of each topic on a separate card. When I encountered a soaring enthusiast, I asked him to arrange the cards in the order of his interest. I then recorded the order of the topics and proceeded to look for another participant. Since the participant ordered

TABLE 1
Interest Ratings of R/C Soaring Topics

Topic	Avg. Position	Best By	2nd Best By	3rd Best By	In Top 3 By
1 Sailplane Design	3.3 —>	50%	10%	5%	65%
2 Construction Tech.	4.6	15%	20%	15%	50%
3 Flying Techniques	5.3	15%	20%	0%	35%
4 Building Tips	5.6	0	5%	20%	25%
5 Trimming	5.9	5%	5% —>	30%	40%
6 Airfoils	5.9	0% —>	30%	0%	30%
7 Kit Evaluation	6.2	0%	5%	10%	15%
8 R/C Electronics	7.5	0%	0%	5%	5%
9 Questions & Answers	8.0	5%	0%	5%	10%
10 Product Announc.	.4	0%	0%	0%	0%
11 Slope Flying	9.2	0%	5%	5%	10%
12 Scale Models	9.4	10%	0%	5%	15%
13 Competition Results	10.7	0%	0%	0%	0%
		100	100	100	300

the topics (versus rating them), no two topics could have equal importance for that person. Fliers sampled were from the southeast part of the country (Florida, Kentucky, West Virginia) with only one from the west. Therefore, the results may not be representative of pilots everywhere.

Table 1 shows the results of my little survey. The topics are shown in order of their relative interest level after being averaged over all participants. A low number indicates high interest. Also included are columns that show the percentage that selected that topic as first (most interesting), 2nd, and 3rd. The last column shows the percentage of readers who had a high (positions 1-3) interest in this topic.

And the winner is: Sailplane Design was the overwhelming choice as the most interesting topic. Half of those surveyed selected this as most interesting. If anyone out there has some knowledge about this subject, consider writing an article or better yet a Sailplane Design column. You will have a lot of interested readers.

The runner up is: Construction Techniques. Congratulations, Gordon Jones! My friends say you have the most popular column in print. Flying Techniques was third with the average reader. Martin Simons fills the bill with "Soaring in Wind and Weather". The readers say, "Keep it coming."

Building Tips is the next most sought after information. Jerry Slates addresses this area with "Jer's Workbench". However, this topic has broad scope and we all can contribute.

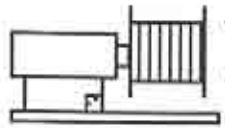
Sailplane Trimming and Airfoils were tied for the next two positions. Thirty percent selected Airfoils as their second most interesting topic. Will Byers has been covering airfoils in his "Ridge Writer" column. Manufactures are using the same airfoil for hand launch through the open class. It appears that we are becoming a one airfoil country. Pilots are asking for airfoil information for thermal applications. So far we have depended on kit manufacturers and retailers to guide us. We are eager to read information from an unbiased source.

R/C Electronics was 7th; this is a topic that is common to all of us, no matter what type of soaring we do. On the topic of Slope Flying, I believe the results are misleading because of the location of those participating in the survey. Fifteen percent of those surveyed were involved with Scale Models, and they all rated it in the top three topics.

Competition Flying is a cornerstone of our hobby and most people enjoy the experience it offers. Even though the majority of those involved attend contests, Competition Results was rated least interesting of all the soaring topics. Perhaps another topic called Competition Flying Techniques should have been included in the survey.

At this point you might ask yourself:

1. How do these results correlate with my interest?
2. What important topics are missing?
3. Which publications address the topics of interest to me?
4. Which periodicals would permit me to publish my knowledge about one of these topics? ■



Winch Line ...by Gordon Jones

Gordon Jones, 214 Sunflower Drive, Garland, Texas 75041; (214) 840-8116 After 5:00 P.M. CST

Spectrum

The Spectrum is a new arrival on the thermal scene that is somewhat different in approach to previous thermal sailplanes in that it has a smaller wing span and introduces a couple of new manufacturing techniques. This sailplane is the latest in a series of designs by Mark Triebes and Ron Vann. With only a 104 inch wing span, it is small by recent standards, but if you have flown one of the current crop of hot two meter sailplanes you will feel right at home from launch to landing with the added squares to keep you aloft longer. The prototypes made their debut at the Visalia contest by placing First and Third and flown by Daryl Perkins and Mar Triebes respectively.

The Spectrum is manufactured by Spectrum Enterprises of Windsor, California owned by Steve Hug. The kit is actually a joint effort in some respects, as the major parts (fuselage, wings and stab) are manufactured in California and then the kit is completed with hardware, packaging and instructions by Ed Slegers of Slegers International in New Jersey. Attention to detail is obviously the key to this manufacturing effort as when you open the box the contents rival Airtonics quality and attention to detail in every respect.

The Kit

The kit comes to the "builder" with wings and stab not only pre-sheeted with obeche and the root rib installed, but with the wood hinge line reinforcement installed prior to sheeting the wing. This "box structure" provides increased torsional stiffness as compared to the more common cap strip method. This box structure method is employed on both the wing and the stabilizer and is a really nice touch. The Kevlar reinforced fiberglass fuselage and nose cone are excellent in every respect, and the nose cone is available with moulded in "Sharks Teeth" if you desire.

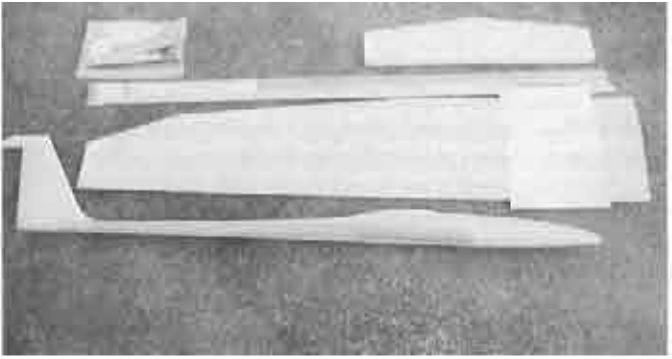
Quality and attention to detail is also evidenced in the plastic wrapped hardware goodies that include 48" Sulivan cables, a Squires wing rod, Ziegelmeyer control horns and tow hook. (This is the tow hook used on the F3B Eagle.) These are some top notch items to be sticking in a kit! Rounding out the goodies department is a pre-cut servo tray that actually fits and an assortment of smaller wood pieces so they don't get lost. Also included is a comprehensive set of building instructions that include the only plan, a scale rudder drawing.

Building (?) the Spectrum

The amount of pre-fabrication that this kit contains doesn't leave a lot of real "building" and thus the Spectrum does not take long to construct. All of the building techniques required to complete construction are straightforward and should not pose any problems for the average builder. The only thing to remember during construction of the Spectrum, or any other sailplane for that matter, is to measure carefully and when in doubt, re-measure.

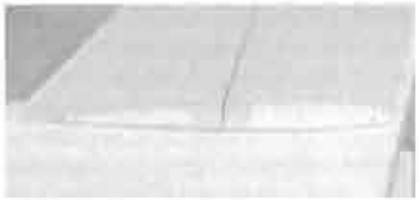
The rudder is the first step in the instructions and it is a simple chore to cut out the balsa pieces and glue them together. The plan for the rudder is located in the building instructions, and is the only "plan" required to put the kit together. The plan is exactly to scale and if you prefer to shave a little off the rudder to alleviate rudder damage on landings there is plenty of meat to take off the top and bottom. Install the rudder control horn and cover with your favorite covering material.

The stabilizer is next on the agenda and is pre-sheeted with the elevator pre-cut. The location of the hold down bolts is marked by counter sunk indentations during the manufacturing process to preclude possible error by the builder; a nice touch. First cut the bass wood leading edge pieces



place.

The wing panels of the Spectrum are things of beauty; the craftsmanship is outstanding. The control surfaces are pre-cut along the hinge line and require the builder to cut them away from the wing surface. Be sure to measure and mark both wings the same so that you don't end up with an oversize or undersize control surface. Cut away the control surfaces with a razor saw and square off the ends with a sanding block.



to length, glue them to the leading edges of the stab and after these are dry add the tip blocks. It is easier to sand the basswood leading edges prior to installing the tip blocks so that you have a harder surface to align the tips when rounding the outer edges.

Next, using the foam bed carefully drill the holes for the hold down bolts; be sure to make these as vertical as possible. I drilled mine on a friend's drill press to insure accuracy and a vertical hole. When you are finished with the bolt holes mount the stab on top of the fin and mark the location of the bolt holes on the top of the fin. I first marked the centerline on the top of the fin and this insures alignment. When you have drilled both holes trial fit the stab to insure alignment. Lastly install the blind nuts with epoxy in the top of the fin on the inside and mount the stab while these dry to further make sure things are straight.

Finish the stabilizer by first cutting or sanding the leading edge angle in the elevator. Mark the location of the control horn for the elevator at the center of the elevator; then check to see that the alignment with the slot on the fin is correct. Next cut a slot through the obeche and foam in the elevator for the control horn and then epoxy the control horn into

As with the stab, first cut the bass wood leading edge pieces to length, glue them to the leading edges of both wing panels and after these are dry add the tip blocks. Measure and mark the location of the control horns for the ailerons and flaps. Then cut the slots through the obeche and foam at the appropriate locations and then epoxy them in place.

I used the HiTec HS-80MG servos in the wings for all surfaces and found that I had to lower the floor of the servo pockets a little and this may be true for some other servos as well. The pockets come routed out for the Airtronics 94141 servos during manufacturing. I used a Dremel tool with the router attachment to increase the depth of the floors. If you use this method please be very careful and measure each servo pocket prior to routing out the pockets. I next cut 1/64" plywood for the floors and epoxied these in place. I use PCM from Hobby Lobby to install servos and it is a great silicone adhesive for installing servos that you may want to remove at some point. It also makes it easy to replace servos in case of damage without tearing up the wing.

On to the fuselage. Mark out the servo tray (which fits great for a change) for the servos and switch and then cut out the slots. Install the tray in the fuselage being sure to mark the height of the servo arms on the radio compartment opening. Next file or Dremel a couple of slots in the rear of the radio compartment for the control cable

housings. Install the control cable housings in the rear of the fuselage using epoxy and microballoons. The elevator cable is mounted on the top of the fuselage and the rudder cable is mounted on the left side about 1/2" from the bottom.

With the rear cable housings in place, pull the front cable housings taut one at a time and epoxy them into the slots at the rear of the radio compartment. When this is complete you can either use a couple pieces of packing foam to anchor the cable housings or dribble some epoxy along the cable housings on the sides of the fuselage.

Next make up the pivot assembly that actuates the elevator and temporarily install it in the fuselage and locate it to the elevator control cable housing in the fuselage. You will note that the angled portion of the top of the pivot rocker faces forward allowing a little more room to provide enough down travel. When you are satisfied solder the coupler onto the cable; then insert the cable in the housing. Hook up the threaded rod for the elevator actuation up to the pivot rocker in the top hole and the cable in the bottom hole. Using some epoxy and microballoons install the pivot assembly with the rod and cable attached. Finish off the fuselage by installing the wing rod and alignment pins. Then cut out the necessary holes for the radio wiring in the fuselage.

Finish the airplane as you desire. There are plenty of articles for the various methods of covering and finishing and I am sure you have found one that you are comfortable with. I generally use water based varathane on the wings/stab with a little paint on top for visibility and paint the fuselage down and dirty. I firmly believe in the five foot finish! Sometimes it even becomes the 10 foot finish, but at 1000 feet no on will notice.

Take your time installing the radio and do a good job of every aspect of installation as it may save you a plane in the long run. I used my JR X347 as usual and as a departure from the norm I selected a set of the HiTec HS-80MG metal geared micro servos for all the control surfaces. They are strong, small and light with enough stamina to handle most airplanes.

Flying the Spectrum

This is where the fun begins needless to say. The Spectrum launches like a rocket due to the smaller size and does not require a lot of flap with the tow hook at the location indicated in the instructions. I must admit that I had a couple of advantages when flying the Spectrum as I had a chance to fly the prototype prior to getting the kit. The prototype had an RG15 and was a little on the heavy side for my taste; but it flew like a dream (I was impressed). The S3021 version fits my style of flying better and I am a lot more comfortable with it; but that is my taste. Both versions are a lot of fun.

The flight test took place on a cold and windy day (wind chill 18 degrees) which would not normally be my choice for testing out a new plane, but the forecast options were not nearly as good. After a couple of test glides to check out the controls, it was up the winch. The first launch, with a light foot on the pedal, turned in astonishing results in altitude. A couple of clicks of up and things were set for the rest of the day. With the wind and mostly down air it was enjoyable to see a S3021 penetrating so well and moving around in search of some wave lift was easy. The design is very clean aerodynamically and it sure shows. I like the smaller airplanes and this airplane sure fits the bill. It launches super, it lands extremely slowly and it will even do reasonable aerobatics.

The Spectrum is available in three different configurations: two meter, open (104") and an unlimited version (116"). Coming in the future will be an electric version and who knows what else they will come up with to tickle our fancy. Of one thing I am sure, the Spectrum is a quality sailplane that flies super and is easy to build. ■

on the Wing

P.O. Box 975
Olalla, Washington
98359-0975

Jef Raskin's Max Plank

Jef Raskin is no stranger to the pages of *RC Soaring Digest*. His articles on slope aerobatics have provided information on the current state of this event, and have stimulated both thought and further discussion. Jef's aerobatic design, the Anabat 2, has been described and advertised in *RCSD*, and is available from Anabatic Aircraft. Recent correspondence from Jef included information about a modification of the Anabat 2 to a tailless design. Here's what Jef had to say about the resulting Max Plank design.

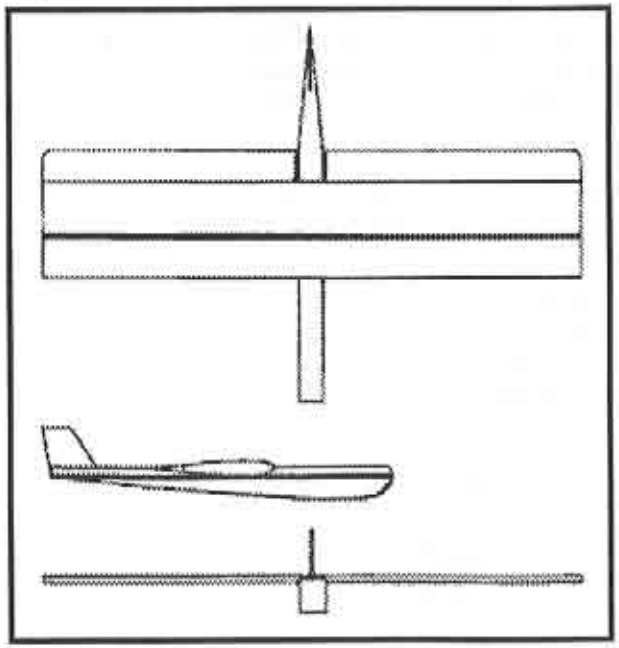
"My son and I have been enjoying a flying wing that we call the 'Max Plank'. It is small, with a span of 36", a chord of 8", and a rectangular planform. It uses aileron-elevator mixing at the transmitter and the usual elevon setup, and flies very well in a wide range of lift.

"This 'wing is hands-off stable. I made one for my 5 year old daughter as a free flight model. She tosses it around - even off the slope where we do R/C soaring - and it always quickly resumes straight and level flight, however bad the launch, so long as there is at least four or five feet of altitude.

"Anybody who thinks that a plank cannot be both very stable and very aerobatic should fly one of these. Rolls are very easy in the Max Plank by simply putting the stick hard over. With the elevons having 25% of the area of the wing and large throws (30 degrees), rolls make the 'plane look like a propeller. Loops are best at large radius, as pulling up too tightly results in a high-frequency oscillation of the airplane in straight ahead flight. This stops when back pressure is released.

"The day before yesterday I was out slope soaring my four channel Anabat 48 and my son Aza, now 9, was flying his Max Plank. I was working on spins (seeing how flat I could get them) and he was practicing landings. His first two landings were good, but on the third landing he slammed it into a rock outcrop with a crash loud enough to make everybody look. I was sure something was broken, but all that had happened was that one wing leading edge corner was pushed in about a sixteenth of an inch, leaving its flying qualities unaffected.

"Here are the coordinates of the airfoil for scratch-builders. Since it is symmetrical, only one surface is given. The coordinates have not been published previously.



"I designed the WE3008 airfoil by a long string of gradual improvements. A number of fliers have built flying wings with this airfoil, some planks like mine, most of them with taper and/or sweep. They have all flown well.

"The airfoil is the same symmetrical WE3008 that I use on my Anabat line of slope soarers, so its inverted performance is as good as its upright performance. This section is 8% thick with no camber; as for any symmetrical section, the pitching moment is zero and the zero lift angle is 0 degrees. In practice the elevons are very slightly reflexed. Beginners use a further forward C.G. and more reflex, more expert fliers move the C.G. back and use almost no reflex.

"It is easy to turn an Anabat 2 kit into one of these wings. Just cut off the fuselage 10" behind the trailing edge of the wing, taper the rear portion of the fuselage, attach the fin at the top of the end of the shortened fuselage, eliminate the stabilizer, and place the two servos side-by-side to operate the ailerons as elevons.

"I can build a Max Plank in about three hours. Like the Anabats, it is nearly indestructible. It is also very convenient to carry to the field since it will fit on the ledge behind the back seat in most cars without any disassembly. Actually, it is impossible to disassemble since it is built in one piece. The Max Plank has become my standard 'plane-that-is-always-in-the-car', and I feel free to try to fly it almost anywhere."

The Max Plank is a rugged, inexpensive, easily built 'ship for slope flying. Whether you are a newcomer to the slope or an advanced flyer looking for something a bit different, the Max Plank should serve you well.

Anabatic Aircraft, 8 Gypsy Hill Road, Pacifica, CA 94044. ■

WE3008

X	Y
0.000	0.00000
0.001	0.00326
0.002	0.00461
0.003	0,00564
0.004	0.00651
0.006	0.00796
0.008	0.00918
0.010	0.01024
0.012	0.01120
0.015	0.01249
0.020	0.01436
0.025	0.01598
0.030	0.01743
0.035	0.01875
0.040	0.01995
0.050	0.02211
0.060	0.02400
0.070	0.02568
0.080	0.02719
0.090	0.02857
0.100	0.02982
0.120	0.03200
0.140	0.03384
0.160	0.03538
0.180	0.03666
0.200	0.03771
0.220	0.03855
0.260	0.03964
0.300	0.04000
0.350	0.03944
0.400	0.03771
0.450	0.03478
0.500	0.03162
0.550	0.02846
0.600	0.02530
0.650	0.02214
0.700	0.01898
0.750	0.01581
0.850	0.00949
1.000	0.00000

Catchin' Cold or Hand-Launch Topics

...by Scott Smith
2 Sugarpine, Irvine, CA 92714
(714) 651-8488 evenings after 7:00 PST

Southpaws

Wes Deetz of Wantage, New Jersey, throws down the gauntlet for right-handed pilots with: "Do you know that left handed pilots have an advantage in hand launch? Well, it's true! We all fly with our right hand because the transmitters are made for right handed pilots. This means we can launch, catch and relaunch much faster than a right handed person."

He's probably right; I've seen Joe Wurts use his technique with great effect.

Of course, right-handers can switch the gimbals if they're interested.

One or Two Fingers?

Dr. Norm says that the conventional finger hole has a problem in that only one finger can transmit throwing pressure. He claims that the finger will yield slightly at maximum force thereby losing launch speed.

He says he gets more power in his launches by providing a throwing tab on either side of the fuselage. Now, the throwing thrust can be transmitted through two fingers instead of one; he says it helps him get higher launches.

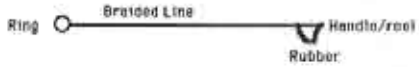
The problem with the tabs is that they stick out and cause drag. He's trying to figure out a way to have the tabs retract automatically.

Alternative Launching Methods

I promised I would address Kenneth Griffith's question about alternative launching methods. These divide into two areas: launching assists that are fixed in the ground and those that can are mobile.

The most common fixed launching aid is the small high-start. Make from 1/4" rubber tubing or smaller (rubber bands looped together have been used successfully), this can be made to launch a hand-launch to virtually any height. Unfortunately, the high-start is cumbersome to set up and move, and would be unwieldy in a contest.

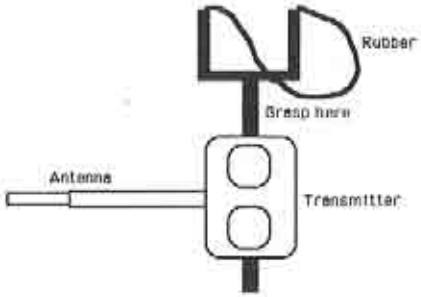
By having an assistant hold the "stake" end, the "high-start" can now be moved. Indeed, if the assistant runs, the high-start becomes a tow-line. For a tow line, make the rubber length only 5 feet or less; it only needs to act as a shock absorber to keep the ring on the towhook.



I've found that if the rubber is limited to 5 feet with the fixed length line at 75 feet, this arrangement will launch the glider to 80 feet.

I've run a couple of contests in which the above towline was used. Unfortunately, I found that too much labor was required. Not only did the pilot need a timer; he also needed a runner.

What is needed is a launch-assist method that can be moved easily that can be handled by the pilot alone. One possibility is the sling-shot. This can be attached to the back of the transmitter as shown.



After launching, the entire arrangement is rotated clockwise 90° and normal flying continues.

This might require smaller sailplanes to get the desired launch height. This brings up all kinds of interesting possibilities: a new contest class with a 3 foot wingspan limit in which shape-memory wire is used instead of servos. 6 ounce sailplanes? Think how easily this would fit in your car or backpack. Hmm, interesting possibilities.

Hmm... New building materials, new airfoils... Could be interesting.

Hmm...

Oh heck, throw the dang thing. ■

Howling Coyote 3 Night Fly Contest Report

...by Frank Deis
(Bob Avery Photos)
Pikes Peak Soaring Society
2680 Fairway Drive
Colorado Springs, Colorado

PPSS's Howling Coyote Night fly on the weekend night nearest the new moon in August has become a favorite with both members and their families. If your club wants to try night flying there is a full description on page 40 of the December, 1991 issue of RCSD .

Last year's Howling Coyote 2 enjoyed perfectly calm weather conditions. The longest flight occurred about 10:30 and was just short of 11:00 minutes. We got a 5 knot tailwind later in the evening and a 10 knot headwind wind shear at about 300 ft. Launching down wind and then hitting a head wind wind shear was pretty interesting in the dark. The Sky was cloudless and the Milky Way was beautiful and frequently slashed by meteors. The only problem we had was that the sailplanes slowed down when going upwind to the point that the lights stopped moving, blended in with the stars and disappeared until you turned cross wind. Nearly everyone made the three flights for 15 minutes total. In fact, we had a tie for first place and had to decide the contest with a sudden death fly off about midnight! Howling Coyote 3 will have to go some to match that.

The third, apparently annual, HOWLING COYOTE NIGHT FLY was held at the club field the night of Aug. 14. Dave Kurth picked the date last January based on the occurrence of the new moon. (It must be perfectly dark for night flying. You cannot risk moon blindness.)

Colorado weather is very tricky and it is at its trickiest on summer evenings, so weather conditions were a major concern this year. We arrived at the field about 5:00 pm to find a picnic dinner and the wind at a gusty and turbulent 12->15 knots. The winches were in place by 6:00 pm and, as hoped, we enjoyed a rewarding evening flying session that saw flight times hovering in the 8 minute territory. The wind diminished steadily (along with the hot dogs, chips, baked beans, potato salad and lemonade) to near dead calm about 7:30 pm.

As dark approached, we struck the picnic and prepared the sailplanes, winches, landing area, etc. with the necessary Cylum lights (chemical light sticks) and got ready to fly. At 8:00 pm the wind instantly jumped back up to 12 knots and scared off several would be Howling Coyotes leaving seven hardy (fool hardy?) souls willing to fly in the dark. With the small number of fliers, we agreed to hold a contest instead of just a fun fly. So, once again we were flying "3 flights for 15 minutes in the dark"!

With the wind at 12 knots and full darkness setting in about 9:00 pm, Dave Kurth zoomed into a dark and cloudy sky for the first flight. He logged a short 2:08 flight given that he is a two time winner of the Howling Coyotes. Jimmy Shoon flew next and logged a similar flight. Bob Avery, Murray Lane, Mike

Installing lights on the wing tips.

Score keeping at a night fly - Jimmy Shoon and Greg Tarza.

Bob Avery ready to fly.

Bob Avery installing the belly light.

The traditional Coyote Howl to appease the GHC for good luck next year.
(L-R) Bob Avery, Mike Fritz, Frank Deis, Jimmy Shoon
The winners for the trophies.

Fritz and I all logged flights approaching four minutes. Barry Welsh provided the first round excitement with a wing bending launch of his Gentle Lady, and early pop-off followed by 48 seconds of some of the wildest flying you have ever seen - or not seen. Remember, it was dark. He safely landed and decided to sit out the second round!

The wind dropped to 8 knots, the clouds began to disperse for the second round and the scores all hovered near four minutes. Murray Lane, filling the void left by Barry, provided a chilling flight and the necessary excitement for the second round. After a smooth launch he sensed that the airspeed was too high and began to feed in the up trim. Soon, the sailplane was at

Spectating at a night fly.

launch altitude, stalling violently out of control and blowing downwind! Murray, unable to recover from the stalls, had the presence of mind to invoke the standard solution to such problems... He set the trim back to the right position, took his hands off the transmitter and let the sailplane straighten itself out! (Some techniques do not change after sunset.) He regained control at about 50 feet of altitude and way down wind. He nursed the sailplane back toward the field but landed short of the fence for the first ever off field Howling Coyote landing. Then, he promptly lost his aforementioned presence of mind, shook noticeably - even in the dark, and began to question the wisdom of flying in the third round!

The wind dropped to 5 knots and the sky was cloud free for the start of the last round. The wind was nearly calm by the end of the round at 11:00 pm. If you have never soared against a background of the Milky Way divided by an occasional meteor streak you have really missed an experience. The conditions were nearly perfect! Murray regained his composure and logged the first flight over four minutes. Mike Fritz was in the groove with a spectacular zoom launch, as good as any in the sunlight! As the calm returned, so did Barry and his Gentle Lady. He put in two more quick and spectacular flights that were carbon copies of his first one. He discovered the next day he had cracked the main spar. Under launch loads, the wing would bend and twist causing a tip stall condition and very exciting launches. On the last flight he stalled his way to a crash that popped the wing off but did no damage otherwise.

No one made the 15:00 cumulative time although I came close at 13:33 thanks to the longest flight of the night at 5:52 seconds. Bob Avery and Jimmy were the only ones to get landing points for being inside the LSF Level I, 3 meter radius. First prize (night fly CDs are not eligible) went to Mike Fritz, a recent transplant from Michigan to Colorado Springs. Not bad for his first ever Night Fly experience. Second place went to Bob Avery, followed by Jimmy Shoon, Murray lane, Dave Kurth and Barry Welsh. Carefully selected trophies, symbolic of the Third Howling Coyote Night Fly, were presented and the requisite pictures were taken as the winners supplied the now traditional Coyote Howl demanded by the Great Soaring Coyote (GSC is the patron god of all night fliers) lest she provide you with "exciting night flights" in Howling Coyote 4. (If you think I am fooling just ask Murray or Barry if they howled properly last year!)

Once again, in defiance of natural law and thanks the GSC, no sailplanes, no people, no cars, no trees, and no fences were damaged, although the latter were threatened a time or two.

To my knowledge, PPSS is the only club that undertakes this event. Either we know something no one else does or everyone knows something we do not.

Kind of makes you say, "HMMMMMMmmmmmmm!" On that sobering note, I will say "HMMMMMMmmmmmmm," until Howling Coyote 4!!! ■

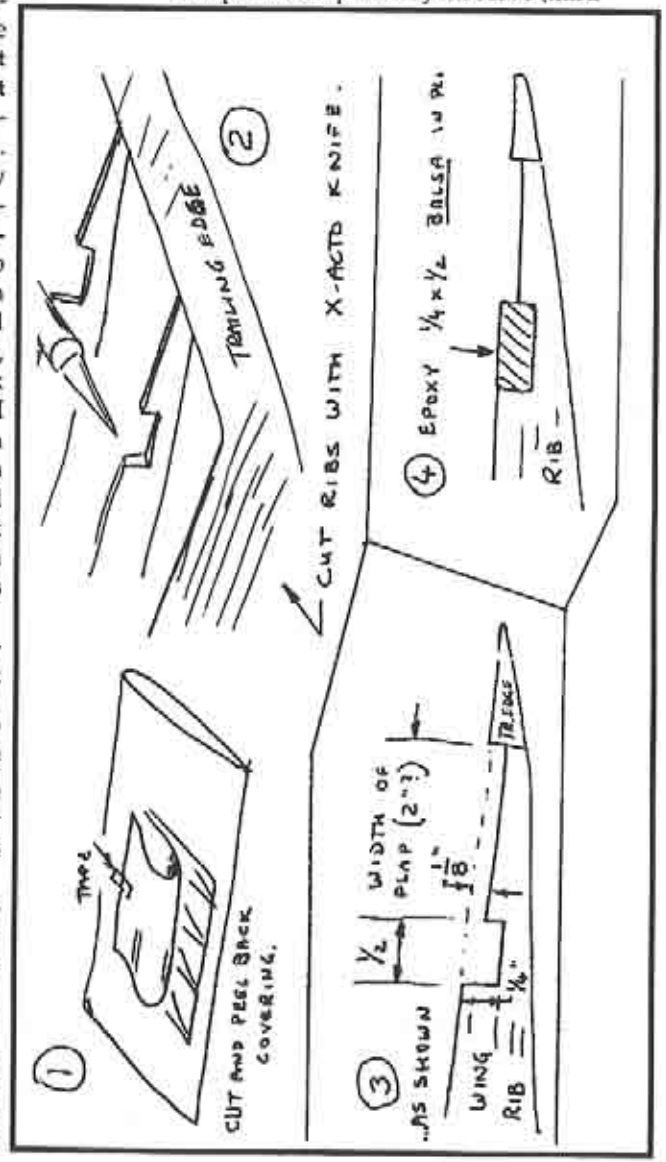
Poor Man's Crow

...by George Siposs
Costa Mesa, California

I have recently purchased somebody's crashed Paragon. (They break their wings on the winch very easily.) I repaired it with a hardwood rod between the original spars. It is very strong now and flies well, of course. The plane has spoilers on top of the wing, but because it is a "floater" the spoilers have little effect on the glide angle. Not enough anyway for pinpoint accuracy in landing. I wanted flaps that slow the plane down, yet maintain control for spot landings. There are many flap systems, but most of them are cumbersome and heavy, with bellcranks, pushrods, horns that stick out in the breeze, etc. I wanted simplicity and a little weight. The system described is just that and can be retrofitted to most conventional construction (i.e., rib and spar) wings (Gemini, etc.).

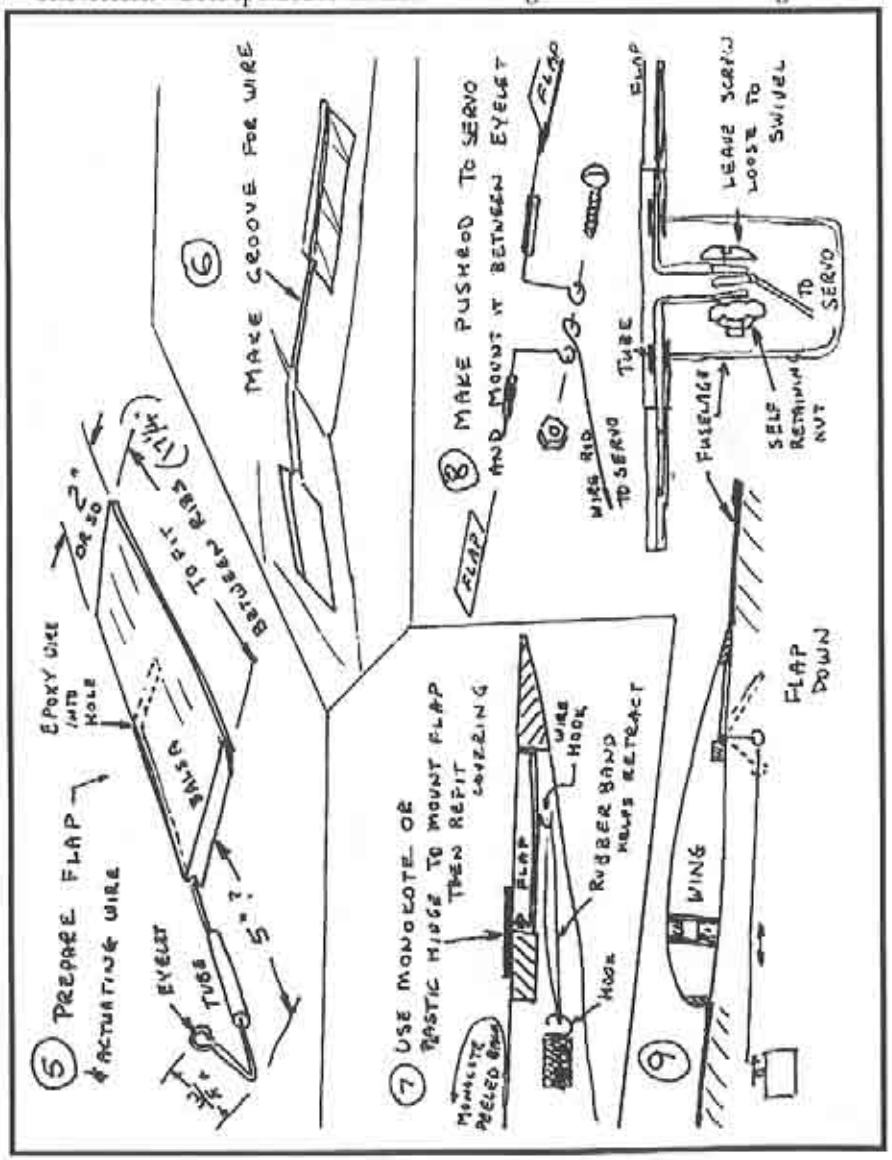
Basically, the flap surface is a balsa sheet about 2" wide by 1/8" thick, and in my case about 17 1/4" long, so I could get two of them from a 36" long piece of balsa. You can modify your according to the plane you have.

Actuation is by a simple 1/16" diameter steel wire which is basically in torsion. One end is bent at a 90° angle and stuck into a pre-drilled hole in the edge of the flap. The other end is bent down to form an actuating arm under the wing center inside the fuselage. An eyelet can be bent at the tip of the inboard arm or a plate soldered on and a hole drilled into it. Each flap has to have its own actuating wire. They are then connected together in the center with a screw (#4 - 40) and self-locking nut. Between the two actuating arms is a long pushrod that goes up front to the servos. when this pushrod is pulled by the servo (third servo in the plane - thus even inexpensive radios can be used), the flaps are pulled down. The same servo can pull the string to the spoilers to actuate them simultaneously with flaps. Thus, "crow".

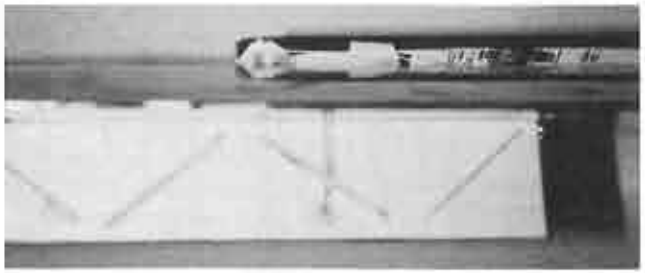


For a hinge, you can use a self sticking plastic hinge, or the monokote covering itself if you are careful about not shrinking it too much.

The torsion wire is epoxied to the leading edge of the flap. (You can make a groove in the balsa.) It then leads towards the center of the wing. You may even want to have a loose-fitting brass tube bushing around it (Put it on the wire before bending.) at the point where the wing meets the fuselage so that when the rubber bands press the wing down, the wire is not gripped but remains freely rotating. If the center of the wing is balsa-



Flap deployed. View from the rear.



Flap and spoiler deployed. View from the rear. Note the diagonal braces that prevent warping and the rubber band to help retract the flap.

Full "crow" as seen from the front.

The flap actuating arms connected to the actuating wire. This is under the wing, inside the fuselage. Black stripes are covering over the wire arm recessed in a groove that leads to the flap. The white plastic tube on left contains the string which pulls the spoilers open.

sheeted, you may have to route a trough in it for the wire. The whole thing operates almost without friction.

I cemented diagonal braces in the inside of the flap to prevent warping. I also cemented little hooks on (two per flap), so that rubber bands can be used to facilitate retract although the servo actuated arms push the flaps back very well.

Now, with spoilers on top and flaps on the bottom, I have good control. It is like "poor man's crow". You can do this modification on your own planes, even small models. It is so light and simple.

When flap only is actuated, a slight elevator down correction is required. When flap and spoiler are hooked up to the same servo arm (i.e., full "crow"), the plane sinks gently and controllably without the need for any elevator correction. Try it! You'll like it!.

P.S. The actuating loops can be of different lengths hooked over a screw or a servo arm so that a 45° movement of the flap is actuated first; at 90° movement, flap and spoiler are deployed. It works very well, and uses one servo. ■

NASSA News

A Call for Justice

...by Gene Cope

I'm compiling information on scale R/C soaring judging and have come up with the following outlook on the tasks. Let me pass them on to you and please feel free to let me know what you think.

What requirements for scale should be expected of an entrant of a scale rally, fun fly, or competition? The term "scale" means an exact copy of a real full-size glider/sailplane or power plane. The question is, "To what degree is the true scale enforced?"

A few modelers build precision scale and enjoy the challenge, but for the majority of flyers stand off scale is close enough. Then there are a few that stretch the stand off scale to the point of, "Well it sorta looks like whatever it is." At a minimum for scale, a 3 view of the plane and a picture of the plane represented should be standard.

The degree of scale should be relaxed so wing area can be increased as long as the profile does not change and realism is not lost. An example would be a fuselage slimmed down to a stick so as to be 2 dimensional, an exaggeration, of course. Yes, the frontal area on some aircraft require thinning but not to the degree of being unrealistic. In the end, the plane should match the picture.

Stand off scale should also require a 3 view and picture of the ship being represented. At a distance of 15' the glider or sailpane should show what a full-size would be at 60'. That is, the lettering or decals such as flags or factory markings should be the same. The ship should not deviate in profile but wing area can be relaxed as long as the profile does not change. A lot of high aspect ships have slightly wider wing chords so as to increase wing area. The cockpit area should not be considered except for shape. Again, what the picture shows is what the sailplane should look like.

Precision scale is not required in AMA for sport scale sailplane, however the roll of precision scale is growing in the sport and should be encouraged. Precision scale is an exact copy of a full-size sailplane or power plane down to and including the cockpit area. Realism is what counts. The vintage ships should have their own class separated from the all glass sailplanes of today and should not be in direct competition with each other.

So now we have 3 classes: vintage, modern, and power slope, with stand off and precision scale in each.

Size, too, will play a factor in scale performance. **That is, the bigger they are the better they fly.** A vintage ship has its own flight restrictions as does the modern glass ship, so the scale size of the ship should be taken into account in flight requirements. In power slope there's a size that requires so much wind to keep aloft that you're leaning at 45 deg. into the wind just to stay put. Flying of this size is hard due to the lack of appropriate weather. A good 15-30 mph wind is not uncommon but a 50-60 mph is rare.

In judging flight performance, the glider, power plane should perform the maneuvers of the ship represented. That means that if the ship was not rated for aerobatics it should not do loops, spins etc., even if the model is capable of such flight. This is for judging purposes only.

Air time should be a multiple of flights to attain a set duration. This duration time should be based on size and class. Almost anything will fly in slope lift, but go to thermal flying and the change is dramatic. Small ships with high wing loadings are at a loss. If there is any wind most small ships can't range to find thermals, and those with large frontal surfaces just can't penetrate.

Then there are the landings; I've been to several full-size sailports, and have yet to see a large circle drawn on the field

Eric Eiche shows off the size of his OBS. Eric says he will enter the OBS in scale at the WSJ.

Super nice shot of Ray Franz DG 600 1/3 scale. Note the plug-in winglet he has added. Says the work is fantastic. WB

to land in. So, for landings the glider should make a smooth approach and land on a runway of say 30' x 100' and come to a rest within its boundaries.

This leads to a search for what is the best idea for judging and flying scale sailpanes and power slope. The scale may range from 1/10 to 1/3 with 3 classes: vintage, modern, and power slope. They will be divided in two categories: stand-off scale and precision scale. However, this may not be a practical situation, but to class a vintage built from scratch against a modern "out of the box" glass ship is what I would consider a misjustice to the sport of R/C scale.

I hope that in years to come scale soaring will still have the enthusiasm it does now. NASSA is currently providing a base for scale to grow from and seems to be established by support of the soaring public. If you're interested in supporting scale, contact NASSA at P.O. Box 4267, W. Richland, WA 99352. Cost is $10.00 per year.

As I stated in the beginning, I'm collecting your ideas as to what you expect of scale judging. Please send your comments to Gene Cope at 3203 1/2 Main St., Union Gap, WA 98903. Your help will be most valuable in developing a format that will help scale grow in our hobby.

Austria SHK - also unusual scale subject. WB

TG-3 on tow. Would make a great scale subject. WB

Low-Speed Airfoil Design and Wind Tunnel Testing for Model Aircraft at the University of Illinois at Urbana Champaign

...by Wil Byers

As stated elsewhere in this magazine, Michael Selig is again searching for a group of experienced modelers to build a variety of airfoil wind tunnel models for tests. These tests will be conducted at the University of Illinois at Urbana-Champaign (UIUC).

Think about it NASSA fans and scale soaring enthusiasts. This is a chance for you to support a US program that will help us develop more and better airfoils for scale soaring model aircraft. It is a program that has a specific goal of testing airfoils at Reynolds numbers of 60K, 100K, 200K, and 300K. If you think about these values for a moment you will most likely realize that scale model wings fall mostly within these ranges. Quite possibly one scale subject would have Reynolds numbers that fall within all of these ranges as the chord length changes down the span of the wing.

So, if you want to know how a Ritz, a Quabeck, a Wortman, a NACA, an Eppler, or even a full scale airfoil stacks up against those we are currently using, this is your chance. The more test sections we can provide for testing the more test data that will be generated. And, that means that scale soaring will grow and prosper by the results.

NASSA hopes each and every one of you will make some kind of effort to support the Wind Tunnel Testing Program. We also hope you will support generously the program with your contributions. They will certainly not be wasted. ■

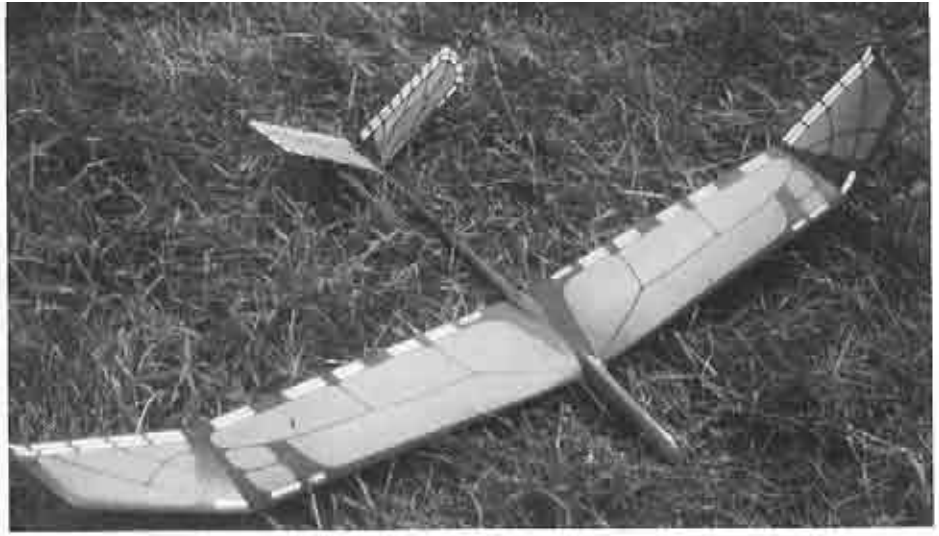
The LSF Nationals

Alan Schwerin photos
Lake Charles, Louisiana.

"Luther Mitchell travels with his workshop. From paints to glues, irons, chargers, covering, composite fabrics, wood, and even cold drinks and meals, this haven of delights was the focal point for much of the contest. If it was not there, it probably did not exist! Oh yes. There were planes to spare in the truck, as well!"

"Departing from the traditional use of line retrievers, the organizers of this year's LSF Nationals resorted to golf carts and youngsters to return the 'chutes' to the winches. The system worked excellently, with few delays due to problems associated with the winches, or their lines. After launching, the winch master simply taped the lines down to the turnaround, where the 'chutes' were collected and brought back to the winches."

"Take your eyes off the plane, or lose sight of it momentarily, and this is what could happen. Charles Baltzer lost his 2m plane in the haze that surrounded the field, only to discover later that it had collided with the runway near the turnarounds. Built with blue foam, Charles used obeche on the wings, and placed six staggered layers of glass cloth over the center. This lay-up produced an exceptionally strong wing. After the crash, the center section was stress-tested to destruction, failure occurring only a little after more than 100 lbs. were placed at the center of the wing!"



"Arguably the most impressive ship at the contest, with its polyhedral, heavily modified SD7037, and light weight fiberglassed fuselage, the balsa over white foam Monarch butterfly - oops, hand launch sailplane, generated a good deal of interest, both on and off the ground. The stain and dark marker pen with white-out yielded a beautiful pattern, both above and below the wings and stabs. While V-tails have notoriously poor roll rates, the Monarch appears to have conquered that problem. This is due, no doubt, to the use of a larger than normal stabilizer, with its ruddervator taking up some 40% of the stab area."

"Even though the temperatures were mild, and the humidity low, a full week of competition does take its toll on the pilot, let alone his planes. With pilots assembling at 7:00 a.m. and at times flying six rounds that end only around 5:00 p.m., assisting with the winches and helping out with timing, it is imperative that one paces oneself through the contest. Tired bodies and depleted minds yield mediocre flights, irrespective of the months of preparation for the contest."

1993 Soaring Tangerine

...by Jim Smith
Orlando, Florida

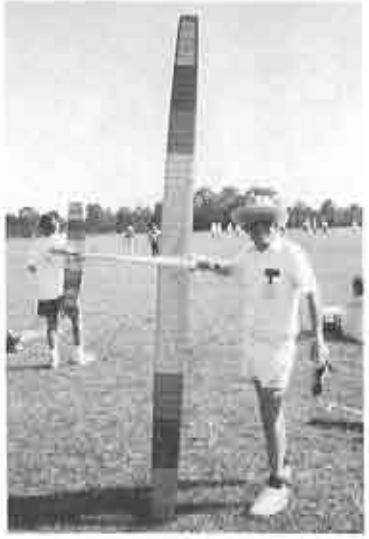
This year marked the 20th Annual Soaring Tangerine contest spanning the three days following thanksgiving. This is the longest running annual soaring event in the US that includes one day of 2-meter and scale, and two days of unlimited soaring.

Plaques were awarded to five places in each day's event in both expert and sportsman classes. One third of the contestants came from outside Florida with middle east coast states well represented.

Two sets of Rahm winches and retrievers

Nelson Montgomery

Scale (L - R) Lee Montgomery, Julius Wagner, Tom Beckman



Frank Cox

(L - R) Tom Beckman, Jarrod Wilson, Lewis Gray, Martin Brungard, Anna Glaab, Jerry Ziegenfuse, Terry Fallon
(Kneeling) Bryan Smith, Josh Glaab, Cal Bice

Unlimited (L - R) Lewis Gray, Martin Brungard, Mike Lachowski, Tom Kiesling, Jerry Winkler, Scott Hunt, Mike Williams, Josh Glaab
(Kneeling) Jerry Ziegenfuse, Dennis Simmons, Fred Rettig (Cornfed)

were used for the contest with a one hour maximum round window, open winch format. Frequency usage was well distributed with no more than 4 fliers on the same frequency that worked well with the open winch format. Winches were kept active throughout the round and sandbagging minimized with some CD prodding.

Jim Smith CD'd Friday's 2-meter event with temperatures in the 80's, 20-25 mph winds, and intermittent misting showers.

The event drew 54 contestants that flew 5 rounds of 7 minute duration with 60/30 bulls-eye landing. The most popular gliders were Bryan Agnew's Banshee and Frank Weston's Two.

Five planes were entered in the scale event and three flew to trophies. Lee Montgomery placed first with an SB-10, Tom Beckman flew a beautiful Reiher to second place, and Dave Elias placed third with a Kestral 19.

The weather cleared for Saturday's unlimited event with light breezes and temperatures in the 80's. Julius Wagner CD'd the meet where 61 contestants flew 7 rounds of 7 minute duration with bulls-eye landings. Lift was light and sporadic where max's were hard to come by.

A cold front blew through from the west for Sunday's unlimited event with clearing skies, temperatures in the 60's and 15 - 20 mph winds. 57 contestants flew 6 rounds of 5 min to 9 min tasks CD'd by Ed White. Good thermals were blowing through, but it was difficult to consistently max.

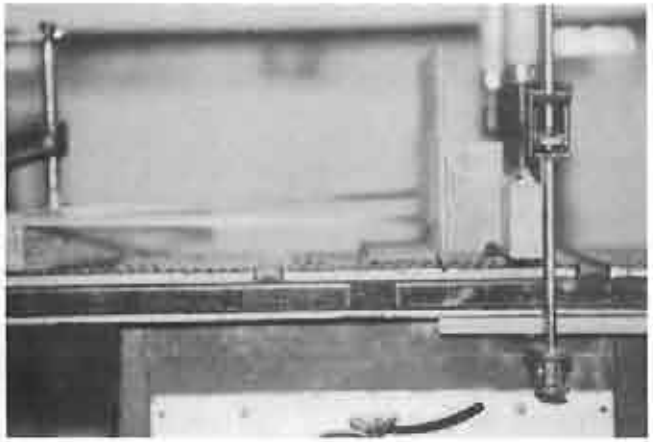
The most popular gliders in the unlimited events were Falcons and Magics, with a spattering of Super V's, Spectrums, Thermal Eagles, and Genesis'. Two Sailairs and a 120" Hobie Hawk rounded out the vintage entries. ■

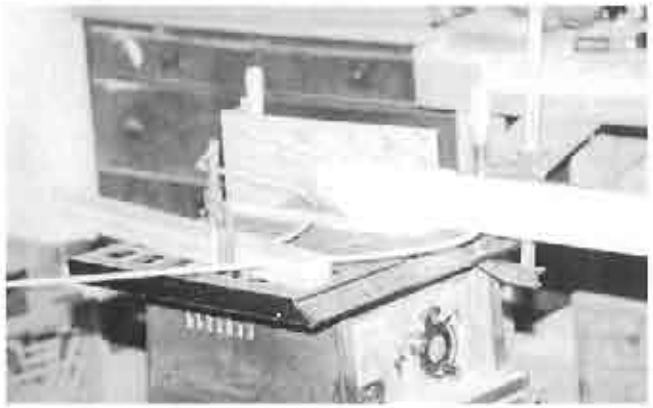
Balsa Trailing Edge Preparation

...by Stephen Savoie
DownEast Soaring Club
RR #3 Box 569
Gorham, ME 04038
(207) 929-6639

A few years ago the DownEast Soaring Club put together a club plane (DSC1) designed around the lines of the Southwind. Ken Baker, the Club's founding President showed us a quick, simple way to feather the last 3/4" of the 1/16" balsa sheeting to form a nice sharp trailing edge for the SD7037 airfoil.

Believe it or not, we beveled the trailing edge balsa sheets for the 11 wings in about 5 minutes with a standard 8" table saw. I have since used this same method for several other projects, including 1/32" balsa for stabs and a rudder. I use is a very thin 40 tooth Makita 81/4" carbide blade that is angled at about 3 degrees to give a 3/4" bevel.





This jig is made from 1/4" plywood and a length of 2x4. The jig is clamped (see illustration) to the saw and several lengths of thin spruce keep the balsa sheeting pre-loaded against the vertical guide (fence) during cutting.

A few practice cuts and adjustments are needed to get everything dialed in, but once that's done a 36" length of sheeting can be beveled in less that 15 seconds. I normally use this method to bevel balsa when I have a lot of trailing edges to cut (10 were recently cut for a 144" Catalina). It is very easy with this method to make the trailing edges so sharp that they can't be used. In fact, I once cut 1/32" balsa so thin the last 1/4" was just about translucent. Give it a try, you'll never sand another trailing edge again. ■

LIFT OFF!

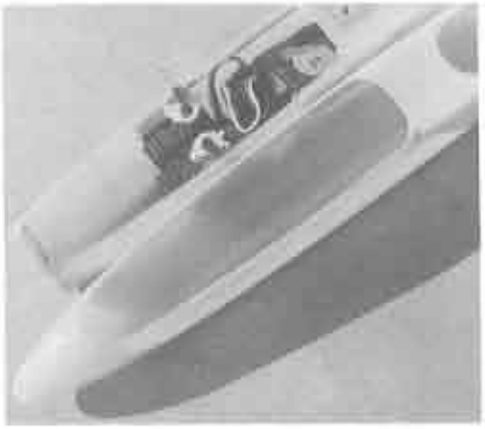
...with Ed Slegers
Route 15
Wharton, New Jersey 07885
(201) 366-0880 - FAX (201) 366-0549
9:30 AM - 5:00 PM (Closed Sun. & Mon.)

Electric Handlaunch Conversions

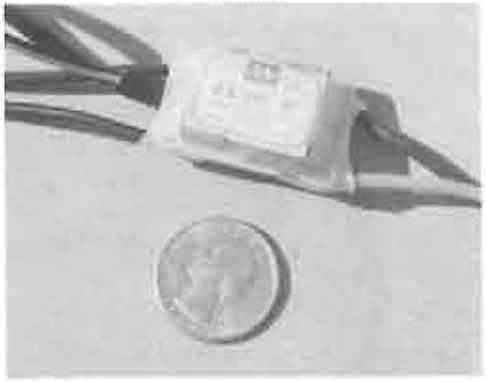
On a recent visit with me, Rudolph Freudenthaler (see Dec. *RCSD*) flew a Vertigo handlaunch and commented that it would make a good electric. At the time I didn't think much about it, although electrifying a handlaunch has always been in the back of my mind. Then, I received the latest issue of *Silent Flight* from England which had an article on electrifying small airplanes using the Speed 400 series of motors. That got me thinking about what Rudolph had said, so I called him to discuss what he would recommend as far as motor, prop and batteries to electrify the Vertigo. He recommended the Speed 400 7.2 volt motor, a 6x3 prop on 6 or 7 cells. One of the things that has always stopped me from electrifying a handlaunch was the size of the speed controllers that I am familiar with, most being too large. Here again Rudolph had the answer. He said he had a speed controller that is a little larger than a quarter (see picture) that was designed for up to 20 amps. This speed controller has a soft start, BEC and a brake. It also weighs .8 ounces.

I ordered a few motors, props and speed controllers from Rudolph and while I was waiting for them to arrive, I received the first batch of fiberglass replacement fuselages for the Vertigo. The fiberglass fuselage for the Vertigo is almost round in the nose section making it ideal for a firewall to be installed to mount the motor to. This was almost too good to be true.

Having never seen a Speed 400 motor I still wasn't sure if it would fit. My order



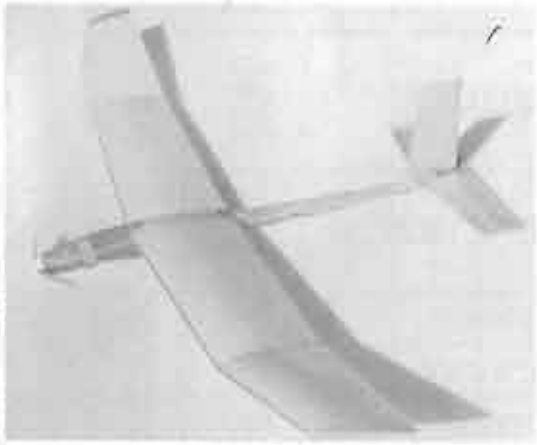
Fuselage



Size of controller

finally arrived and as luck would have it, the motor fit perfectly. The first thing I did was to measure and cut off the nose of the fuselage. I then made a firewall out of 1/16 plywood and mounted the motor and spinner. Not knowing if this project was going to work, I took an old slightly damaged wing (leading edge hit a tree) and mounted this to the fuselage. To get the plane in the air quickly I cut out the stab and rudder from 3/32 balsa and CA'd this to the fuselage. The project didn't take much more than an evening as I wasn't interested in a finely finished airplane because I wanted to see if it was going to fly first.

After a few days of some very bad weather it was time to fly the electric Vertigo. As with any new project, the first flights, not really knowing what's going to happen, can be exciting. In the case of the Vertigo Electric, there were no bad sur-



Electric Vertigo - Yes! In the snow!

prises. The plane flew almost perfect. The only adjustments made were to the CG and a little bit of down trim had to be added to the elevator. As a matter of fact, the plane flew better than I had ever hoped for. Sometimes this is not always the case. I have spent many weeks and have made many different combinations of wings, tails, fuselages, etc. and wound up with a plane that was less than satisfactory, but in the case of the Vertigo it was almost perfect from the start. I would like to say that it was skill, but it was mostly luck that it worked out so well. I wish I had made one sooner.

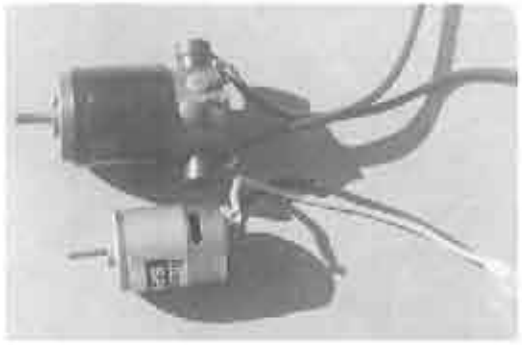
An advantage to electrifying small planes is the cost factor. For example, electrifying the Vertigo involved the following costs: motor about $15.00, SR battery about $35.00, and the speed controller approximately $50.00.

The electric conversion of the Vertigo is one of the most enjoyable projects I have done. I am now in the process of building another one. I will pay more attention to fit and finish on this one. I am also going to try a geared drive Speed 400 and will let you know the results of this. If any of you readers have tried electrifying small planes, I would be interested in the results, or if you have any questions about this project, give me a call.

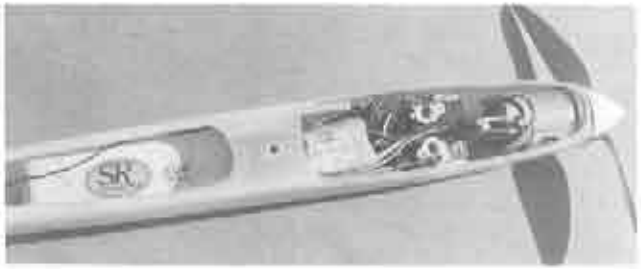
Some of the specifications are:

Motor and prop assembly	3.8oz.
Speed controller	.8 oz.
Battery	4.8oz.

Battery size comparison



Motor size comparison



Complete view of plane

These weights plus the Vertigo air frame weight gave a total ready to fly weight of 19.5 oz. Not bad, as some handlaunch gliders weigh that much non electrified.

Good flying! ■

WSJ EVENT SCHEDULE!		DATE	28-May	29-May	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	5-Jun	6-Jun	SOARING
DATE	LISTING OF EVENTS	TOTAL COST	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	EVENT CDs
28-May	SLOPE SCALE FUN FLY	$10	X										MIKE MELLOR
28-May	THERMAL NOVICE DAY	$10	X										GARY ANDERSON
28 & 29 May	THERMAL UNLIMITED	$30	X	X									FRANK WHEELER
29-May	BANQUET - PRESENTATION PROF DR. MICHAEL SELIG	$25		X									PROF. DR SELIG
29-May	SLOPE FUN FLY	$10		X									MIKE MELLOR
30-May	SLOPE RACE NOVICE	$10			X								JOSEPH CONRAD
30-May	THERMAL TWO METER	$20			X								ERWIN LEDAT
31-May	SLOPE RACE UNLIMITED	$20				X							JOSEPH CONRAD
1-Jun	THERMAL STANDARD	$20					X						SCOTT CARROLL
1-Jun	F3B CHAMPION JOE WURTS PRESENTATION	$2	DONATION				X						JOE WURTS
2-Jun	SLOPE RACE 60 INCH	$20						X					JOSEPH CONRAD
2-Jun	THERMAL X-COUNTRY	$20						X					MIKE BAMBERG
3-Jun	THERMAL F3J	$20							X				GARY ANDERSON
3-Jun	BATTELLE AUDITORIUM DR. EPPLER PRESENTATION	N/C							X				DR. GARY MCVAY
3-Jun	SCALE JUDGING - EVENING	N/C							X				GENE COPE
4-Jun	DR. EPPLER PRESENTATION THEN EVENING SOCIAL	$15								X			DR. EPPLER
4-Jun	THERMAL HAND LAUNCH	$20								X			ROBIN ROBINSON
4-Jun	THERMAL SCALE	$20								X			GENE COPE
5-Jun	P.S.S. FUN FLY	$10									X		SCOTT CARROLL
5 & 6 Jun	THERMAL F3B	$30									X	X	PHIL RENAUD
1-4 Jun	EVENING VENDOR SHOW	N/C					X	X	X	X	X		VENDORS
	RECORD TRIALS	$10	BY ARRANGEMENT WITH CD										GARY ANDERSON

Low-Speed Airfoil Design and Wind Tunnel Testing for Model Aircraft at the University of Illinois at Urbana-Champaign

(This letter was sent in by Prof. Michael Selig and at his request is printed in its entirety. Michael says, "If this is going to succeed and be on-going we are going to need lots of support. Wish me luck!" Good luck, Michael! ED.)

We are searching for a group of experienced modelers to build a variety of airfoil wind tunnel models for tests at the University of Illinois at Urbana-Champaign (UIUC). A low-speed, low-turbulence wind tunnel has been instrumented to take lift and drag measurements on airfoils at low speeds over the Reynolds number range from 60k to 300k. The scope of the airfoil wind tunnel tests will be limited only by the number of wind tunnel models provided and the amount of funding received. Hopefully, the proposed modeler-supported airfoil test program will become self-sustaining. Your support and help of any kind will be acknowledged in reports on the project to be published by Herk Stokely in "Soartech". We plan to publish the results through "Soartech" frequently - possibly twice a year.

A similar undertaking (with substantial support from modelers) was started by Michael Selig, John Donovan, and the late David Fraser in 1987 at Princeton University. In a two year period, over sixty low-speed airfoils were wind tunnel tested, involving over 1200 hours of wind tunnel test time. The results were published in "Soartech 8" in 1989, and many of the new airfoil designs produced and tested during the program are now widely used on R/C sailplanes. As of November 1993, over 2200 copies of "Soartech 8" are in circulation worldwide. ("Soartech 8" is available from: Soartech Journal, c/o Herk Stokely, 1504 N. Horseshoe Circle, Virginia Beach, VA 23451.)

At the present time, there is a need for new airfoils for R/C sailplanes. For example, R/C hand launch soaring is booming, but few good airfoils (e.g., E387, and SD7037) presently exist for such sailplanes. Sailplanes for the new F3J competition are just beginning to evolve, and new airfoils will probably be required. What will they look like? In the past, only a few airfoils (e.g., HQ1.5/8.5, RG15 and SD7003) have been favored for F3B competition. In shape, handling and performance the SD7003 is quite different from the other airfoils mentioned. These significant differences suggest that it may be possible to design new airfoils that have better overall characteristics for F3B competition. In addition to the design and wind tunnel testing of new airfoils, several existing airfoils should be tested. The SD7037 and RG15 are quite popular and often used with flaps. The flap effectiveness of these airfoils should be quantified through wind tunnel tests, and the results should be used in the design of new airfoils.

There is also a need for new airfoils for R/C sport, aerobatic, and electric planes, as well as R/C helicopters. Often, old NACA airfoils are used for these aircraft. Compared with airfoils that could be designed today, these NACA airfoils (which were designed decades ago mostly by trial and error) are inferior. At the time the NACA airfoils were designed, little was known about the complex aerodynamics of airfoils at low Reynolds numbers. (Airfoils with small chords at low speeds, such as those on model aircraft, are said to operate in the low Reynolds number flight regime.) In recent years, much has been learned about low Reynolds number aerodynamics, and this knowledge has been successfully applied to the design of new airfoils for R/C sailplanes, ushering in a new era in R/C soaring. Overall, R/C sailplane performance has improved dramatically. Older airfoils are no longer used. R/C power aircraft performance could likewise be dramatically improved through the use of newly designed, specially tailored airfoils.

Unique airfoil design requirements also exist for other categories of model aircraft. For example, FAI free flight aircraft (which incorporate both a powered launch segment and gliding flight) operate over a wide range of speeds. In the past, many airfoils with good performance characteristics have been designed for FAI free flight. These airfoils should be wind tunnel tested to quantify their performance. The results gleaned from the tests could then be applied in the design process in an effort to develop new airfoils with improved performance. Also, the Society of Automotive Engineers (SAE) sponsors an annual model design competition in which university student teams design, build and fly and R/C cargo aircraft. The record cargo weight that has been carried now stands at 23 1/4 lb. for a model with a 60-size engine and 1200 in^2 total projected area. Conceivably, this record could be broken by an aircraft with an airfoil (or airfoils) specifically designed for the competition. Clearly, the need for new airfoils and data on existing airfoils is not limited just to R/C sailplanes, but applies to any type of model aircraft where better handling qualities and overall performance are desired.

Other topics of interest include the effects of turbulators, contour accuracy and airfoil blending. Are trips simply repairs to otherwise bad airfoils, or can trips be integrated with the airfoil and result in improvements over, say, SD7037? The Princeton tests began to address this issue, but many questions still remain. For example, what is the best trip height for a given airfoil? Also, what is the best trip geometry, where should the trip be located for best performance, and what type of airfoils respond best to trips? The Princeton tests also shed some light on how accurate airfoils must be in order to achieve expected performance, but a more systematic effort should be made to test the best airfoils for sensitivity to contour accuracy. It is also unlikely that the best performance can be obtained from a single airfoil used along the entire wing span. Rather, airfoils should be blended from root to tip. This is especially true for flying wings. Companion airfoils for blending should be designed for use with the most popular existing airfoils, E.G., SD7037 and RG15. It is expected that blended airfoils will be the wave of the future. In an effort to maximize low Reynolds number airfoil performance for model aircraft, all of these topics should be addressed.

Overall, the UIUC test objectives will be to design and wind tunnel test new airfoils for each category of aircraft listed above and also to examine the effects of flaps, turbulators, contour accuracy, and airfoil blending on airfoil performance. We are especially interested in testing existing airfoils that are known to have superior performance. Wind tunnel data on such airfoils will be used during the design of new and better airfoils. If you believe that we have overlooked an important area, we would be interested in your input and may consider expanding the scope of the project. The number of airfoil models to be tested has not been pre-defined; rather, it will depend on the level of interest and support from the modeling community.

The wind tunnel models should be 33 5/8" in span with a 12" chord and can either be built-up or foam core. To insure a uniform contour, the built-up models need to be fully sheeted. For the foam core models, we may be able to supply two 12" chord wing templates. The sur-

face finish can be either fiberglass or monokote; however, we are interested in the effects of surface finish and will consider testing models with non-smooth surfaces. The models will be attached to the wind tunnel balance by standard model wing rods. Details of the mounting system and airfoil model dimensions are presented in figure 1. Standard model construction techniques should provide the necessary strength (supporting 15 - 20 lb. of lift when pinned at both ends). The brass tubing and collars for the models will be supplied along with full-scale plots and/or coordinates of the airfoil, if requested.

The airfoils will be tested in the UIUC open-circuit 3 x 4 ft. subsonic wind tunnel (see figure 2). The turbulence intensity level is minimal and more than sufficient to ensure good flow integrity at low Reynolds numbers. The experimental apparatus used at Princeton will be modified for the UIUC tests. Lift and drag measurements for each airfoil will be taken at Reynolds numbers 60k, 200k, and 300k. In some instances, it may be possible to take limited data over an expanded range (20k - 1000k). The lift characteristics will be determined through force-balance measurements, while the drag will be evaluated by the momentum method through the use of a wake-rake traversed through the wake at four spanwise locations. We are also interested in airfoil pitching moment measurements, but the current apparatus does not have such a capability.

If you are interested in building wind tunnel models for the tests, please write, call, fax or send e-mail. Correspondence and calls for information should be directed to the graduate student in charge of the project:

James J. Guglielmo, Coordinator
Dept. of Aeronautical and Astronautical Eng.
University of Illinois at Urbana-Champaign
306 Talbot Laboratory, 104 S. Wright St.
Urbana, IL 61801-2935
(217) 244-0684 work
(217) 367-1960 home (ans. machine)
(217) 244-0720 fax
e-mail: jjgug@uxh.cso.uiuc.edu

The program will be self-sustaining so long as funds are made available for equipment maintenance/upgrades and graduate student stipend support and tuition and fees (approximately $16,000/yr. per student). The initial goal is to raise enough money to support at least two graduate students for a three year period. *It is envisioned that a small level of support from a large number of modeling enthusiasts could sustain the airfoil design wind tunnel test program indefinitely. The impact on model aviation could be tremendous.* Contributions can be mailed to:

Prof. Michael Selig
Dept. of Aeronautical and Astronautical Eng.
University of Illinois at Urbana-Champaign
306 Talbot Laboratory, 104 S. Wright St.
Urbana, IL 61801-2935
(217) 244-5757

Please make checks payable to "University of Illinois, AAE Dept". Also, please write on the check "Selig - Wind Tunnel Testing/AAE Unrestricted Funds", and provide a letter stating that your contribution is to be used by Prof. Selig and his group of students (both undergraduate and graduate) in support of the airfoil wind tunnel tests. Feel free to circulate this letter to others who might have an interest in our plans. ■

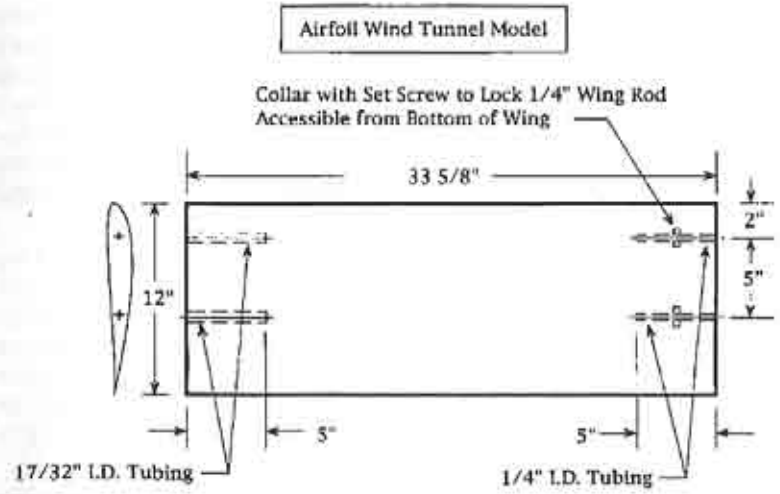


Figure 1: Airfoil Wind Tunnel Model Dimensions and Wing Rod Locations

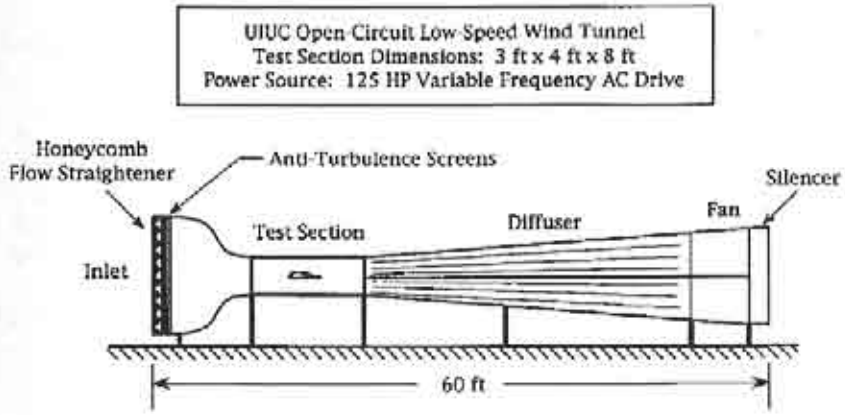


Figure 2: UIUC Open-Circuit Low-Speed Wind Tunnel

Act 3
Yaw Stability

...by Ed Jentsch
2887 Glenora Lane
Rockville, Maryland 20850-3052
(301) 279-7611

Hello... Anybody home? ... Bunky, is that you? ... Where are you? ... (Workshop?! That's stretching the term.) ... That's OK, I'll come down there, I'd like to see your latest project...

Hey! Bunky, where'd all these crates come from!? ... What? ... Bunky, there are at least a dozen of them. ... And more in the garage!? ... Why? No one needs this much sandpaper! ... I'm sure you've got a good reason (can't wait to hear this one).

Good grief! Bunky, what is that thing? It looks almost like... It is! It's a cinder block? With wings? What in the world... No, don't tell me... I recognize it now. And I don't believe it! You didn't!? You actually bought one? A Cowabunga!?

How did you ever let those guys talk you into it? ... Oh, they didn't? Then what ... Uh huh... Uh huh... in other words YOU talked THEM into selling you one ... Sure, the published penetration specs were impressive, but ... I can see there's lots of room for radio gear, but ... Yes, the metal wing makes it almost indestructible, but ... The what?? ... Piece of resistor?? ... "The piece of resistor was its rock-bottom price?" ... I thought that's what you said. (Think he meant "piece de resistance".)

Sorry I doubted your need for all the sandpaper. Maybe I should be asking if you have enough. Are you sure there isn't a better way to shape the airfoil? ... No, I wasn't implying anything by that. Even master-craftsmen lower themselves to use power tools on occasion.

By the way, where's the empennage? ... Of course you care. ... Why would it be in France? ... Bunky, empennage isn't a French restaurant, it's a word that means an airplane's tail ... OK, I could have said tail. ... No, I wasn't being pretentious ... Really ... OK, OK, a little. Now stop avoiding the question: where's the em... the tail?

... Yes it needs one. It isn't a flying wing is it? ... Then it needs a tail. Remember when we discussed decalage and pitch stability? [1] ... Right, the day Superman helped you out. And, do you remember that a plane needs a horizontal stabilizer for pitch stability? ... It's coming back to you ... Good.

Then how about a vertical stabilizer? ... That's nice, it's going to be an aileron ship, so what? ... Right, some aileron ships don't have rudders, but ... Bunky! Where did you ever get the idea that the purpose of the vertical stabilizer is so you "have something to hang the rudder off of"?

The vertical stabilizer has a much more important role than that. It's what gives a plane yaw stability ... Not "your" stability (that's an oxymoron), Y-A-W stability, or lateral stability ... How about side-to-side stability, does that ring a bell? ... Yes, that's what the vertical stabilizer does, it keeps the plane flying straight (Whew!).

Now that we've settled that, why don't we ... How big what? ... (Uh oh, I never should've brought this up) ... No, you can't just guess ... No, it's not a matter of "bigger is better" ... Whoa, slow down - you can't make it too big and you can't make it too small, it's got to be ... Yeah, like the porridge in your favorite story.

... It's complicated, Bunky, it involves aerodynamics and ... No, why didn't you take that course? ... That's right, she didn't teach it ... No, I don't know why ... I can't disagree with you, but BEING aerodynamic isn't the only qualification for teaching it. By the way, did you sign up for any classes Miss Myers didn't teach? ... Thought so ... Just curious.

Look, maybe we can learn about lateral stability the way we learned about pitch stability, by using a thought experiment (for some, every thought is an experiment) ... You're willing to try? OK. Let's see now...

How about this? Picture a weather vane, one shaped like an arrow, on a day when the wind direction is varying... Well? ... You've got a good clear picture, OK ... It's in color? That's terrific, Bunky. ... Then wh... What do you mean you're waiting for the wind to start blowing?! It's your picture, you make the wind blow! ... That's better.

What does the weather vane do when the wind shifts? ... Right, it moves so it's always pointing into the wind. Do you know why? ... "Because the wind pushes on the tail feathers" is good enough for our purposes. Now, suppose we remove the tail feathers? ... Right again, the weather vane stops moving.

Now, let's try something a little more subtle - small tail feathers. How does the weather vane act now when the wind direction changes? ... "Lazy"? ... No, actually I'm impressed, that's a good one-word description. The weather vane will move with wind changes, but it's reaction will be lazy, or slow.

Alright, let's set the weather vane aside for a few minutes and imagine a glider with a too-small tail flying into the wind ... Take your time, I know it's hard to shift those mental gears (particularly with a worn clutch). Ready? ... What happens if the wind briefly changes direction? Remember, this glider has an undersized tail. ... Not bad, Bunky. It'll turn into the wind, but it'll be lazy about it.

But there's more to it than that. Remember how wing dihedral works? [2] ... That's OK, I'll refresh your memory (all 30 bytes).

Let's imagine we're flying along in front of our glider and looking back at it. ... Bunky, we don't have to have something holding us up, we're just imagining ... I know it would violate a law of physics, but ... OK, OK, if it'll make you happy, your friend Superman is back and carrying us. Can we get back to plane now? ... Thanks.

Watch the plane. We're seeing it head on, just as the airflow would. Now, if a sudden, short gust comes at the plane from off to its left ... Good, Superman's on the ball, and he quickly moves us off to our right so we continue to see the plane from the airflow's vantage point. ... You remember now? ... That's it. The left wing is now pointing more into the wind, and because of dihedral, has a higher angle of attack than the right wing, so the plane rolls to its right.

Do you see what's happened? ... Right. When the wind changed direction, the tail tried to turn the plane into the wind, but it was too small to do it quickly enough to overcome the dihedral effect, which caused the plane to roll into a right turn. ... Yeah, just the opposite of what you want to happen.

But, let's not stop watching just yet. Our plane, due to the gust, is banked to its right and ... Yes, it's falling off, or slipping, to the right. That means that the right wing is now pointed more into the airflow, and that causes the plane to roll left. When it does that, the left wing points more into the airflow, so another roll to the right takes place. ... Yeah, just like in the army, left, right, left, right; the plane flutters down like an autumn leaf.

What the plane is doing is called a "Dutch roll". ... I have no idea. ... No, why would anyone blame them? ... Something to do with "Dutch courage"? Hmmm... could be.

But we're getting sidetracked (as usual).

Whether we call it Dutch roll, or lateral instability or directional instability, it's still a problem. And the way to cure it is to either make the vertical stabilizer bigger, or reduce the dihedral, or both.

... No, you can't just add a "great big tail". ... Because that creates a different problem. ... Hold on, let's go at it step-by-step just as we did for a too-small tail.

Back to the weather vane. ... What do you mean it's gone? ... You lost the picture and can't tune it back in? {What do you expect from pre-vacuum tube technology.} Keep trying ... You've got the picture back? Then why the sad face? ... It doesn't have to be in color! ... Yes, I'm sure. {Gads!}

This time, the weather vane has very big tail feathers. How does it react to wind changes now? ... I'm asking you, I already know the answer. ... Thanks. And, you're right, the weather vane "whips" around each time the wind shifts.

Let's go back up and look at our plane, and this time its tail will be too big. ... Why not? ... So, where did he go? The little boys'... Bunky! I'm going to k... He's back? ... Forget it, it wasn't important. Let's have him take us back up to the plane.

Same scenario, Bunky, a sudden gust of wind comes at the plane from just off to its left. ... Right, dihedral would try to roll the plane to its right, but don't ignore the effect the tail has this time ... Very good, because the tail is too big, it "whips" the plane to the left. And? ... How long do you need to think about it? ... Your Cowabunga's wings will rust by then...

When the plane rotates quickly to the left, due to the gust, its' right wing speeds up, generating more lift, and the left one slows down, losing lift. ... Yeah, the plane now banks left instead of right, as it did with a too-small tail.

... No, although banking left into the gust sounds better, wait and see what happens. In this position the plane starts falling off, or slipping to the left and perpetuates the situation caused by the gust. The airflow continues to come from its left, "pushing" on the too-large tail so the plane turns more left, etc., etc.. ... Right, a spiral down and to the left.

... No, Bunky, it's not called a "Dutch spiral", it's called spiral instability.

But, we're not quite finished. Remember from our too-small-tail example that wing dihedral is also important to lateral stability. In this case, with sufficient dihedral, a gust of wind coming from left would increase the lift on the left wing and reduce it on the right one, off-setting the lift changes caused by the plane rotating, or yawing, to the left.

Got that? ... No, I agree. It's not easy to visualize. Let's summarize and see if that helps.

Ignoring dihedral:

- The vertical stabilizer, will turn a plane toward a wind gust. This speeds up the wing "away" from the gust, and slows down the one pointing into the gust. The wing that speeds up, gains lift; the one that slows down, loses lift. That causes the plane to bank in the direction from which the gust came.
- A big tail swings the plane around faster creating a bigger difference in lift between the two wings [I.e., big tails produce steeper banks, faster]. Once banked, the plane slips in the direction it's banked, perpetuating the airflow direction that caused the bank, thus reinforcing the bank. The result is a spiral.
- If the tail is small enough, although all of the above still happens, it's much less dramatic and might not even be noticeable.

Now, if we add dihedral to the equation ... Whoops. Sorry, Bunky. Forget I said the 'e' word {he breaks out in hives at the mention of anything to do with math}.

- With dihedral, the wing pointing into the wind gust suddenly has a higher angle of attack and generates more lift than the one pointing away from the gust. If nothing else compensates, dihedral causes a plane to bank away from the gust.
- However, as we saw earlier, the tail will try to swing the plane around to point into the gust and, in doing so, bank the plane into the gust. The tail and dihedral work to offset each other's effect.
- If the tail is too small, dihedral will rule, and the plane will exhibit Dutch Roll. If the tail is too large, it will overpower the dihedral effect, and the plane will enter a spiral.

Starting to sink in? ... Sorry again, I didn't mean to mention the air you usually fly in.

... Yeah, back to where it all started. Namely, how big should the tail be? Let's try Eric Lister's design book [3] and see if there's any help there. ... There it is, Section 2, "Directional Stability". It's a few pages, so why don't you read it later - I'm sure you'll be able to figure out the correct size vertical stabilizer without too much trouble. ... Yes, you can call me if you need help {my phone's disconnected}.

... What? Hmmm, you're right, that is interesting. {Bunky's looking at Table 4, "Do-It-Yourself Designs", page 14 in Eric's book}. But it makes sense when you think about it. ... Come on Bunky, why would the vertical stabilizer size-factor be the only factor to increase with increased wing aspect ratio? [I.e., why do planes with bigger wingspans need a proportionately bigger tail?]

Remember something called "Moment of Inertia"? ... No, not your moments of inertia {which are all too common}. It's a term from physics and engineering. ... OK, that's better, and you're on the right track, it does have to do with mass and acceleration.

You'd better gulp down some allergy pills, we need to dredge up some simple math for this.

$$F = ma$$

Force = mass x acceleration.

That didn't cause you a histamine avalanche did it? ... Too b... I mean, that's good.

Now let's move mass to the other side of the equation and we get:

$$a = F/m$$

Which simply tells us that the more massive something is, for a given force pushing on it, the slower it will accelerate. ... Sure, you knew that, and you didn't even need the math to tell you.

... Patience Bunky. This IS leading somewhere. The formula we just looked at has to do with linear motion, and what we're concerned with is rotational motion. ... Why? Because a vertical stabilizer/rudder controls a plane's rotation in one of the three dimensions, that's why.

The equivalent formula for a body subjected to angular, or rotational acceleration, is:

$$\tau = I\,\alpha$$

Torque = Moment of Inertia x Angular Acceleration

Switching things around, as we did before, yields:

$$\alpha = \tau / I$$

In other words, and equivalent to the linear situation, the greater a body's Moment of Inertia, for a given torque - torque being simply force times distance from the center of rotation, the slower will be the body's angular acceleration.

What differentiates Moment of Inertia from simple mass is that it takes into account the distribution of the mass with respect to the center of rotation. The farther a body's mass is from its center of rotation, the more "resistant" it will be to

angular acceleration.

In the case of a glider wing, an inexact, but sufficient, equation for Moment of Inertia is:

$$I = mL^2/12$$

Moment of Inertial = (wing mass x wing span squared)/12

The fact that a wing's Moment of Inertia increases as the square of its span, explains why high aspect ratio sailplanes require proportionately bigger vertical stabilizers/rudders. Big wings put more mass farther away from the plane's center of rotation, so a bigger tail is needed to overcome the greater "resistance" to turning.

Bunky? Hey Bunky! Wake up! ... What do you mean you weren't sleeping? ... Then who was snoring? ... You don't even own a dog! ... No, I can't run that by you again, you'll just have to accept the information in Eric's book on faith now.

Uh oh... look at this Bunky. You'd better get hopping on those wings if you want to keep ahead of the oxidation.

I have to run, see you at the club meeting tonight.....

PS to readers. I would have mentioned this to you-know-who - sleeping beauty - but not after that. Well, maybe after I cool down, I'll tell him. Anyway, there's an obvious lesson from the math we just went through. Namely: weight at the wing tips isn't just bad, it's bad-squared (actually it's bad-cubed, since mass is a function of wing volume, which is also a function of wing span).

That's why we use the smallest aileron servos we can get away with. That's why we mount them on the inboard side of the aileron. That's why some designers use lighter foam for the outer end of the wing. That's why it's better to ballast the fuselage than to use wing ballast tubes, particularly if the tubes extend to the wing tips.

The less weight at the tip end of the wing, the more responsive the plane and the smaller the tail needed, which means less drag, which is good-squared.

Can you imagine the size tail he's going to need for that ferrous-winged, cinder monstrosity that he's building?

Author's note: This ends, with no arguments from followers of Euclid, the trilogy chronicling Bunky's adventures in the three dimensions of model aircraft stability. Those indoctrinated in an Einsteinian world view might argue for a fourth. Others, more inclined towards modern mathematical cosmology, would counter that even that would be woefully insufficient. So, where does that leave Bunky? Maybe The Shadow knows.

1. *Ed Jentsch, "Decalage, Again," R/C Soaring Digest, Vol. 10, No. 1 (January, 1993), p. 22.*

2. *Ed Jentsch, "Tale of Two Hedrals," R/C Soaring Digest, Vol. 9, No. 11 (November, 1992), p. 26.*

3. *Eric Lister, Sailplane Designer's Handbook (Clarksburg, MD: Eric Lister, 1975), p. 8.* ■

The Mother of All Winds

Dan Fulmer
San Francisco, California

We knew something was wrong when we came back from lunch and found hang gliders were not set up in the launch parking area. In fact, there were hardly any cars in the whole parking lot and the lot is huge! Then Bill said, "Look at the wind sock pole!" I usually look at the wind sock when I pull into the area to get wind strength and direction, and I guess I really didn't notice the pole that held the sock. It's a normal, fairly heavy, steel twenty foot high pole... Wait a second! Hold on! There was a big bend in the pole! At that point, I started to re-evaluate what we were about to do.

The day had started out innocently enough with a call to my fellow flying buddy, Bill. We were to meet on this blustery March day for some flying of our home brewed and designed creations. I said to Bill, "Let's get out to Ft. Funston before the hang glider pilots arrive. The weather radio is calling for strong north westerly all day, and I can see white caps from my back window with the binoculars." (We can't fly RCs at Ft. Funston if there are hang gliders in the air, but they usually don't get there before noon time.) So, off I went for the 5 minute drive to Ft. Funston where you can fly large slope soarers off 200' cliffs and land with relative ease in ice plant away from the hellacious rotors that plague most slopes.

Bill was there at 10:00 a.m. along with Bob, another friend who also flies RCs and hang gliders. They both said that we wouldn't have to worry about not flying because of hang gliders, as the wind was pretty strong already and the hang glider pilots can't fly comfortably in over 25 - 30 mph winds. This sounded great to me as we started setting up our planes, ballasting up for the already 30 mph + wind. Good flying was had by all, and as we broke for lunch, I said I was going to bring back my 100" span heavy artillery plane, U-2, to keep Bill's 90" pivot wing rocket ship, Blade Runner, company in the afternoon. We give our home-brewed planes their own identity with personal monikers to make them seem more life-like or death-like in the event of a major malfunction by pilot or equipment.

A couple of hours later we were back in the somewhat deserted parking lot witnessing an angry ocean frothy with white caps. The three of us decided to check the wind strength at the cliff edge. Bill and Bob got their hang glider wind speed gauges and I got my trusty windsurfer gauge. This was to see how much lead we were going to attach to penetrate the wind, or so we thought. Out we went with virtually no one else remotely near the cliff edge; I think everyone else had more sense that day. Nearing the cliff edge, we were getting sand blasted big time as we thrusted our trusty wind speed instruments out into the void. Fighting the wind and sand, we gazed up to read 40 - 45 mph winds gusting to 50+ with regularity on all three gauges. As I thought to myself, "Let's get out of here," Bob said, "It's just too dangerous to fly." And Bill said that he couldn't put enough weight in his bird and didn't trust it to fly very well as he was still working the kinks out of the design. so, that left me and my 10 lb. + flying tank to do battle with what was rapidly appearing to me as a battle my plane wasn't going to win.

Naturally, both my buddies cautioned me that they wouldn't think any less of me or my plane's flying ability as they would question my sanity if I attempted to fly in this upper Beaufort wind scale clearing front, or whatever this northwest monster was called. As we walked (were blown) back to the shelter of our vehicles, I considered how I should just pack it in and call it a day when something in the back of the lizzard area of my brain said, "Hold on! Let's show this

wind just who is boss!" Now I know that this thought was just so much stupid macho, but what was I thinking when I was designing and building this plane? I'll tell you what I was thinking and it is probably the same thing most of us think about: TOTAL FANTASY!! ... How this baby is going to do this and that, how it will look and fly so much better than the last one we built, whatever that means. High winds? No problemo! That's what I built it for in the first place. Big cliffs, big winds, big planes doing big maneuvers. Yea!!! OK! Let's unload this cruise missile from the back of the truck and do it! Actually, the decision to launch took a fair amount of self soul searching and cajoling on my friends' part, and if the truth be known, I had a slight of cold feet!

The only way Bill could launch the darn thing was to hold it with a death grip, both hands on the leading edge. Throwing it was completely out of the question. We re-grouped to discuss strategy, as if the elements cared in the slightest what we did. Bill had the very difficult chore of getting to the cliff edge without losing the plane to rotors and gusts. This was definitely the worst conditions any of us had ever attempted to fly in by a large margin. We had all flown in serious winds, but this was definitely something else. My grip on the transmitter was unconsciously tightening. The plane was going nuts, flexing its wings violently up at the tips, and shaking its sturdy tailfeathers (No Mickey Mouse flimsy flying stab or "T" tail on this baby!) as Bill held it overhead. The plane poised there looking as if it could take off with Bill hanging on. It was crying out to either be let go and freed from its restraints or put down to safety out of the vicious tip lift that was shaking it to bits. I was shaking like a leaf as I held the transmitter, watching the whole scene mesmerized. After what seemed a few seconds, Bill shouted, "I can't hold it anymore! What do you want me to do?" I yelled back to him without much conviction over the howl of the wind, "Launch it!"

I thought that either the plane would flip straight over on its back, go straight down into the cliff, or just self destruct. But that was just negative thinking blocking what was left of my mind. Fortunately, the aircraft had other ideas concerning self destruct tendencies. What it actually did in this force 9 gale was to slowly move out and up from the cliff edge, much to my relief. "Maybe I should start to fly this beast after all before it just keeps going to China," I thought to myself. "OK. Let's get back to basic maneuvers to see what happens up there. Simple figure 8's..." Wait a minute! Nothing was simple under these conditions. The main problem was that the plane was taking up so much room and was going so fast that everything seemed to be happening in slow motion, except for how fast it got back to me in downwind mode. Bob and Bill shouted encouragement as I fought to calm down and concentrate on huge, smooth flying maneuvers. One tense moment had the plane inverted coming toward me downwind and high, with me pulling full up elevator. But nothing happened for what seemed an eternity until the nose gradually started to come down and the elevator started to bite as it got some air speed to work with. Whew! The beach runs we usually do were out of the question that day, because I couldn't stand close enough to the cliff edge; because of sand blasting and wind, I couldn't even see the beach. I was standing 40' from the edge trying to keep from getting knocked off my feet!

After 15 minutes of hair raising flying, I was completely worn out, both physically and mentally. As I looked out over the angry Pacific, I thought about how I was going to get this bird down in one piece, which was something I hadn't given much thought to until then. By now the macho lizzard brain in my head had exhausted all of its bravado in exchange for real fear that comes from more rational thinking. "How am I going to land? Help!" As for the airplane, it loved it up there in its playground. No bad habits. No hint of flutter. It just went real fast and high with a lot of cubic acres of air space as its home. It couldn't have been happier. The problem was that at that moment, I didn't love it up there, anymore. I wanted that big bird nice and cozy and safe on the ground. "They" say (whoever the mysterious force called "They" are), that the planes never break in the air, only when they hit something. I felt that "They" were going to be proved correct!

"Oh well, here goes," I thought as I got it high, blasted it 200' over my head, nose down to punch through those mean rotors with authority. Whoops, I just lost 50' altitude!! It ballooned back up 50' as it fought its way back through the massive rotors. Way back in the landing area it settled down, and as I turned it toward me, one thought gripped me, "Get it down!" With wings level, flaps down, elevator down, it clawed its way down to earth through sheer will power! Technology and skill over the elements once more. Ha ha, I was almost down. Ten feet from the ground the aircraft completely settled down for a perfect landing. My neck ached and I was sweating all over, like I had been through a wringer, but I felt good. I also felt lucky. The elements would win the battle over me and this plane one day. But not that day.

I mentioned to Bill and Bob as we struggled to get the glider back to the truck in one piece, that I was worn out and was going home to relax. We were the only ones in the parking lot witnessing the wind sock trying to rip itself apart... All in all? It was a good day flying. ■

R/C Soaring Resources

Do you hold seminars and workshops? Would you like to be included as a contact to answer questions on soaring sites or contests in your area? If so, please contact *RCSD*. Our address and telephone numbers are on page 1.

Seminars & Workshops

Free instruction for beginners on construction and flight techniques. Friday & week-ends (Excluding contest days) Bob Pairman, 3274 Kathleen St., San Jose, California, 95124; (408) 377-2115.

California Composite Seminars - We want to help you build better! Bring your project and let us help you with it. Thirty five dollars for a six hour plus Composite Technician lesson includes lunch! Two people minimum, please. Great mountain flying all year round! Clubs? We travel, too! Please call (805) 822-7994 and ask for Scott Metze.

Reference Material

Madison Area Radio Control Society (M.A.R.C.S.) *National Sailplane Symposium Proceedings*, 2 day conference, on the subject and direction of soaring. 1983 for $7.00, 1984 for $7.00, 1985 for $8.00, 1986 for $8.00, 1987 for $9.00, 1988 for $9.00, 1989 for $10.00, 1992 for $12.00. Delivery in U.S.A. is $3.00 per copy. Outside U.S.A. is $6.00 per copy. Set of 8 sent UPS in U.S.A. for $75.00, outside U.S.A. for $80.00. Last 4 (1987-1992) in U.S.A. is $45.00, outside is $50.00. Allan Scidmore, 5013 Dorsett Dr., Madison, WI 53711.

BBS

BBS: SLOPETECH, Southern California; (714) 525-7932, 2400 - 8-N-1

BBS: South Bay Soaring Society, Northern California; (408) 281-4895, 8-N-1

Contacts & Soaring Groups

Arizona - Southern Arizona Glider Enthusiasts, Bill Melcher (contact), 14260 N. Silwind Way, Tucson, Arizona 85737 U.S.A., (602) 325-2729. SAGE welcomes all level of flyers!

California - California Slope Racers, John Dvorak, 1638 Farringdon Court, San Jose, California 95127 U.S.A., (408) 259-4205.

California - Northern California Soaring League, Mike Clancy (President), 2018 El Dorado Ct., Novato, California 94947 U.S.A., (415) 897-2917.

Canada - Southern Ontario Glider Group, "Wings" Program, dedicated instructors, Fred Freeman (416) 627-9090 or David Woodhouse (519) 821-4346.

England (BARCS & European contests), Jack Sile (Editor), 21 Bures Close, Stowmarket, Suffolk, IP14 2PL, England, Tele. # 0449-675190.

Iowa - Eastern Iowa Soaring Society (Iowa, Illinois, Wisconsin, Minnesota), Bob Baker (Editor), 1408 62nd St., Des Moines, IA 50311 U.S.A., (515) 277-5258.

Kansas - Wichita Area Soaring Association, Pat McCleave (Contact), 11621 Nantucket, Wichita, Kansas 67212 U.S.A., (316) 721-5647.

Maine - DownEast Soaring Club (Northern New England area), Steve Savoie (Contact), RR#3 Box 569, Gorham ME 04038 U.S.A., (207) 929-6639.

Maryland - Baltimore Area Soaring Society, Bill Cavanaugh (President), 1428 Park Ave., Baltimore, Maryland 21217 U.S.A., (410) 523-0778.

Minnesota - Minnesota R/C Soaring Society, Tom Rent (Contact), 17540 Kodiak Ave., Lakeville, MN 55044 U.S.A., (612) 435-2792.

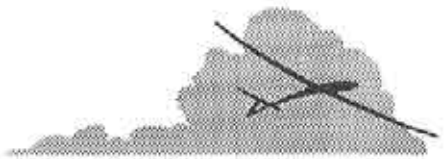
Nevada - Las Vegas Soaring Club, Jeff Burg (President), 853 Shrubbery Lane, Las Vegas, Nevada 89110 U.S.A., (702) 459-8100.

Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Roger Breedlove (Editor), 6680 S.W. Wisteria Pl, Beaverton, OR 97005 U.S.A., (503) 646-1695 (H) (503) 297-7691 (O).

Texas - Texas Soaring Conference (Texas, Oklahoma, New Mexico, Louisiana, Arkansas), Gordon Jones (Contact), 214 Sunflower Drive, Garland, Texas 75041 U.S.A., (214) 840-8116.

Utah (U.S.A.) - Intermountain Silent Flyers (IMSF), Bob Harman (contact), (801) 571-6406... "Come Fly With Us!"

Washington - Seattle Area Soaring Society, Waid Reynolds (Editor), 12448 83rd Avenue South, Seattle, Washington 98178 U.S.A., (206) 772-0291.



NASSA
North American Scale Soaring Association

The North American Scale Soaring Association is an organization of scale soaring enthusiasts dedicated to the furtherance and enjoyment of scale soaring in North America. Membership dues are $10.00 a year, and provide for sponsorship of NASSA Scale Fun Flys & Rallies, and for the implementation of a National Scale Building and Soaring Achievement Program. Join NASSA and join a network of scale soaring enthusiasts that influence the direction of scale sailplanes in North America. Please provide your address, phone #, and AMA #, and we will send you a membership card and membership roster. A bi-monthly column keeping NASSA members up to date is included in *RCSD*, with additional information available periodically direct from NASSA. Help promote and support the continuation of scale soaring by sending $10.00 to: NASSA, P.O. Box 4267, W. Richland, WA 99352.

F3B/USA • F3F/USA
RC Sailplane Technical Journal

F3B/USA is a bi-monthly publication dedicated to the sports of F3B and F3F. The journal is intended for the beginning as well as experienced multi-task soaring enthusiast. Articles cover a wide variety of areas including: technical data issues, description of techniques, and articles written by and about the top people in the sports.

Subscription Rates: $12 per year (6 issues)
For More Info Write: F3B/USA,
87 1/2 N. Catalina, Pasadena, CA 91106

LSF

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.

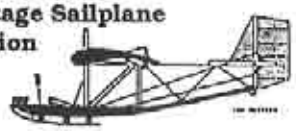
League of Silent Flight
10173 St. Joe Rd.
Ft. Wayne, IN 46835

T.W.I.T.T.
(The Wing Is The Thing)

T.W.I.T.T. is an organization of engineers, scientists, pilots, sailplane enthusiasts, model builders and many other persons having an interest in flying wing/tailless aircraft technology. Write to T.W.I.T.T., P.O. Box 20430, El Cajon, CA 92021 to find out how you can participate.

Send SASE for membership application and flyer: "What is T.W.I.T.T." or, send $2.50 for full information package including one back issue of our newsletter, postpaid. Full membership is $18.00 (US) or $22.00 (Foreign) per year and includes twelve issues of the newsletter. Back issues of newsletter are $.75 each, postpaid in USA.

The Vintage Sailplane Association

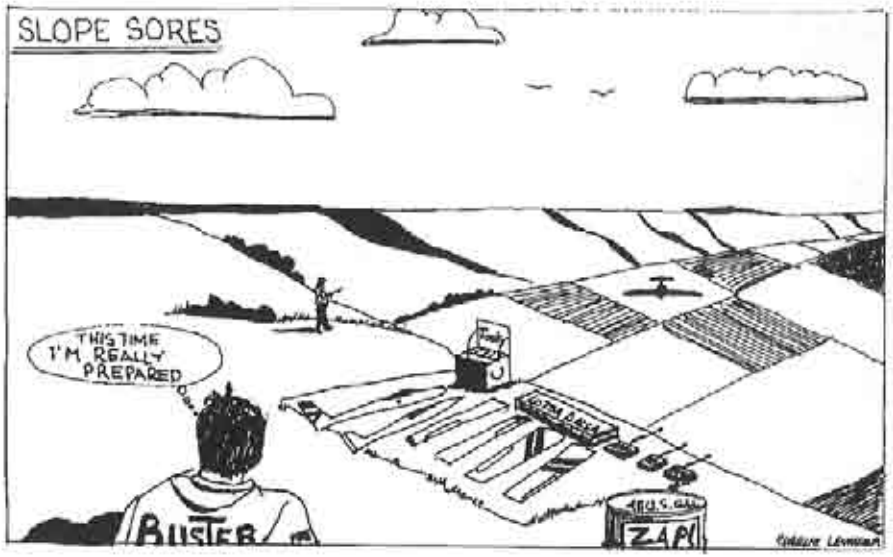


VSA is a very dedicated group of soaring enthusiasts who are keeping our gliding history and heritage alive by building, restoring and flying military and civilian gliders from the past, some more than fifty years old. Several vintage glider meets are held each year. Members include modellers, pilot veterans, aviation historians and other aviation enthusiasts from all continents of the world. VSA publishes the quarterly magazine BUNGEE CORD. Sample issue $1.-. Membership $10.- per year. For more information write: **Vintage Sailplane Association, Route 1, Box 239, Lovettsville, VA 22080.**

You are invited to join the
NATIONAL SOARING SOCIETY

- OFFICIAL AMA SOARING "SPECIAL INTEREST GROUP"
- YEARLY NSS "SOAR-IN" TOURNAMENTS
- NATION'WIDE "EXCELLENCE AWARDS PROGRAM"
- EXCELLENT BI-MONTHLY NEWSLETTER
- NSS FULLY SUPPORTS THE F3B SOARING TEAM & LSF SOARING PROGRAM
- NSS IS INVOLVED IN THE ORGANIZATION AND OVERSEEING OF THE SOARING PORTION OF AMA NATS (INCLUDING AWARDS BANQUET)
- YEARLY DUES ARE $15 U.S.A. AND $20 OVERSEAS (SPECIAL FAMILY RATES)
- NSS OFFICERS ARE FROM ALL 11 DISTRICTS

For Info., Contact NSS Secretary/Treasurer
Robert Massmann
282 Jodie Lane
Wilmington, OH 45177
(513) 382-4612



G. Levasseur
Manitoba, Canada

Schedule of Special Events

Date	Event	Location	Contact
May 14-15	Masters of Soaring	Covina, CA	Pete Olsen (909) 597-2095
May 29-30	Radio Glide	Oxford, England	Jack Sile 0449-675190
May 28-June 5	World Soaring Jamboree	Richland, WA	Wil Byers (509) 627-5224
June 25-26	Flatland Open	Hillsdale, KS	Ed Kempf (913) 780-5543
June 23-26	Mid-South Soaring Championships	Memphis, TN	Bob Sowder (901) 757-5536
July 23-24	Inter Glide F3J	Birmingham, England	Jack Sile 0449-675190
Aug. 13-14 & Aug. 20-21	Holland Glide	Amsterdam / Amay Belgium	Jack Sile 0449-675190
Sept. 10-11	F3J	Germany Heerieden, Bavaria	Jack Sile 0449-675190
Oct. 1-2	CVRC Fall Soaring Festival	Visalia, CA	

Book Review

"Mostly Sailplanes"

written by David A, Craddock
...reviewed by Bruce Abell
Cessnock, NSW, Australia

"Mostly Sailplanes" by David A. Craddock is a fascinating book that constitutes a chronology of Australian designed gliders and sailplanes from 1931 - 1936.

To date, there are three volumes:

Volume 1	1865 - 1918	"Wood, Wire, and Calico"
Volume 2	1915 - 1930	"Primaries Omnigenous"
Volume 3	1931 - 1936	"Mostly Sailplanes"

David is an associate member of the Royal Aeronautical Society and a member of the Vintage Glider Association of Australia, so is very knowledgeable on his subject.

The books not only have photos of most of the gliders/sailplanes he describes, but excellent 3-view drawings that are, in most cases, more than adequate for the building of scale models; so, if you want to build and fly a scale model glider/sailplane that is unusual, then these books are for you.

Apart from being a good source of 3-views (etc.) for modellers, these books are fascinating reading in themselves and give an insight into a bit of aviation history that has had little written about it; so, even if you never build a model from one of the 3-views, you will find these books extremely interesting reading.

Costs are:

Volume 1	Aust. $20 + Pack & Post
Volume 2	Aust. $20 + Pack & Post
Volume 3	Aust. $20 + Pack & Post

Books are available from: David Craddock, 78 Kent Street, Epping, N.S.W. 2121, Australia. (For each book, Pack & Post in Australian $: Airmail is $4.90, Economy Air is $4.20, Surface is $2.60.) ■

1994 LSF NATS
Nostalgia Event

...from Jack Iafret
LSF Vice President
Grand Blanc, Michigan

This note is dual purpose. The first is to let all the readers know that the 1994 LSF NATS will include several unofficial events this year and one of them will be NOSTALGIA. The second we will get to later.

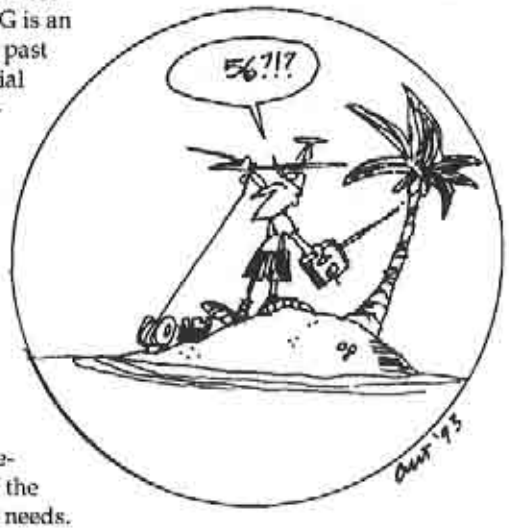
I have hosted a really low key nostalgia event at the Detroit Soaring and Hiking Society's major summer event for the last two years, and it has been somewhat successful and a lot of fun for those that entered it. Mike Stump, 'our illustrious LSF Prez.', flew in the 1993 event and really went wild (This is quite normal behavior for Mike.) with his box stock HOBIE SHORT WING. This must have fired up the old gray matter and a month or so later Mike asked if I would CD a nostalgia event at the '94 LSF NATS. Who can turn Mike 'Super Salesman' down? (If you try, he turns Stumpett loose on you and it is all over anyway).

This event may rank right up there with Hand Launch Golf for fun and relaxation in an otherwise super competitive contest. In case you don't know, HLG is an invention of Gill Gauger, our past NATS CD, and another unofficial event that we have had a ball flying the last two years. Seems like the unofficial events are the fun ones, doesn't it? Attached you will find a copy of the NOSTALGIA rules as I see them today. I do not plan on changes this year as it is still an experiment and we need to see if the demand warrants the efforts. Changes can be made over the next several years if the event catches on and maybe it will become an official event with all of the rule making system anyone really needs.

Now for the second part of the letter. I am looking for help from the knowledgeable people out there: individuals, manufacturers, past manufacturers, columnists or anyone who can document the eligibility of designs that meet the rules supplied. I will volunteer to keep a data base and publish it in *RCSD* initially and mail it to anyone who sends a SASE, so if any of you are interested in this event, please send me (or call me from 8:00 to 10:00 EST) with the name of the plane, its date of publication or release and where it is documented (what magazine article, etc.) at 519 Boutell Dr., Grand Blanc, MI 48439; 810 694-2490.

Of course, the list will come in handy at the NATS this year to validate any planes that we don't already have a history on. I will also record any requested changes to the rules for future consideration, but only if they are submitted in writing with supporting rational for the change. Changes involving safety or use of non-visible technology will get the most consideration and those that involve any deviation from the original styling or construction of the plane will get the least consideration. ■

Curt Nehring
Southern California



Nostalgia Sailplane Event

Design Release Requirements:

Date of Release:

The latest accepted magazine date for the published design, or the release of a kit will be 01JA77.

If the kit or published design had several release dates that included modifications to the design, only those prior to 01JA77 will be accepted.

Airframe Requirements:

Items That Must Duplicate the Original:

- Airfoil, flying surfaces planforms, moments and surface areas...
- Fuselage form or styling in outline both in side and plan views.
- Basic construction... i.e., open bay wing structure, wood vs. FRP, etc.
- In other words, the plane must replicate the original styling and appearance.
- Control surfaces... only those shown on the plans may be used. If the plans show spoilers, you can not use flaps for glide path control, etc.

Items That Can Deviate from the Original:

- Any interior, non-visible structural modifications to enable the plane to handle modern launch equipment and techniques... Some examples:
  - Substitute spruce for balsa
  - CF reinforcements in non-visible area (underside of spars, etc.)
  - Larger joiner rods and tow hook systems
- Wing incidence and decalogue
- Wing mounting (bolt on vs. rubber bands)
- Removable or bolt on stabs rather than permanent stabs as long as the assembled position replicates the original and architecture is unchanged
- Dihedral (either tips or center or both) can be modified a maximum of 25% of the original for personal handling characteristics

Special Items:

- Radios can be of any type legal to operate and electronic mixing is allowable on any set of surfaces. (Too much trouble to police mixed functions.)
- The CD will have the final vote on legality for 1994 on any item not covered in this document... Bear in mind that the philosophy of the event is to duplicate the spirit of the old days in styling and form of aircraft and flying capability of said aircraft and only those changes consistent with launch and landing safety will be allowed.
- The final proof of legality of the design for this event lies with the contestant and having an original set of plans would be really neat to settle any questions.

Press Release

Mid-South Soaring Championships

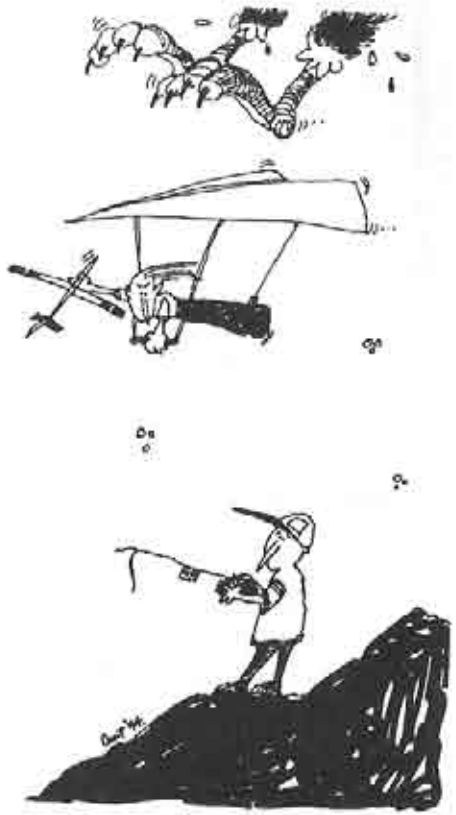
Modeler's Mall

In an expanded effort to bring the sailplane enthusiast the latest in our hobby-sport, the Mid-South Soaring Championships is reserving a limited amount of field space for sailplane related businesses, electric and non-electric.

This is an excellent opportunity for your business, no matter how large or small, to present your products and services to a captured audience during the Mid-South Soaring Championships, Saturday and Sunday, June 25 and 26. This is a two day opportunity for you to speak one-on-one with sailplane fliers who want your service.

Modeler's Mall is being offered at no cost to you. Our only request is that you provide your own display facilities. (Display tables may be rented locally for cost.) In 1993, the MSSC drew 100 contestants from 19 states. We anticipate significantly larger participation in 1994 due to the addition of Hand Launch and Cross Country!

To reserve your field space at the MSSC Modeler's Mall, call Bob Sowder at (901) 757-5536 day or evening. We look forward to seeing your business represented at the Mid-South Soaring Championships! ■



Curt Nehring
Southern California

NEW PRODUCTS

The information in this column has been derived from manufacturers press releases or other material submitted by a manufacturer about their product. The appearance of any product in this column does not constitute an endorsement of the product by the *R/C Soaring Digest*.

NI-SPY IV

...from Aero Scientific

NI-SPY IV is a precision battery watch dog that mounts in just about any plane, boat or car. This tiny unit helps protect your investment by indicating when it's time to stop and recharge the receiver battery.

Features include an automatic self test that indicates if NI-SPY is functioning properly and built-in noise reduction circuitry that reduces false triggering. Complete mounting hardware, mating connector and detailed instructions manual are included with each NI-SPY to make installation easy.

Priced at $19.95 plus $3.00 S&H from Aero Scientific Inc., P.O. Box 292, Grayslake, IL 60030; (708) 223-9066. ■

Catalog/Resource Guide

...from Scale Model Research

Bob Banka's Scale Model Research, the World's largest commercial collection of full-color aircraft documentation and 3-view drawings has expanded their inventory, again. The 152 page, 1994 issue of their Catalog and Resource Guide lists 5000 different FOTO-PAAKS (800 new), 22,000 3-view drawings and includes 13 scale related articles written by some of the top competitors and authorities in the scale movement. Bob recently acquired the Replatec Photo collection and has added 450 of the best to his catalog this year. The FOTO-PAAK (studies) are full-color 3 1/2" x 5" pictures taken with the modeler in mind, to show details like paint scheme, markings, instruments, landing gear, etc. These PAAKS are sold on a satisfaction guaranteed basis, and because of the large inventory, orders are usually mailed within 24 hours.

Most FOTO-PAAKS have 3-view drawings available that will enable the modeler to have complete documentation for their project. The 3-views are either KOKU-FAN drawings, or copies of drawings gleaned from modeling and/or full size aircraft magazines or other sources. Scale Model research is the World's exclusive dealer for the KOKU-FAN 3-views, considered by many modelers to be the World's standard in accuracy and detail.

Modelers and enthusiasts can get their 1994 Scale Aircraft Documentation and Resource Guide (Catalog) by sending $6.00 (Canada $7.00, Overseas $12.00 - includes Air Post) to Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626 U.S.A.; (714) 979-8058. The best times to call are 7:30 a.m. to 3:00 p.m. or 4:00 p.m. to 7:00 p.m., Pacific Time. VISA and Mastercard accepted on orders of $20.00 or more. ■

Foam Cores

...from Wings!

What do you get when you mix together twelve feet of 5/8" steel rod, ten feet of aluminum bar stock, a few bearings, lots of bolts, threaded rods, some 0.018" stainless steel wire, a computer, four stepper motors, some electronics, more bolts, and a lot of work? A computer controlled foam core cutting machine, of course! (This machine is presently NOT for sale.) This new device is designed, built and operated by Wings!, and it totally eliminates templates.

As it stands now, the device can cut cores up to about eight inches thick and about fourteen inches wide. Four ten inch wide cores can be cut at the same time. The device cuts a wing core by starting at the trailing edge and exiting at the trailing edge. It can very easily cut wings which have different airfoils on each end. As a test of this, I cut a core with an 8" FX60-100 at the root and a 1.5" diameter circle at the tip. I ended up with what looked like a fan blade or a cross between a wing and a baseball bat. Washout, skin thickness, taper, sweep, and cutting wire diameter are also taken care of by the device. If I decide I need an eighty inch long core, no problem. As long as the device knows the length of the cutting wire, it will produce an accurate core. Wire sag is also not a problem. When I cut a 9.25" FX60-100 with no skin thickness, the chord measures 9.25" and the trailing edge is straight. Even if devices like this don't change the way modelers build wings, one thing is certain: I've built my last set of templates.

The device can cut wings with chords up to 14 inches, cores up to 8" thick and 60" long. It can cut any airfoil, non-airfoil shapes such as circles and ovals, panels with different airfoils or shapes at each end, wings with straight LE, straight TE, or double taper; It can add washout or washin, compensate for sheeting and wire thickness, and foam melt.

The prices for the cores are: $6.00 up to 1', $7.00 over 1' to 2', $8.00 over 2' to 3', $10.00 over 3' to 4', $12.00 over 4' to 5'. $5.00 shipping if the cores fit in a single box with maximum size of 12" x 7" x 44". These prices assume that the cores can be cut from 1 1/2" foam. If the cores are thicker, the prices will be adjusted.

Contact Wings! for more information at 3198 Shady Oak Lane, Verona, WI 53593; (608) 845-7961. ■

New HL and 2 Meter Saturns

...from Layne/Urwyler

Layne/Urwyler, manufacturer of the Saturn series of electric and non-electric sailplanes is pleased to announce the availability of the following new products from Layne/Urwyler; the Saturn Hand Launch and the Saturn 2.0.

Saturn HL

The Saturn HL is not a revolutionary new hand launch glider. It does everything every other hand launch glider does with the exception of one thing: It doesn't keep breaking!!

Layne/Urwyler decided early on in the design of this hand launch sailplane that flying a hand launch sailplane is a lot of fun; fixing a hand launch sailplane every time you fly it is NOT!

The Saturn HL uses the proven E387 airfoil for great hang time and good launching ability; however, the wing area is slightly larger than average (420 sq in) which allows for more strength to be built into the wing and fuselage, while still maintaining optimum 5.5 oz wing loading.

The Saturn HL was also designed around standard radio gear, i.e., standard micro servos, a standard seven channel receiver, and a standard 280 ma battery pack.

It's simple - the Saturn HL is a great flying hand launch that won't empty your wallet for exotic micro radio gear, with an extra measure of durability built in to keep you flying.

Specifications:

Airfoil:	E387
Planform:	Triple taper
Wing:	Foam/Obeche
Fuselage:	Glass/Kevlar
Wing Loading:	5.5 oz sq ft
Standard tail of V tail	
Kit price:	$99.00
Pre-Sheeted:	$149.00

(Add $10.00 S&H, CA res. add 7.25% tax)

Saturn 2.0

Saturn 2.0 is our exciting new two meter sailplane that shares a lot of the design and flying characteristics of our successful, contest winning, Saturn 2.9T unlimited sailplane — with one small twist.

The Saturn 2.0 shares the same light, ultra strong, T/6 aluminum alloy wing tube/spar system as the larger 2.9T which is the backbone of its extremely strong triple taper wing. The 2.0 also sports a stylish T tail with a fixed stabilizer and articulated elevator. The twist is that the Saturn 2.0 kit was designed to also be built as a V tail which weighs in at a very slight 9 oz/sq ft wing loading — the T tail version weighs in at 10 oz/sq ft.

The Saturn 2.0 has a speed range normally associated only with larger unlimited class sailplanes, compliments of its world class Quabeck airfoil. The Saturn 2.0 will float in the lightest lift, yet still move out, providing an impressive range to search for lift. We experimented with several of the more popular airfoils during our extensive testing of our two meter design. Our final selection of a Quabeck airfoil for our high performance two meter Saturn was based upon real time flying comparisons — we think you'll be impressed!

Specifications:

Airfoil:	HQ 3/10 - 3/9
Planform:	Triple taper
Wing:	Foam/Obeche
Fuselage:	Glass/Kevlar
Wing Loading:	9 - 10 oz sq ft
Kit Price:	$149.00
Pre-Sheeted:	$239.00

(Add $15.00 S&H, CA res. add 7.25% tax)

Layne/Urwyler, 1808 Applegate Drive, Modesto, CA 95350; (209) 529-8457. ■

Liberty

...from Wright Manufacturing Co.

Liberty, a generic two meter or slope fuselage, is the second in a series of generic sailplane fuselages from Wright Mfg. Co. with specifications necessary to support a two meter plug-in wing. Liberty Plus is reinforced with kevlar and carbon fiber in specific stress areas for long lasting strength.

Specifications: 40" length, 6 oz. weight, 2" width at widest point, molded fin, full flying removable stabilizer, accommodates two meter plug-in wings with a 9-10" root chord up to 84" long.

Capacity: Up to 4 standard servos, standard receiver, up to 1200 mah battery power, and switch harness. Includes molded glass canopy.

Available from Wright Manufacturing, P.O. Box 3281, Bellevue, WA 98009; (206) 488-6558. Also available from Slegers International at (201) 366-0880 (9:30 a.m. - 5:00 p.m. EST, closed Sun. & Mon.). ■

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MINI HI START KIT designed especially for 1-1/2 meter (hand launch). Thirty feet of 1/8 tubing stretches four times relaxed length for gentle launches. Two day glow colored tow lines, 120' and 150', use separately or together. $19.95 + $4.00 shipping. Sky Bench Aerotech, 58030 Cyrenus Lane, Washington, MI 48094; (313) 781-7018.

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SBXC Cross Country ship, all glass, w/six servos, perfect condition... $795.00. Call John Ellias @ (805) 388-5674, S. Calif.

Slope gliders: QUICKSILVER with fiberglass fuse RTF with radio... $140.00; SILHOUETTE w/glass fuse., RTF without radio... $50.00 or with Futaba Micro Radio... $150.00. Slope glider "JAMMER" 60 inch, RTF, fiberglass fuse. without radio... $150.00 or with radio... $250.00. Astro Flight Mini Challenger w/cobalt motor, battery, speed controller, 2 Airtronics micro servos, RTF... $150.00. Call Mike @ (714) 960-2835, S. Calif.

Roke DG-202 all glass, 1:3.5 scale, 4.86 meter span, retract, all servos in wings, pull-pull system on rudder and elevator, museum quality airplane, cockpit 100% scale of original, plexiglass canopy w/operational clear-view window, canopy opens like full scale, all documentation included. This is one-of-a-kind airplane in the world... $1650.00 + shipping. Aerotek (Terry Lukenbach) 1/4 scale ASW-20, absolutely one of the best kits in the world, NIB... $350.00 + shipping. Contact Asher Carmichael @ (205) 626-9141 home or (205) 433-3686 work, Alabama.

Ace EASY EAGLE NIB... $35.00; DSC LUCIFER two meter electric, NIB... $25.00; DCU SUPER DRAGONFLY 70" slope soarer, fiberglass fuselage, NIB... $60.00. Call John Pearson @ (303) 770-0797 work or (800) 888-6996 work, or (303) 756-9234 home, Colorado.

Tekoa SHADOW 118... $200.00; Flite Lite FALCON 880... $150.00; Airtronics SUPER QUESTOR... $75.00; MIDWEST SOARER... $25.00; CMP PHOENIX... $175.00; CMP MARIAH... $125.00. Prices include shipping. Contact Tom Gressman after 7:00 PM MT @ (303) 979-8073 or @ (303) 744-3535 8-5 MT, Colorado.

100" SONIC (mid-tail version of SPECTRUM), R/E/A/F, carbon reinf. obeche sheeted wings, RG-15, 62 oz., prototype fuse. designed by Mark Triebes, no R/C gear... $300.00; 90" MINI-THERMORIS, slope racer, German kit, R/E/F/A, 4 in wing ballast tubes, foam - obeche wings, white fuse. and wings, Futaba gear, RTF... $125.00; 2m hybrid FALCON 600 fuse., 3021 ctr. sec., SD 8000 tips, 42 oz., 102 wing loading, no R/C gear, R/E/F/A... $150.00. Leigh Hodgdon @ (408) 243-7250 home or (415) 858-3582 work, N. Calif.

Shadow, built w/wing servos... $350.00; two S3021 glass bagged wings (1 plug-in & 1 bolt-on three piece)... $125.00 ea.; Falcon 880 fuse & sheeted wing... $200.00; Genesis, built w/new 141 wing servos... $650.00; Raven, built 3+ meter wingspan... $550.00. Gordon Jones (214) 840-8116 after 5pm, TX.

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ULTRA GP

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SPECIFICATIONS

WINGSPAN	55 3/8 INCHES
LENGTH O.A.	33 INCHES
WEIGHT RTF	24 TO 27 OUNCES

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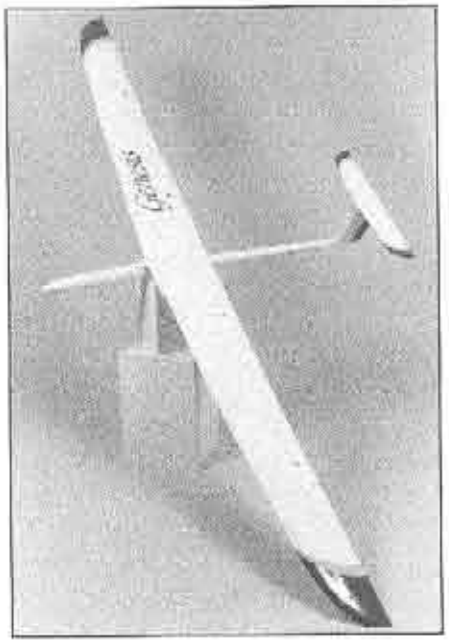

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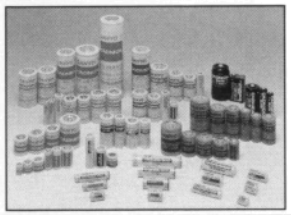

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&
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Standard Kit Price: $199.00
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SPECIFICATIONS:	2.9T	2.5T
Wing Span:	113"	99"
Wing Area:	938 Sq. In.	825 Sq. In.
Airfoil:	HQ 2.0/9 - 2.0/8	Same
Weight:	65 - 72 Oz.	57 - 65 Oz.
Wing Loading:	10.0 - 11.0 Oz./Sq. Ft.	Same