R/C Soaring DIGEST

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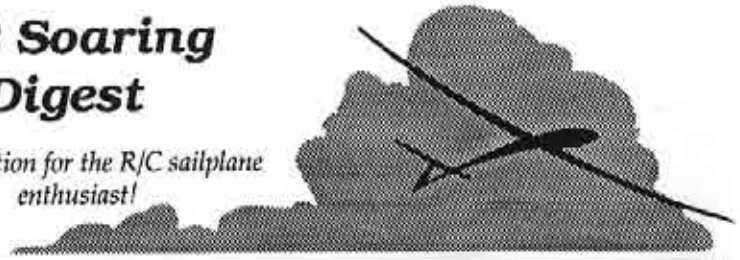
THE WORLD SOARING JAMBOREE "A FESTIVAL OF FUN & COMPETITION"

Erik Eiche of British Columbia, Canada, flew a beautiful scale replica of the full-size OBS which was originally designed in 1931-1932. Erik's eye for detail even included a minature wall map and pencils in the cockpit as shown here!

Cover photo by Barry Kennedy of San Antonio, Texas. Details by Gordon Jones on page 4.

R/C Soaring Digest

A publication for the R/C sailplane enthusiast!



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R/C Soaring Digest (RCSD) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January, 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of all articles, model designs, press & news releases, etc. are the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author. *RCSD* was founded by Jim Gray, lecturer and technical consultant. He can be reached at: 210 East Chateau Circle, Payson, AZ 85541; (602) 474-5015.

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The Soaring Site

This Old Plane

There is a new column in the issue called "This Old Plane". Fred Mallett of Corpus Christi, Texas says, "I'll describe a different plane each month, mostly scratch built, from construction to flight characteristics. Some kits may be included as well. I'm mostly thinking about pointing out "cool" construction techniques, performance to planform characteristics. There will be a consistent spec sheet about each plane to compare things like aspect ratio, fuselage frontal area, wing loading, decalage, tail size percentages, etc. Most of the planes will be slope and HLG type ships, as that is mostly what I build, although I do some limited thermal and electric."

Fred's address is with his first article, "Corpus Christi Slope Flying", and he says, "Come fly with us." Please let him know what you're interested in hearing about! Thanks, Fred!

The Tangerine

We received a FAX from Ed White regarding the 21st Annual Tangerine Soaring Championship which will be held Thanksgiving weekend this coming November. Ed says, "This is the oldest, and one of the most prestigious 3 day contests in the southern United States. Last year, we had over 10 states represented and some of the top fliers in the U.S. competed. Bring your whole family down to Florida, and while you are flying, send them to Disney World, Sea World, Universal Studios, Cape Canaveral, and the beaches.

"We have a new contest field that is over 250 acres (of a total 3000 acres belonging to the State of Florida) of green pasture land about five miles east of our club field. This will be a great contest and we invite everyone to attend. Trophies are

through 5th place on all three days with a grand champion trophy, also. We will fly 2 meter on Friday, and unlimited on Saturday and Sunday."

For further information, please contact Ed White, 3601 S. Laurel Ave., Sanford, FL 32773. Or call (407) 277-3862 (work), or (407) 321-1863 (home).

And from Colorado

Kurt Rosner of Boulder, Colorado, wrote to say, "I miss Martin Simons' writing already. How about running it all again, from the start, until he produces more for you?"

"P.S. How about some descriptions of thermals from the people who really know: the meteorological scientists who use "LIDAR" equipment to study the lower atmosphere? There has been quite a bit in the Soartech seminars."

Well, Kurt, your first question is easily answered. Martin has written an article for this issue and we have received a couple more, as well. In regards to your P.S., perhaps there is someone reading this that would like to write an article on this subject. If any of you can help, please let us know.

Corrections

In the May issue of *RCSD*, page 24, the ARIA HL was incorrectly called the Aria. Our apology to the designer, Mark Weiland. If anyone should wish to contact him about his ARIA HL, the address is: The Sailplane Works, 3355 South Dunkirk Way, Aurora, CO 80013. Mark's phone number is (303) 699-0467.

In the March issue of *RCSD*, page 39, reference was made to a "neat sport flier called the Whirlwind". The article was written by Jef Raskin, and he sent in the following.

"I spoke with David Reed, who designed the Whirlwind glider and is now coming out with a larger model of similar design called the "Visionary". He correctly points out that where I said in March that the Whirlwind was "not designed for aerobatic competition..." I should have said "not designed for precision aerobatic competition..." since as with any R/C sailplane there are many aerobatic maneuvers that can be performed with it. The Whirlwind is a delight to fly and handles with commendable quickness. (But then I'm partial to small, light models!) Expert flier Tony Carl kit-bashed his and equipped it with rudder and coupled flaperons-to-elevator. In this configuration it is a very competent mount for any kind of slope aerobatics. I can only repeat the compliment I gave the Whirlwind in the March issue: it is a neat airplane. Reed told me, as I reported in March, that he had designed the whirlwind for general sport flying, but he asked me to relay that he also intended it for combat and other forms of competition."

Happy Flying!
Jerry & Judy

Ron Widel's Minimoa

The Los Banos Scale Fun Fly

Photos by Ron Widel
Carmel, California

Jose Serrano of Long Beach & F-15 English kit.

Rich Spicer of San Jose & 17" wing span SB10.

Tom Overton of San Jose & Messerschmidt B.F. 110.

Planes by Lynsel Miller of San Jose
M.E. 109 - ASW 20 - TG3.

Kiona 60" Slope Race

Winch Line

Gordon Jones, 214 Sunflower Drive,
Garland, Texas 75041; (214) 271-5334
After 5:00 P.M. CST

My Summer Vacation
(Photos by Gordon Jones, Barry Kennedy, Jerry Slates)

This year I spent my summer vacation in Richland, Washington at the World Soaring Jamboree. No, I am not going to present a travelogue of blow by blow events, but rather a synopsis of the events that took place. It was a week well spent, with plenty of flying and a great group of folks (including 21 states, England and Canada). The event was sponsored by the Richland Chamber of Commerce, JR Radio, Slegers International, *R/C Soaring Digest* and a host of soaring clubs. Each event was run by the sponsoring club over ten days to include all of the events. On the slope side there was scale, novice racing, unlimited racing and 60 inch racing. The thermal events included novice, two meter, standard, unlimited, cross-country, F3J, F3B, hand launch and scale. In addition, there was a PSS fun fly.

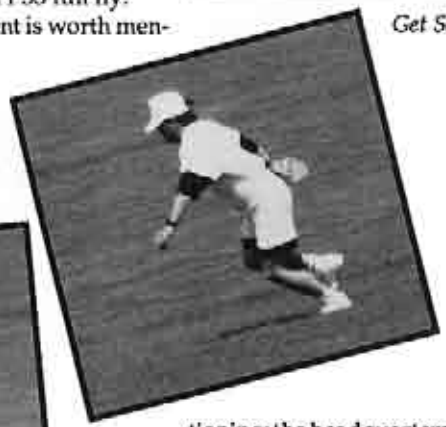
One aspect of this event is worth mentioning; the headquarters of the WSJ was located at the Tower Inn and managed by Charlie and Dorothy Harris. These folks are to be commended for the work they did for assisting in registering late arrivals, giving directions, providing the individual contest directors the entrants listings for each event and giving directions to any number of non-event locations throughout the Jamboree. If you

Dr. Eppler

F3J

On Your Mark!

Get Set!



Go!!!!!

Can anyone tell us who this runner is? Things happened just too fast to get his name!

(L - R) Ray Olsen (Arizona), Ed Slegers (New Jersey), Dr. Michael Selig (Illinois), and Dave Diesen (Arizona). Dr. Selig is holding a new plane by Ray & Dave called the Blackhawk.

ran into a problem all you had to do was get a hold of Charlie or Dorothy and they would help with the problem or answer the question. Plus, Charlie only got off his leash on special occasions so he didn't get to see a whole lot of flying.

As this was my first sortie to the high desert of Washington, I was impressed with the availability of great sites at which to fly. The slopes (Eagle Butte and Kiona) afforded the opportunity to fly in virtually every wind direction, and the sod farm provided a super thermal setting. The weather cooperated about as well as you could expect for that length of time in the northwest with a couple of partially rainy days, but mostly sunny skies for the majority of the event.

I went to the WSJ with several goals in mind, but primarily to view the slope flying and the scale events; in Dallas we consider a highway overpass the best slope around and the police just don't appreciate any flying there. In addition, this would be an opportunity for the majority of the *RCSD* columnists to actually get together in one setting. It was great to meet other folks that I and my counterparts had talked to or corresponded with over the years. Add to that the flyers that we met and you have the setting for the exchange

The English folks came a long way to fly.

Dorothy and Charlie Harris

of stories and ideas that make something like this a most enjoyable experience.

The stories included the one about the 62 mph straight wind at the slope with the 77 mph gusts that would hold up anyone who wished to lean out over the edge without fear of falling. This one was true because I was up there that afternoon and other than some windburn it was great.

Another tale circulating was about a thermal flyer who's transmitter "low battery" warning went off shortly into his flight. He borrowed a transmitter

Registration Area

(L - R) Gordon Jones, Jerry Slates, Ed Slegers, and Wil Byers

Erik Eiche's OBS! The cockpit detail is amazing. There is a pilot and a navigator who is facing back towards a minature map!

pack from another flyer on the flight line who had just completed his flight. He turned off the transmitter, grabbed the borrowed pack and as he was inserting the pack heard the other flyer say, "I hope this isn't the pack that bends pins all the time!" Now that will give you a warm fuzzy feeling for sure. (No, I won't divulge the names involved, but they know who they are.)

During the week we were fortunate enough to attend presentations by Professor Michael Selig and Professor Doctor Richard Eppler. Each of these gentlemen directed their talks on a variety of subjects while not overlapping nor covering the same topic. This provided a great deal of information to those who attended and made each presentation an experience worth while.

Michael Selig introduced a new airfoil - the S7012. This airfoil is projected to provide a greater speed range than the RG15 yet afford greater lift

The common area of the Tower Inn where the modelers gathered after hours.

D-Fafnir by Erik Eiche of Canada. 1st place Precision Vintage

Note scale construction on Erik's D-Fafnir!

SG-38 by W. Grundwr.

SG-38 detail by W. Grundwr!

capability than the S3021. When you look at the airfoil plots and associated data presented, the outlook for this airfoil is very promising. It was used by Michael Lachowski on his 60 inch slope racer and proved to be a very quick wing on the slope. In addition, the plans for the upcoming wind tunnel tests were unveiled in detail and a call for support from the soaring community was issued. It must be noted that the more we support these tests the more we will benefit in the coming years. If you are unable to do anything else, please contribute some bucks to this worthy cause. (Contact information is in the 2/94 issue of *RCSD*, page 40.)

Richard Eppler gave two talks, one on the history of flight which was presented in a slightly different manner from the normal straight historical perspective. This one provided the history with the reason for the success or failure of the various attempts at manned flight. He even demonstrated the results of these theories and calculations with models that provided first hand a realistic view of the successes. This approach gave the attendees a visual as well as analytical perspective into early flight. His calculations and design criteria centered around longitudinal stability. During his week at the WSJ, Doctor Eppler was so taken with the slope races that he plans to design several new airfoils for that purpose. These should prove interesting in the coming months.

In additions to the flying and seminars, a vendor display took place each night at the WSJ headquarters. It was mostly an impromptu

1/5 scale Rhonbussard by Greg Vasgerdsian.

(L-R) Carl Bice & Gene Cope helping G. Bennett install aero-tow release in his DG-500.

DH-Sparrow by Fred China.

Carl Bice and his Pilatus B4 after completing his first aero-tow.

100" Salto by Jerry Slates.

affair with the first few nights being a display and gathering of a great many folks from the sod farm and slope alike. Many an idea and story was passed in this informal setting with some of the discussions lasting to the wee hours. On the night of the static scale judging there were even real tables with table cloths to make it a somewhat formal affair. I don't know that modelers can really take formal settings.

I will let the photographs tell the rest of the story. Suffice to say, if you didn't make it you missed a great time. ■

1/5 scale Ornith by Jerry Slates.

1st place Stand Off Scale. Bbrgu Falkie by Gary Brokaw.

1/4 scale 1-26 by R. Holzapple.

Jantar I by Guy Russo.

Three Thousand Miles??

...by Ed Slegers

Three thousand miles, sixteen hours with layovers in airports and five days away from home... Was the World Soaring Jamboree worth it? You bet!! The slope site had to have been one of the best in the world and the thermal site looked like one of the largest. The Richland chamber of Commerce did a great job in making all the modellers welcome. As a matter of fact, there were so many things to do in Richland that, next time, I would bring my family.

The organizers did an extremely great job. I wish I could remember all their names, but there were so many it would be difficult to name them all. All of us there can certainly thank Wil Byers and his crew of hard workers.

A personal highlight for me was sitting at the dinner table with Dr. Eppler on my left and Dr. Selig on my right.

Next time they have the WSJ, I would highly recommend you go! ■

Wil Byers and his unlimited slope racer.

World Soaring Jamboree

Thanks for the Memories!

...by Jerry Slates

Well, it's over! It was a long 3 day drive from Texas for Barry Kennedy and I (and another 3 days back), but given a bit of a rest, we're ready to go again! As Wil promised, I had the "Festival of My Life"!

There were 211 entrants according to the last count I heard, but there were people everywhere. There was no time to get bored what with flying or watching others fly, eating, shopping, sight seeing, talking sailplanes, flying, and taking side trips such as picking up Gordon at the airport.

On behalf of all of us, I want to thank Wil and Mary Jo Byers for their enthusiastic support of the hobby. As Promotions Director and Event Coordinator, the amount of time, energy, and unselfish dedication that Wil was able to put into an undertaking of this size in order to share his love of the hobby with others leaves me at a loss for words. A simple "Thanks" just doesn't say enough. And, Mary Jo? Perhaps a bigger "THANKS" is in order. Her daily support included such things as running errands, greeting unexpected company, taking care of phone calls, taking messages, proofing copy, offering suggestions, and she was indeed observed to be at more than one location at the same time offering help, chatting, or just having fun. Well, maybe at just one location at a time.

Special thanks goes to the Richland Chamber of Commerce for not only sponsoring the event but for making me feel comfortable. (The Richland folks were helpful and friendly; the food was great!) And special thanks go to JR Radio and Slegers International for their sponsorship of the WSJ.

The presentations were great! I enjoyed meeting and speaking with Dr. Eppler, and always look forward to Dr. Selig's talks. For those of you that couldn't attend, video tapes from the presentations will hopefully be available soon; when we get more information, we'll let you know.

Another thanks is in order to Dorothy and Charlie Harris, each event CD, event helpers, and each sponsoring club. I was impressed! The events went extremely well and small obstacles (always has to be a few) were overcome with considerable ease and professional dispatch! A sailplane convention of this size just couldn't work without a tremendous amount of coordination! A job extremely well done to my way of thinking! Thanks also go to HiTecHobbys, the WSJ Hobby Shop Sponsor, and all the supporting sponsors who generously donated to the event! I hope I haven't forgotten anyone!

I wish I could list all the names of everyone I met and spoke with; you made my vacation a memorable time. Hopefully a simple, "Thanks!" will do until we meet again next time!

Will there be a second World Soaring Jamboree? Tentative arrangements suggest that the WSJ will be back in four years. However, we have a favor to ask. For those of you that attended, and while the event is still fresh in your minds, could you take a moment and fill out the Evaluation Form on page 31 of the WSJ Program? And now, for those of you that would like to have attended but didn't, the WSJ folks would like to hear from you, too! If you think you may be able to attend in four years, then go back through the issues of *RCSD* that contain information on the WSJ and jot down your thoughts on what events, for example, you would like to see. How about the time of year? School breaks? Can you help out with any events? Your input is important! The address is: WSJ, P.O. Box 4267, W. Richland, WA 99352. ■

Ventus by Gary Brokaw.

on the Wing

B^2

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

Winglets vs. a Single Central Fin

In looking over some photographs and contest descriptions in recent issues of *Silent Flight* and *Flug- und Modelltechnik*, we suddenly came upon some information which may be of use to designers of swept wing tailless sailplanes.

We noticed nearly all swept 'wings in European competition fall into one of two categories. They have either two fins, one at each wing tip, or a single central fin mounted on a boom. In the descriptions of the contest winners, those with two fins were characterized as the better thermal performers, while those with a single fin were said to track better in straight line flight.

There are a couple of logical reasons for this:

- Fin area mounted at the end of the wing acts as a winglet, increasing the effective span and preventing formation of a large vortex from the wing tip. This increases the potential C_{Lmax} — just what's needed during thermaling.
- A single central fin provides more directional stability because its surface area remains further behind the CG during yaw, thus providing greater leverage in a more consistent manner. It has no way of affecting the air flow over the wing tips, however.

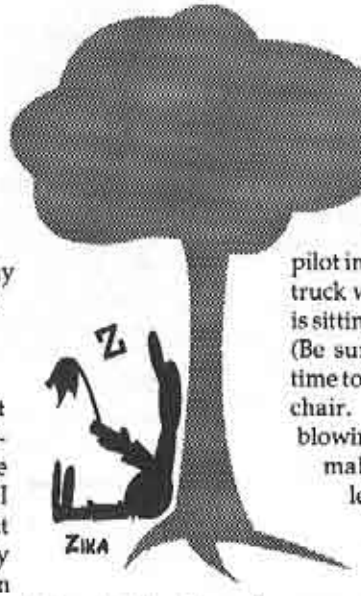
If you are designing a thermal duration or F3J 'ship, place the vertical fin area at the wing tips. If you are designing a 'ship which will be flying at higher speeds and in straight lines, a single central fin is probably best.

As two of three F3B tasks involve primarily straight line flight and only one task involves thermal duration, it seems a single central fin may be best for that event. But what about F3F? In this event, high speed flight and good tracking are very important, so a single central fin looks like a good choice. High g turns with maximum ballast, however, require sustained C_{lmax}, and this task is better suited to winglet equipped 'wings.

If any readers have additional thoughts on this subject, we'd appreciate hearing from you! B^2 Kuhlman, P.O. Box 975, Olalla WA 98359-0975. ■

On The Air With Cornfed

Fred Rettig
1778 S. Beltline Highway
Mobile, Alabama 36609
(205) 471-2507 (days)



"Flat Out"

Well, you know if you let enough time go by, someone will try to reinvent the wheel. This is just what I have done. Not reinvent the wheel, but a new way to launch a glider. Listen closely to my expert description of this new method, and you be singin' its praises, too, in no time.

To start with, here is a list of things you will need:

- One long wheel base pickup truck with a V-eight engine
- One bean bag chair
- One cheap mattress (Box springs don't work. Trust me.)
- 100 feet of line with rings tied to the ends
- Some rope
- A good driver
- One agile tow and release man
- Yourself at the controls (of course)
- (And most important) At least 1200 running feet of land without a creek crossing it

The Set Up:

Remove all trash from truck bed and sweep it out. Take the mattress and tie or tape it to the back wall of the bed, just behind the cab. Leave no metal showing. Now, put the bean bag chair in the corner by the gate. Don't forget to check fuel, oil and, most important, the brakes.

Set your plane on the ground pointing into the wind about seventy five feet behind the truck. The truck should also be facing into the wind. The driver should be set and ready to go. The tow man's job will first be to tie the pilot into the rear corner of the truck with the rope. The pilot is sitting on the bean bag chair. (Be sure to take a little extra time to tape all the holes in the chair. All that white stuff blowin' in your eyes can sure make for an extra challenge.) Securing the pilot in the chair can be difficult because of the lack of tie points. It may be necessary to go around the bag and the pilot two or three times, then over the gate, around the bumper, back over the gate, around the pilot, and then tie off on the bumper. Now, the tow man should hook up the tow line to the tow hook on the plane and climb into the truck bed and sit on the bed floor facing the rear of the truck.

The Launch:

The pilot hollers to the driver to ease the slack out of the line. As the plane starts to slide across the ground, the pilot screams, "Floor it!" The tow man will feed information to the pilot. The launch should go quickly. As the truck builds up speed and the plane becomes airborne, the plane will climb to about seventy five feet. Here comes the most important parts. As the truck builds speed, be especially careful when hitting potholes not to come loose from the bean bag chair. The tow man needs to stay upright and in position for the release.

Here is where the driver plays his most critical part. **The driver must be doing a flat out eighty five miles per hour.**

Upon reaching that speed, the driver will blow the horn (or holler if the horn doesn't work). Then he will stomp on the brakes bringing the truck to a screeching halt. The tow man's job becomes very critical at this point. (It's all in the timing.) Upon his transfer from the tail gate to the mattress, while sliding across the bed floor and just before impact with the mattress, he should look up at the plane to make sure it is in the right attitude for launching and flick the line as hard as possible for the most effective launch. Now the launch transfers to the pilot. (If by chance you become loose from your chair and rope, and you start to move through the bed of the truck at a high rate of speed, whatever you do when you arrive at the cab of the truck, do not, I repeat, **DO NOT** give down elevator. It took me a while to perfect this, but I think you'll agree with me after you've tried it that it's quite genius.

Now, since most of you probably don't own a long wheel base pickup, I reckon I'll share another way I like to launch. This launching equipment list is short. You will need twenty five feet of very heavy duty high start tubing. (One that will launch a four meter plane.) Hobby Lobby, for example, carries this. Oh yeah, it only comes in 100 foot lengths so, when you get it, cut off the twenty five feet needed and tie it to a big key ring for staking off. Tie a little smaller ring to the other end. Then tie on about 125 feet (maybe a little less) of 50 lb. test line, then last of all the chute.

Let me stop here and emphasize that this upstart is only for very strong built planes. I'm talking zoom-launching planes

Now, go out to your favorite field and lay the high start out. At first, when you hook the plane up and start walking back, you will feel like, if the line breaks, you might fall down. You will. So, be careful at first. Put the nose of the plane under and in your arm pit area as you walk away from the staked off end. Only walk as far as you can turn around and hold the plane comfortably until you become more confident with launches.

Now, let me tell you that the launch will take all of about two to five seconds. It is, therefore, very important to remember to set Launch Mode on radio before walking back. Then just pull tight and release the plane. At what looks about half way up or a little more, turn off Launch Mode and hold the plane on line for maybe another second, then zoom off. If you have done it right, I guarantee you will zoom to about 200 feet or more from a 150 foot launching device.

Now I know that some of you might be asking what can be done with a 200 foot launch. Well, let me tell you. Perhaps you want to shoot some landings with your unlimited plane. This method is more than enough to get a 70 to 80 ounce plane up. This launch also helps with learning more about low-level climbouts. Also, if you set the landing zone up close, to where the chute falls back to earth, you will be able to do anywhere from 20 to 30 one minute count downs inside of a one hour period.

Now, I understand that Joe Wurts uses a system similar to this, but I don't think his rubber is as strong. I hope that some of you will give this method a try. I believe you will almost stop using your winch once you get hooked on these short, fast launches. Oh yeah, make sure your plane does not have a tendency to roll off to the left or right when launched hard, because this launch has one heck of a pull.

Be careful now, you hear!

Signing Off,
Cornfed

P.S. Say your prayers and use some sun screen this summer.

ATTENTION: Asher Carmichael of Spanish Fort, Alabama. Please hurry up and get well from your recent back surgery. You know I hate to say I told you so, but if you would have listened to your

wife and not tried to carry the piano up the stairs on your back by yourself, this would never have happened. GET WELL SOON.

ATTENTION: Fred Rettig of Mobile, Alabama. This is your editor speaking. Where do you come up with this stuff? I spoke with Asher at length, and he informs me that he does not have any stairs, and is now working on a suitable response for his "corny" friend!

DEAR ASHER: Please get well soon! ■

The Need for Speed

...by Pancho Morris
Mesquite, Texas

I always see new fliers with floater planes like Gentle Ladies, Windrifters, and such flying around on the edge of a stall. Their planes are like a leaf or soap bubble in the wind being tossed around by any gust or turbulence. They will sometimes complain that they don't have much control over the plane, and when the wind comes up, they say that the plane is too light and won't penetrate. If they flew the plane faster, they would find that many of these problems would disappear.

Faster flying, to many people, especially beginners, is like adding ballast. They think that the plane will come down faster. They think that the slower they can fly the plane, the more it will hang up there like a feather, and it will stay up longer. Flying faster does at least two things. As you speed up, the plane becomes much more efficient and does come down a little faster, but it covers much more ground for the altitude lost. You are therefore able to search for lift over a much larger area while coming down rather than just floundering around hoping something will come along and stumble into you. The other thing is that the plane becomes much more controllable and responsive because the control surfaces have more airflow over them, making them more effective. You will find that the light plane will penetrate a whole lot better than you had imagined.

Most of the beginner planes are so light and forgiving that they can be flown very slowly and you can get away with it without much bad happening. They will fly much better speeded up but you can dog them around and they will still fly. The problem comes when you move into a higher performance plane and try to fly it the same way you did a floater. Some of the intermediate planes, like the Sagittas, Geminis, and the Spirits will still fly very slowly but the performance really starts to degrade. When you move into one of the high performance ships, they will not let you fly like that. They will come out of the sky like a lump of cold mashed potatoes. You must fly them more aggressively. Yes, they will slow down and float, but the pilot has to know the limits of the plane and has to keep right on top of it.

The next time you are out flying, try putting an extra click or two of down trim in your plane and fly a little faster and see if you don't stay up longer. ■

Finishing Obechi Wings

A few months ago I wrote an article on finishing obechi wings. The article gave a step-by-step description using the epoxy filler and clear laquer method. Although this gave excellent results, it was time consuming. Since then, I have been using a different method that is fast, very light, and I think gives even better results.

The new method uses a product by Carl Goldberg called Ultracote Plus; it is relatively new. It comes in many colors, but I used the clear. The unique feature of Ultracote Plus is that it has a sticky back, similar to shelf paper. The nice thing about the sticky backing is that no heat is required except to seal the edges. The bad thing is that it sticks to itself like crazy, so application is a little different from other plastic coverings. The steps to getting what I think is one of the best, lightest, and nicest finishes are as follows:

Step One: Sand, sand, and sand the wing. Start with coarse and work your way down to about 400. Use long sanding blocks. Most experienced modelers I know use long sanding blocks. For you new builders, do yourself a favor and either purchase or make a few long (about 18" to 24" x 1 1/2") blocks. The results are well worth the effort. After your wing is sanded, remove all the dust. The best way is to use a compressor and blow off the dust. If you do not have a compressor or access to one, the next best thing is to use a vacuum.

Step Two: This is the step that I feel makes the biggest difference from having a good finish or having a great finish. Seal the wood with balsarite. Balsarite is a product made by Balsarite Rycoverite and is available in most hobby shops. Apply the Balsarite with a brush, being careful not to put too much on; don't let it get on bare foam like the servo cutouts. Balsarite eats foam. Let the first coat dry about an hour. Sand lightly with 400 paper and vacuum or blow off the dust. Apply a second coat and let dry for about an hour, and also remove the dust.

Step Three: Cut Ultracote Plus about 1" larger than the surface being covered. Anything bigger than 1" and you run the risk of the covering sticking to itself. This has to be avoided because if it does happen, it is almost impossible to separate. I start at the root and work my way out to the tip. Lift the backing off of the covering about 4" and fold the backing paper under itself. Next, position the film on the wing and rub down with a soft rag. Pull the backing off a few inches at a time, rubbing down the film as you go. Rub down the center, and then out to the leading and trailing edge. Try to work out any bubbles as you go. Removing bubbles is very easy with Ultracote Plus. Also try to avoid having to lift the covering off your wing. Ultracote Plus is so sticky that, in most cases, some obechi will also come up. Make sure to use a soft rag. By rubbing down the covering with a soft rag, you will get a finish that is mark free, something that you will not get using an iron and heat.

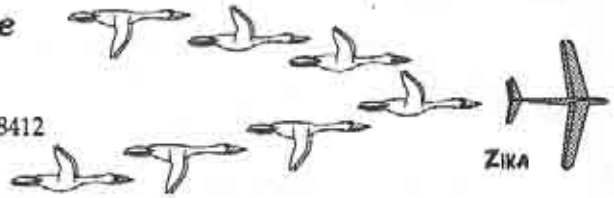
Once you have the covering rubbed down, trim the edges with a new razor blade. Ultracote Plus is very hard on blades, so be prepared to use quite a few. Use an iron to seal only the edges. Do the rest of the wing, rudder, and stab the same way. On the last wing I did, I tried something that worked very well. Cut some trim of your choice and apply that first. Then do the whole wing in clear and your trim is sealed under the clear. This eliminates any loose edges from peeling up.

Give this new method a try next time you want a natural obechi look.

Good Flying! ■

This Old Plane

...by Fred Mallett
334 Haroldson Dr.
Corpus Christi, Texas 78412

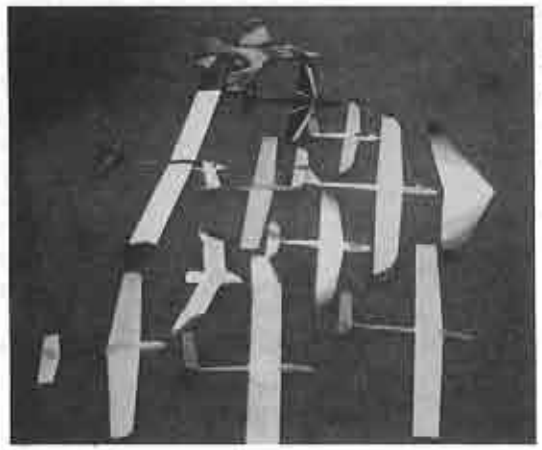


Corpus Christi Slope Flying

Three up, three down. It was a great day of Corpus Christi slope flying. Our secret slope was going off big. Not many people know about this site, and not many people would want to, but we like it that way. Standing on the edge of the biggest cliff around these parts (about 50 feet), the wind blows at your back when you launch. Kinda un-nerving to throw a lead sled with a tail wind. Especially since it's 50 feet down a 70 degree gnarly slope to water. Well, mud at low tide. The plane usually does a tail drop before hitting the lift zone and gets sucked up. This hill gives great lift, but the zone is very narrow, and very vertical. The top of the hill is perfectly flat, and grassy. The field is very narrow, and surrounded by two houses. Across the street under the power lines is a bigger field. The typical landing approach here is to turn down wind very high; when at the east side of the field, count three telephone poles, then turn to base, diving madly to get low out of the lift, then fight the rotor back across the field 'til slow enough to hit the deck. This location has the most intense rotor I have ever seen when it is going off. A great landing is when you fight the rotor back across the street under the power lines into the small field.

The better the wind, the worse the rotor. Kind of a love hate place to fly. On this day the lift was fantastic, so the rotor ate all three planes on landing. That's why god made 4-40 nylon bolts. No serious damages done, but all three landings drew hoots and hollers.

Slope flying is alive and well down here, but rather different here in the southern sticks of Texas than in the more known locations. After traveling around for slope flying and after flying some of the big Pacific, Colombia River basin, desert, and Atlantic sites, I still prefer home. Here is the rundown on Corpus slopes: The season is pretty much year round, but the our favorite site really turns on March to May. That is when we get the most consistent easterlies, which means Rope Park. (As this is written, it has been great flying for the past 14 days in a row.) From October to March we look forward to fronts which give us good north and northeast winds to make Oleander Park onshore. During the summer with guaranteed southeasterlies everyday, the Dunes at the Gulf work, but not for lead sleds due to the irregularities in the dunes. Here we usually fly more floater type planes: true floaters sometimes, but usually handlaunch, or flat wing lightly loaded or efficient aileron planes. The thermals really boil up off the salt marsh behind the dunes if you have the intestinal fortitude to go downwind over that mosquito infested swamp. Landing at the dunes is usually hand catch, as the dunes drop off behind you, so the rotor is bad. The good part is that there is tall sea-grass and sand all around. For beginners, just fly out over the beach, turn parallel to the dunes, and land down below. The dunes range from 30-50 feet tall. The parks described below are on Corpus Christi bay, and are listed on all the maps.



My May 1st active fleet.

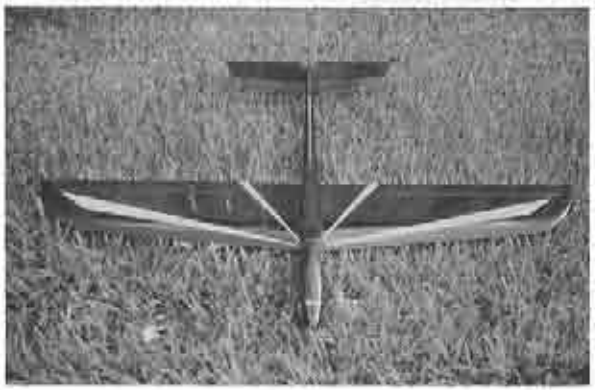
Ropes Park in April. Ray is flying the Penetrator while Roland watches.

Penetrator (L) with Ray Milburn's Sweepie scratch built.

My Combat Models F16.

Seen in the picture (facing west), Ropes Park is higher to the west than east, with a great gray wall (house) at the end which gives an extra 50 feet to the hill for a good lift bump on that turn. There have been as many as 30 planes out here on a nice spring day, usually no more than half a dozen or so in the air at once. The lift band is narrow due to the size of the hill, but this makes it fun. The norm is for grass mowing slope racing with the lead sleds, or follow the leader aerobatics when the racing gets old. Slope racing is a natural as there are built in turn points, the palm trees at one end, and the shoreline curve at the other end. The runs here are short and intense, this is why we like it. From end to end is about 400 feet.

Another great location is Oleander Point. Best wind is north-northeast. There is almost a mile of slope, with a couple bowls to favor slightly crossed winds. At

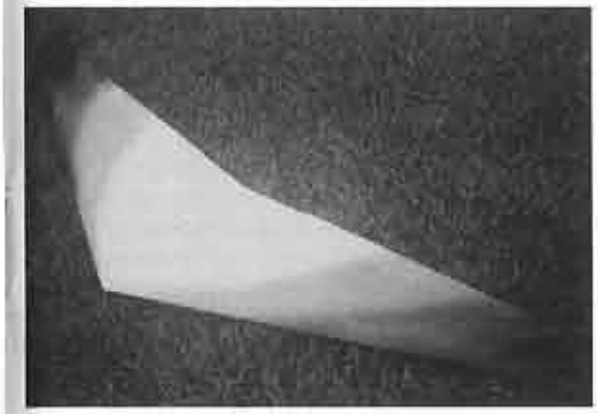


Quicksilver with modified wing tip.

Shred-Air designed and built by Bobbie Dumas.

the west end is a small steep bowl for northwesterlies, and to the east end is a big bowl for when the wind crosses from the right (head to Ropes Park when it is too crossed to the right). This is a good beginner spot when the wind is light (under 10 MPH) as the landing approaches are clear. The entire length of the park is a 100 foot wide grass strip mowed by the city. Even the hill here is long grass for "feathered in" crashes. But then again, land behind the strip and you've got 4 lanes of plane crushers waiting (beginners shouldn't fly at 5 pm on weekdays). This slope will fly a handlaunch in 2 mph, and a gentle lady in 4. At around 15 mph it turns on for the lead sleds, and the good days are the 30 mph winter northerlies.

So, what do we fly down here? Glad you asked. There are quite a few new fliers with the usual assortment of polyhedral planes: Gentle and Sophisticated Ladies, Explorers, Gnomes and the likes. On light wind days these planes are also seen floating around guided by beginner through expert alike. More common on light lift days are handlaunches and the high performance thermal/slope machines like the Mark Allen T2000, and lots of scratch built type aileron birds from 60 to 100 inches with high wing loading and fast airfoils like SD7037, S6060, RG14, RG15. These birds eat up the slope fast in light wind and can also out float the floaters. They also



My Javelin.

have the advantage of being able to keep on flying when the wind picks up. On medium wind days (10 - 20), the big planes above are flown, but you'll usually see many more smaller planes. We have found the 50 - 60 inch class to be very fun here as the roll rate allows more maneuvers in less air space. Most of our local fliers have a wide selection of scratch built planes in this size like the Shred-Air and Sweepie. Kits most common on these days are Silhouettes and Nighthawks. When the wind really gets going (15 - 40) the planes that look like planes start to show up; Penetrators, Strykers, F-16s, A-10s are what come to mind. The only thing I have not yet seen on the slope here is a scale version of a Sailplane, I hear one is in the works.

Local things to know

Best excuse for crashing a plane: Look at that flock of birds!

Second best excuse for crashing a plane: I was watching your plane!

What to say when you crash a plane and it doesn't break: I feathered it in!

Best feather in: Tails locked sparrows with inverted landings. (WE feathered them in.)

Crash to beat: Lodged in a storm shutter across the street.

Landing to beat: Middle of the street at rush hour while not looking. (He was watching someone else's plane.)

Record to beat: Three trashed planes in one day (by one pilot).

What to tell non-R/C tourists before they even ask: No. It gets wet. As far as you can see. Build a new one. $200 dollars. No.

Oh yeah, you are all welcome to come and fly with us, but don't forget to bring some shmigglys. ■

Scale is Cool

...by Jim Blum
Springwater, New York

Many times over the last 8 years (usually after the arrival of a new Hobby Lobby Catalog!) I have really wanted to try flying a large scale sailplane. Some practical considerations such as: "Boy these things are pricey!", or "Where would I fly it?", and "How would I get it up?", intervened whenever I would reach for the phone/credit card. But the image of that 4-meter Discus cruising effortlessly over the Alps remained firmly embedded in my mind. (These marketing guys really know how to hook you!)

Excited by Wil Byers' writings, I attended the 1992 scale fun fly in Richland, Washington to get a first hand look at some of these machines in action. While Kiona Ridge and Eagle Butte certainly must be two of the premier slope sites in the world, the wind did not cooperate that weekend. Although all the great PSS stuff was grounded, it provided an opportunity to see how scale sailplanes would per- form on thermal lift alone. These would be the conditions I would have to deal with (Upstate, New York), if

I were to pursue flying these sailplanes.

I was VERY impressed with what I saw! From a hand toss off windless Eagle Butte, Bill Liscomb put in a tremendous performance with his Fiber Glas Flügel ASW 20. After centering in a thermal, the big ASW 20 was merely a speck in the sky after a few minutes of precision turning. The flight culminated with a high speed pass right on the deck, showing the speed, strength, and versatility of this magnificent sailplane! The approach was long and scale-like with retractable landing gear and spoilers deployed to a smooth roll-out landing.

Next up to risk their bird on the windless butte was Gary Brokaw with his impeccable scratch built 1/4 scale ASK 18. After dropping several hundred feet below the lip of the butte, he caught a thermal and proceeded to speck out in a short time. I knew I was no longer in New York when I witnessed Gary working a thermal 300 feet BELOW us! The show continued with Gary's scratch built 1/4 scale Habicht and Minimoa. The consecutive axial rolls he performed with the Habicht were particularly well executed. Yes, scale sailplanes can be quite aerobatic! Several other flyers were able to work the day's thermals with these large scale gliders.

My first misconception, "scale sailplanes are heavy and thermal poorly", had been shattered. Earlier that morning a couple of Legends (a very respectable thermal duration sailplane) had been flown, and I can unequivocally say that the scale ships performed every bit as well, if not better, than these thermal duration thoroughbreds.

Sunday dawned with the same calm conditions that had prevailed Saturday. The decision to winch launch from a local soccer field was made. Again, I was disappointed not to see all the diverse ships on a working ridge, but it would be valuable to see how large scale gliders would work when winch launched. A nice mix of equipment was flown including Wil Byers' 1/4 scale Jantar, Bill Liscomb's ASW 20, Guy Russo's 1/4 scale Graupner Discus (complete with releasable water ballast!), and Gary Brokaw's vintage 25 ft. wingspan, Austria Elephant. Thermals were more difficult to come by, but all the ships flew well with several flights in the 10 minute range. All the gliders performed ROG launches with a standard Rahm winch providing the motivation. Launch heights were noticeably lower in the calm conditions than TD or F3B aircraft might achieve. I am sure the added weight, high A/R wings, and flexing spars contributed to this. My second misconception, "scale gliders are difficult to winch launch", was badly shaken. I'll admit that you need to be able to read the air well to thermal a 1/4 scale glider from a winch launch, but I saw it done numerous times that Sunday.

I had given up flying conventionally launched gliders in favor of electric a couple of years ago because there were no local clubs, and I was sick of pulling high starts out of trees! I had a Multiplex Fiesta which I flew on the one nice ridge in my area, but it always seemed that the wind direction/velocity was wrong when it came time to fly. One of the members of the power club I belonged to built a crutch last year which he strapped to the wing of his Senior Telemaster. I was now being lifted to heights of over 1000 feet! This completely changed the venue of possibilities. Instead of struggling like h*ll to catch a thermal from a relatively low bungee launch, I was able to work the better developed higher altitude thermals and even start practicing some aerobatics. The first time I did a high speed pass three feet off the main runway and proceeded to fly out about 1/4 mile and make it back for an easy landing, the view of glider performance at this power-only club changed forever!

The success I had experienced piggybacking the Fiesta prompted me to place an ad in the club newsletter soliciting folks to combine resources (radios, servos, motor, time, etc.) to build a club towplane. I had hoped to stimulate some glider interest in the club, plus insure a platform for my own soaring endeavors. The only response came from a non-club member who fortuitously happened to see our newsletter. A few weeks later I received a call from Robin Lehman. I was very familiar with Robin's activities in aero-towing large sailplanes from the articles he had authored in several publications. In fact, I had purchased John Clarke's video on aero-towing which featured a couple of Robin's 1/2 scale sailplanes. Through Robin's generous help, I was introduced to the joy and challenge of aero-towing big gliders.

The first aero-tow I witnessed featured the 1/4 scale Roke ASK 18 towed by a Senior Telemaster. Robin and the tow pilot, Lenny, made it look easy! The ASK 18 was released at high altitude on this blustery April morning, and I was quickly handed the transmitter. The ASK 18 proved to be a wonderful floater, gracefully flying much like I imagine its full-sized scale counterpart. After 15 minutes my hands were cold, so the transmitter was passed around to several different people (one rank beginner). The flight ended at over 40 minutes and could have been longer had the novices not participated. Forty minute flights in my neck of the woods are not common occurrences with any type of sailplane, scale or otherwise! I was psyched! Next up was a beautiful fully moulded, 5-meter, Orfa ASW 24. This elegant glass slipper was easily pulled to altitude where its superior L/D was quite evident, resulting in a nice long flight covering lots of ground. The following weekend my initiation began as I successfully piloted my Aero Composites ASW 24 from takeoff to landing. I did it! I had a few problems keeping my orientation to the towplane at altitude, but I am confident I can master this exciting launch method. The thrill of flying my first large sailplane had finally become a reality.

I think aero-towing is the vehicle with the potential to open up the world of scale soaring to those of us not lucky enough to live near those gorgeous west coast slopes. Virtually every power club field is a candidate for a flying site, plus competent tow pilots can often be recruited to assist. Flatlanders everywhere can enjoy the unique challenges, beauty, and performance available from large scale sail- planes. With this reliable method of getting your scale glider to a high starting altitude you are assured longer and more rewarding flights, plus towing itself is fun!

Obtaining large, scale glider kits has not always been easy in the past. Slowly this is changing, with more individuals importing quality German-made sailplanes, complimenting the recent upsurge of domestic scale offerings. By joining NASSA (North American Scale Sailplane Association) you will have access to a comprehensive list of individuals and manufacturers who can assist you in finding the scale glider of your dreams. I must admit that my foray into scale did reinforce one of the preconceptions I mentioned, "scale sailplanes are pricey". But... the good news is the performance matches the price!

Scale is Cool! Do It! ■

ZIKA

Computing Rib Cords for an Elliptical Planform Wing

...by Wildey Johnson
Lerona, West Virginia

Stuart Smith's question about computing rib cords for an elliptical planform wing has several easy solutions.

Rib cords can be computed from the equation for an ellipse.

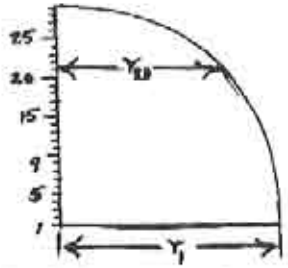
$$y = (a/b)\ \text{sqr}\ (b^2 - x^2)$$

Where

y = rib cord
x= spanwise distance from center
a = cord at center of wing
b = half span of wing
sqr = square root

Put this equation on a spread sheet program and you can compute a complete set of rib cords in seconds.

Another approach is to solve this graphically. Since a circle is a special case of an ellipse, you can scale a circle to represent any ellipse. First draw 1/4 of a circle with a radius equal to the root cord of your wing.



Now decide how many ribs you will need for each wing (half span). Divide one dimension of the 1/4 circle into that many equal parts. Measure the cord lengths directly on the diagram you constructed.

As a side note, I would construct the wing with a straight spar (not a straight T.E.). For a straight spar, decide on the spar location (at the 30% point, for example). Notch each rib at the (30% or whatever) point and attach to a straight spar. This will result in a wing centered about the 30% (spar) cord.

Cut the ribs full length so the L.E. and the T.E. wood can be placed between the ribs. Place the ribs close enough so the L.E. and T.E. curves are sufficiently defined by the ribs alone. ■

Plotting Elliptical Planforms

...by Al J. Szymanski
Aumsville, Oregon

The intent of this short article is to respond to Stuart Smith of Tasmania, Australia, on his question about plotting elliptical planforms. (See *RCSD* 5/94, page 2.) The following BASIC language program will generate the points for plotting any conic section.

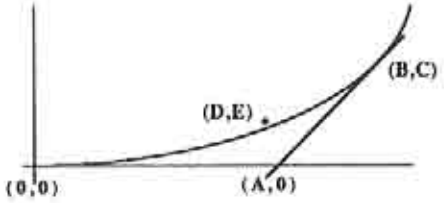


Figure 1.
Points required to plot an conic section.

All plots are considered to begin at the origin 0,0 and plot a half ellipse to point (b,c). Point (a,0) is that point where the tangents to the desired curve meet. For an elliptical planform, the value for a and b will be the same. Point (b,c) then represents the maximum half span of the wing and the half chord dimension. Point (d,e) requires a bit of explanation though. (d,e) is called the sholder point and you can think of it as the point that the ellipse has to go around on it's way from the origin to the destination. You can have an infinite number of curves that start at the origin and end at (b,c),

```
5 REM - Conic Lofting Program, Al J. Szymanski 1993
6 REM - Written in GWBasic/MSDOS
7 REM ------------------------------------------
10 REM -program for generating conic loft points
20 REM -given three points and one being 0,0
30 REM -(a,0) is the common point of tangency
40 REM -(b,c) is the second point for calculation
50 REM -(d,e) is the sholder point
60 REM -ask for number of iterations
70 REM -display points for curve
90 F$ = "####.#####"
100 PRINT "Enter point of common tangency , A,0 :";
110 INPUT A,Z
120 PRINT "Enter point B,C              :";
130 INPUT B,C
140 PRINT "Enter sholder point D,E      :";
150 INPUT D,E
160 PRINT "Enter number of iterations   :";
170 INPUT I
180 REM -prepre values for calculations
190 F = C*D - B*E
200 G = F*F
210 H = C*(A-D) + E*(B-A)
220 K = (H*E)/G
230 L = B*B
240 M = A-B+(L*K)
250 N = C/M
260 O = (B*K)-.5
270 P = O*N
280 Q = (A*N)/2
290 U = N*(.25 - (A*K) )
300 R = N*U
310 S = 2*Q*P
320 T = Q*Q
330 CLS
380 INPUT Z$ : CLS : W = 0
390 REM -now run calculations
400 OPEN "ARC_OUT" FOR OUTPUT AS #1
405 PRINT "A",A," B",B," C",C," D",D," E",E
410 PRINT #1,"A",A," B",B," C",C," D",D," E",E
420 FOR X = 0 TO B STEP I
430 Y = ( (P*X) +Q ) - ( (R*X*X)+(S*X)+T )^.5
435 PRINT X,Y
440 PRINT #1, X,Y
450 NEXT X
460 CLOSE #1
470 SYSTEM
```

all that differentiates them is the sholder point. Your selection of the values for the sholder point may depend upon aesthetics or upon hardware desires, at any rate, this is one value that you'll have to play around with to get your final curve values. I have used this program to generate the values for a sheared ellipse planform (one with the chordwise dimensions of the ellipse, but with an straight line for a trailing edge) with an ellipti-hedral (my name for a continuously curving upsweep of the wing - the ultimate in polyhedrals). The value for iterations allows you to create values for more or less than 1 unit, that is to say, if your measurements are in millimeters and you want points plotted every centimeter, use a value of 10 for your iterations. Conversely, if your measurements are in inches and you want points every half inch, use a value of 0.5. The program saves the points in an ASCII Text file called "Arc_out", that you can print out for final plotting. ■

This photograph of Dan Fulmer of San Francisco, California with his Spitfire was sent in by Ron Widel of Carmel, California. The event was the Los Banos Scale Fun Fly.

Something About A Spitfire

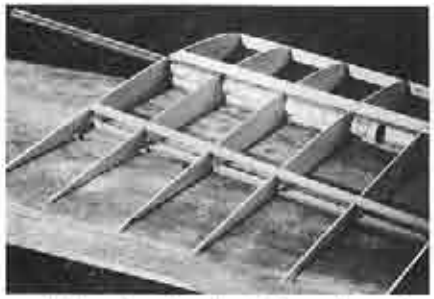
...by Dan Fulmer
San Francisco, California

The spark of creativity popped into my head one blustery fall flying day last year. As I flew my ME-109 in the strong winds south of San Francisco, I wondered what a Spitfire would look like chasing the 109 around the sky. Just like that, I knew I would have to build a "Spit" some day. Probably sooner than later as the relentless summer winds were dying and I would have all winter to plan, build, cuss, re-fit, etc. This would be, I knew, no small undertaking, for the size of the ME 109 (85") span would mean the Spitfire span would approximately be 95", as it was a larger plane all around. With these thoughts in mind, I went home to family, work, friends, and 49er football, where over the next few weeks the Spitfire seed started to germinate. Loose ideas about airfoils, fuselage construction, controls, and just about everything else were gathering momentum and a somewhat fuzzy battle plan was emerging, sometimes on paper, but mostly in my head.

This is not meant to be a construction article with many unrecognizable explanations and pictures interesting only to those contemplating building that particular aircraft, but rather an exploration into how a completely scratch built project achieves actual flying status and the stumbling blocks that are overcome along the way.

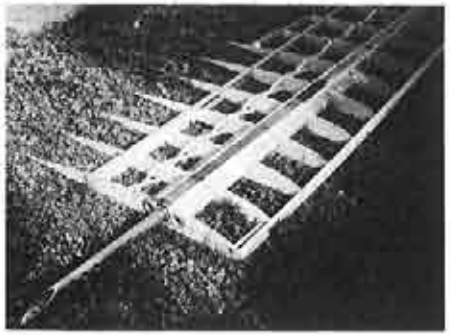
One of the first areas of concern with building a slope soaring warbird is what to do about the scale dimensions of the full size plane scaled down to whatever size you want it to be. Without going into a lot of physics and mathematics, of which I have only a smattering of knowledge, let's just say that an exactly scaled down WWII fighter needs a little help aerodynamically if it is to be a glider. This means that the model will be a sport or semi scale replica of the real McCoy. Some might have a problem with this concept of compromise, but I am not one of them. As they say, "Life is full of compromises". The main area to look at in this regard is the increasing of the span and area of the flying surfaces. Especially important is the surface area of the vertical fin and rudder. WWII fighters do not have very large tail moment arms nor do they have typical glider size vertical fins. Of course they had a huge prop blast and high speed to keep everything straightened out in the rear. I learned this lesson the hard way on my ME-109 as it was first configured with a very small fin and rudder to simulate scale appearance. The first real flight off of 200' cliffs had me on the verge of losing the plane due to low speed yaw instability that would drop a wing tip on the 9 1/2 lb. plane. Increasing the size of the vertical fin and rudder to a little over one and a half times the area of the scale size fin made a huge difference in the stability of the yaw and roll axis.

The typical fuselage of even the water cooled V 12 engined fighters were huge compared to your average glider. Frontal area is in the 30 - 40 sq. in. range if you make your fuselage true to scale (1/5 - 1/6). The Spitfire especially, has a very short nose moment and stretching it out to avoid putting lead in the spinner would drastically alter the look of the plane. I figured to slim down the fuse and extend it in the front slightly to prevent putting a massive amount of lead in the nose to balance the lack of a 2 - 3 lb. engine in front.



Right wing showing ballast tubes and joiner rod.

Foam blank fuselage with initial layer of epoxy glass.



Almost completed left wing ready for sheeting and showing drilled and tapered joiner rod and kevlar wrap spar, "X" bracing and sub spar.

A constant shuffling of these ideas and thoughts are kept in somewhat loose order as the total concept is sorted out prior to starting actual construction. This is not in any way to say that this is the only way to approach a project like this but rather this is the direction that I took with this particular plane. I tend to build each plane differently; foam/sheeted with some, built up with others, exact plans, hardly any plans. I find it interesting to go with what feels comfortable at the time. Of course experience with many methods of construction, planning and building lets me pick and choose rather loosely and "Change horses in midstream", as the saying goes, to accommodate any changes or hurdles along the way.

So this is basically the way this Spitfire project was approached. I'm sure many of you have started much the same way. You sort of grope and feel your way through it with experience, basic knowledge of aerodynamics, etc., keeping in mind the overall goals. After all we are doing something completely from scratch and it is like a blank piece of canvas; you can do it any way you want. That to me is the reward of scratch building. As far as being fearful of failure, I never think about that. The only failure would be not to start the project or complete it to its logical conclusion.... diving down from 400' to the beach below and soaring out over the breakers etc., etc.! Oh well, enough of fantasyland, back to the realities of life.

In my humble opinion, the magic of a spitfire, aside from its historic contribution to the war effort, is the classic lines of the airplane, namely its wing. And therein lies the major area of concern for construction. It is not just "The Wing",

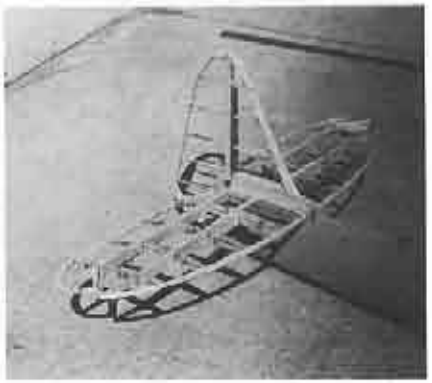
but rather "The Elliptical Wing". There is a commercial about dog food that says: "How do you get a square meal in a round can?" I asked myself how I could get an elliptical wing out of a foam blank with a hot wire cutter and could not come up with an answer. A friend of mine said that he had read where you could bend the foam blank then cut the wing to the required shape but that the process was quite involved and a whole lot of math was involved. Needless to say, problem #1 was solved automatically; I will be forced to construct a built up, balsa ribbed, curved leading and trailing edged, two piece, I beam spared monster with elliptical tips! Tail feathers will also have to be constructed by this method. We are talking about a lot of hours in the garage for this baby.

Almost completed fuse. with fairing for wing and ready for tail feathers and canopy fitting.

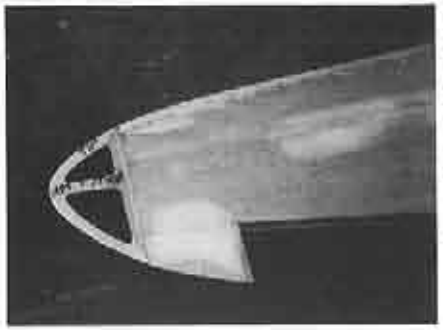
Completed fuse. with only painting and tail feather covering to do.

Looking for an easier way to construct a wing such as this one, I thought of how much headache I could save myself if I just used a flat bottomed airfoil. Alas, the good performing 3021 Selig came to mind as the perfect choice. An all around outstanding performer with no vices such as super thin trailing edges, rear undercamber, etc. By using an old piece of 5/8 sheet rock laid on an old dining room china cabinet, I had my perfect work table that I could draw the whole wing on. Pins stick into sheet rock very well and you can throw the sheet rock away when you're finished! Again looking for an easy way to plot about 16 different rib sizes, I went up to a copy store with my Soartech #8 airfoil book and went about enlarging the airfoil plots up to a 16" root cord. I was smiling all the way home with the idea of how easy cutting out all these different size ribs was going to be. That is until I took a good look at the 16" enlargement, which didn't look anything at all like a 3021 airfoil! Where did all that undercamber come from? How come it looks so thick? Apparently the copier distorts each % enlargement just slightly, enough so that by the time you have a 200% enlargement, you have a major distortion problem. Someone told me that some of the older copiers did this to prevent counterfeiters from making money. What I really needed was an airfoil computer program. I didn't, so I did them the old fashioned way; root and end foils out of plywood, then stack sanding a few pieces of balsa (32) between.

Digressing a little on the structure needed to keep this large bird together at high speeds in high winds, I figured the wing with the 3021 airfoil could support quite a bit of weight because of the 1100 sq. in. plus area. Coupling this with the fact that the cliffs around here are fairly high and steep with 20 to 30 MPH winds,



Built up tail feathers ready for covering.



Elliptical wing tip construction prior to sheeting with 1/32" balsa & painting.

Monokote covered and primered (laquer grey auto primer). Ready for final painting and detailing.

the plane will be subjected to quite high loads. I have built a P-38 and the ME-109, and both of these planes have come out consistently a little heavier than my best intentions. I feel that most of the weight increase in these warbirds is in the fuselages because of the huge diameters of them compared to your average glider with the same wing area. This produces, in the case of 1/6 to 1/4 scale fighters, a massive increase in frontal area and total wetted fuselage area and the accompanying parasitic drag. The plane then needs more weight to overcome the affects of drag. This, unfortunately, means the plane needs more lift to achieve the same results of its slippery cousins, which means more wind and a higher average wind speed to fly like it should. This whole process is like a catch 22 deal. Ideally you would normally want to build something this scale as light as possible, but with all that parasitic drag working against you, it just won't penetrate out in anything stronger than a 15 MPH wind. Now all of this just means that these big WW II warbirds need some weight (18 - 25+ oz. per sq. ft.) and big wind to fly well. This leads to building the airplane strong enough to take some pretty good loads and "G" forces. If you build a plane such as this type with a wingspan of 85" - 105" or thereabouts, you can pretty well figure that it will weigh somewhere around 8 - 12 lbs. after nose weight to counteract the short nose moments of this type of plane. This is a fair amount of weight to pack around. This is the reason that the wing and other structural components should be robust. The airfoil chosen should be one that performs better in the higher angle of attack realm rather than its low drag/high speed/low angle of attack cousins. A foil of somewhere around 10% thick should take care of the strength requirements without sacrificing much performance.

Basically, the wing is a two piece affair

View showing relative size. Spoilers (10" Graupner) located just behind 20mm cannons 1/3 out on half span.

with a 5/8" OD X .049 wall chrome moly joiner rod set in a substantial spar arrangement with balsa sheeting with fiberglass and paint. I have read many articles on wing structures and construction methods that have greatly assisted me in designing and building. Adding sufficient dihedral makes the plane a little more stable upright and also gives the appearance of realistic flight. The full size planes had quite a bit (about 5 degrees per side) and if you don't put it in, the airplane just does not look right in the air. Actually, one of the main reasons I like to build and fly this type of airplane is that they look so realistic in the air. The bigger they are, the better they fly and look airborne. Unfortunately, when they are bigger they are subject to more damage when things go wrong. But we won't talk about that subject.

The fuselage is white foam free formed by shaping with sandpaper and epoxy glassed and painted. Tail controls are large Sullivan tubes with braided wire CA'ed inside the inner tube. This really stiffens the control action up and prevents stretch in the linkage. You do not want excess slop in any control surface. Aileron servos are direct to ailerons. Spoilers are set into the wing outboard of the horizontal stab to make landings much easier. Tail feathers are built up with NACA 009 airfoil and covered with monokote and then painted. Canopy and pilot figure with cockpit trimmings were added for a realistic effect.

On the subject of flight control surfaces, I feel that one of the most important areas of concern should be the accurate and smooth operation of all controls. This entails building strong ailerons, rudder, elevator, and other control surfaces with strong hinges and sealed gaps. This makes a tremendous difference in how the model will fly. A bad flutter of a control surface on a 10 lb. plane in a 80 MPH dive will have a pretty decent chance of totally destroying your handiwork. These big planes do not do tight quick aerobatics very well, but do generate a fair amount of speed and "G" forces while cruising around doing loops and rolls.

After countless hours of thoroughly enjoyable building, the day arrived to see what this huge bird would do in the air. A process I usually go through when first flying a new plane is to toss it into a fairly strong breeze from off the sand dunes that are about 10' above the beach. This is primarily to see if the pitch controls are set somewhere near to where they will glide the plane easily to the beach. There is nothing worse than pitching a huge heavy plane out into the void that you have fight to control its every movement because the CG is way off or the elevator trim is nowhere close. As it turned out the plane was slightly tail heavy and needed more weight in the nose. A larger miscalculation on the MAC and related C/G of the elliptical wing could have really trashed the plane. The elliptical form of the wing makes figuring out the MAC of the wing a little tricky.

The next week the wind gods were cooperating with a good stiff breeze coming out of the west. With the Spitfire loaded into the truck I headed out to the

Head on view showing cramped pilot quarters due to thinning of fuselage. Had to use a 1/7 scale pilot instead of 1/6 scale!

cliffs with a few butterflies in my stomach. All systems were checked and double checked for correctness. "Is this thing heavy or what," I said to myself as I held it up approaching the cliff edge. As the wing started to lift in the winds, the plane suddenly wasn't heavy anymore; in fact it was starting to pull my arm up wanting to get airborne. Needless to say, the Spitfire soared off into the void and with very little trim adjustments, flew majestically for its maiden flight. It had good speed and carried a lot of momentum and energy retention on wingovers and hammerheads. Of course an eleven lb. airplane needs a lot of room for maneuvers and doesn't come around or loop like a floater, but has a presence in the air that is something to behold. Just make sure to keep the speed up on these big birds and more or less let them fly by themselves most of the time. Keep the maneuvers big and smooth and you won't have any trouble. A downwind stall could be a recipe for disaster! The use of spoilers or flaps greatly assist on landings and I highly recommend either system or both.

I hope this article will inspire some of you to build a big warbird, they look fantastic in the air even with a slightly stretched wingspan and other modifications. There is absolutely no mistaking it for anything other than a Spitfire. Enclosed are a few pictures of the process of building and of the finished project. Next on the drawing board is a 120" U-2 spy plane, but that is another story. ■

Symmetry: an unnecessary goal!

...by Al Sugar
Carrollton, Texas

Blaine Rawdon created a stir when he built his Mirage with a movable elevator on 1/2 his stabilizer. The Gulf coaster was built the same way, and most everyone at the time felt that it shouldn't fly "normal". It is humorous when we think in detail why something should not work when at the same time we violate the premise of logic used to make that determination by ignoring the fact that we consistently use a asymmetrical force on another axis. The rudder towers above the center of mass, and is usually untuned for uniform lift generation. This lopsided force is accepted because nobody wants to stick a flying surface, although correct to maintain symmetry, in a position where it will be knocked off every landing. When the Old-Timers realized that elevator control variations are considerably less than rudder deflections, they have accepted putting the elevator on 1/2 their stabs primarily to maintain the integrity of the antiques they are resurrecting.

No, this is not an exercise to distort healthy minds into the depths of perversion, but one to stimulate free thinking and enjoyment of one's engineering skills. There are times when we have to analyze our limits and try to get the most of what we as an individual can handle without regard to what the Expert has done. I happen to like simplicity, and efficiency. After flying the modern equipment like JR 347 radio and Ellipse, I have learned something about myself that motivates me into flying the type of machines that my peers feel are weird. My goals are to build equipment that I personally enjoy without regard to opinions of others. My primary goal is stay-up-man-ship when anchored to a flying field of sufficient dimensions for me to launch and land safely. This universe is the stimulant for the asymmetrical approach of control functions I am planing for the future. I like to fly 4 channels

when I fly power. I would like to have a sailplane set up to fly similar to the power plane, and have the control features embellish (improve) soaring capability. Here comes the groans: tell me what is wrong with taking an Olympic II, attaching a tape hinged strip aileron onto the right inboard wing panel and installing a servo in the wing to articulate it. Yes it looks weird with the aileron on one wing only, but let's see what we have gained. The typical Oly is weak in turn, and with the weak aileron force complimenting the dihedral, a much more positive control is available. What will it cost in performance? Nothing! The right panel is heavier than the left, however it has more area to support the extra weight. The differential in adverse yaw (up versus down of the aileron) is not apparent at this small abridgment and simply would not be noticed by a pilot because no model turns exactly the same way right and left. (We pilots compensate automatically without any forethought.)

Well, if you the reader has not trashed this article by now you are ready to go to the next level of asymmetry so that we can go from 3 channels to 4 and be able to build model sailplanes that have similar controls to the high tech machines without computer radios. I am not trying to say that this approach is superior to the current trend, but is an option to get all things we want with an off the shelf 4 channel radio (inexpensive) and a Spirit 100 kit (as an example) that would be very effective in the hands of an expert (i.e., more for the dollar). The center panels of the wing are built with flaps, however the wing tip panels are built as a poly-sporter without tip ailerons. Now comes the fun; the right flap will be connected to the aileron servo and will be articulated with equal motion (i.e., up and down), whereas the left flap will be connected to the throttle servo (spoiler, for us glider-guider types). To assist getting accustomed to the combo, and for initial trimming, a Y adapter could be installed for the rudder and aileron servos if mixer on the transmitter doesn't exist.

Let's look at the advantages besides having equipment that costs less than 1/2 the price with a capability of doing it (i.e., the task contests require)!! For us power flyers, roll is on the right stick, yaw the left. The power boys really get into flying improperly trimmed machines so they can easily handle a mushier low speed control; however, since efficiency is dependent upon trimming they will have to be less cavalier. For those of us that truly enjoy working light lift one has to feed a little flap in and do a flatter spiral by turning toward the flap side. Yes, you are limited to one direction however the lift efficiency should more than compensate. When the time comes for landing the yaw generated by the drag of one flap is controllable, and not marginal. I rarely landed my full size Taylorcraft straight away and used the forward slip to act as drag to ruin its famous L/D that other pilots complained about when the floating T'craft just never seemed to set down. In my point of view, 1/2 a spoiler is far, far better than no spoiler at all. Now with 3 axis of control and one braking function it would be quite interesting to see how the great hand eye coordination geniuses stack up at AMA sailplane contests. (You do realize power flyers land and takeoff at a much higher frequency than the expert glider-guider?)

Finally, let's look at design evolution. The built-up balsa and film sailplane with its wingtips sticking up in the air, one inch for every foot of wingspan, is missing a lot of efficiency, on top of finding a lot of trouble from crosswind gusts. On a small sailplane or powered airplane, low angles of dihedral can be effective because of weight savings and simplicity. Running one inch of tip height for every 18 inches of span would do more for increasing the performance of a polyhedral design than the most exotic airfoil could possibly do... Too bad it only works well when it is flying straight away. The inboard aileron working in harmony with the dihedral seems to me the best solution to make our more efficient machine turn at realistic yaw angles thus making it competitive. These types of controls will give us much more design freedom to build long, skinny wings and push the boundaries of performance even higher. Yes, there is a lot of development for pioneers to prosper on, and I still believe in American ingenuity. When you pick up your next trophy at a contest and someone says, "Boy, your airplane looks really weird!" Smile, you have just been complimented. ■

Mother's Day Blues ...Again

...by Lee Murray
Appleton, Wisconsin

I should never consider going out to fly on the second Sunday in May. How could it happen again to me? Last time the almost new Sagitta 600 disappeared in a thermal not to be seen again in the air. This time it was the Chipperosa hand launch glider, flown away into the Great Medina Marsh northeast of Anderson sod farm. I knew something was wrong about three minutes into the flight when I couldn't change directions in a thermal - the best of the day. Despite my extreme movements of my right thumb, the Chipperosa, "hummingbird" in Spanish, was tuned out, on its own, devoid of any energy to understand my impassioned commands to come back to Papa. The last few moments before the tightening circles reached ground level, I got a bearing on the very distant hummingbird. I drove over to the farmer who owned the land I was to cross and ask his permission to get the model. Having heard similar pleas a few times before, he consented expressing his best wishes. He himself had found a few models while working his fields. Two hours later, I left the marsh with wet feet, blackened socks and pants from my wander through the marsh that rarely sees human traffic except for hunting season. It was beautiful. Hawks and cranes soaring above, yellow wild flowers and budding red stalk bushes added beauty to the journey not yet hampered by mosquitos. At times, the brush was so thick that you couldn't see beyond a few feet. The footing was precarious. While trying to find the next mound of vegetation and soil to stand on, one barely had time to look for the lost hummingbird. Dejected, I left the marsh and drove up to the county airport to see if an instructor or pilot were around to take me up to look for the model from above. The weather was beginning to get rough and it being Mother's Day, there wasn't much going on at MaxAir.

Randy McCarry, father of a fellow club member, Ron, and husband of a work associate, volunteered to take me up on Wednesday morning, the day of the solar eclipse, in his Cessna. Randy, an accomplished instrument rated pilot, made some low, slow passes and circles at 20 mph over stall speed as we looked for anything resembling the red, white and blue Chipperosa. The closest thing we found was an abandoned deer stand in a pine tree along the hummingbird's flight path. Disappointed, we returned to the hanger with only the pleasure of a nice flight in some greatest weather of the year. Thanks to an aircraft mechanic armed with a welders eye protection, we got a safe glimpse of the eclipse.

Saturday morning, Bob Rae (club president), Dave Beck, his son, John and I headed out overland; walkie talkies and long poles with flags in hand, over the Chipperosa's ill fated flight path. Wife, Bobbie, standing on a step ladder at the base point of the heading told us when we were off course and offered us encouragement. This method had been used with success on more than one occasion to find lost models. Once again we all became acquainted with field & stream, and muck - a word the natives use to describe the wet fine black terra firma of the area. Our best efforts were insufficient to find the lost hummingbird's resting place. Bobbie later told us how our not so stealth movements flushed the wildlife from the marsh.

I will have to call this a learning experience and offer the following advice to those who follow: First of all, spend Mother's Day with your wife or mother, not your model. Keep your name and address in the model. Know your battery charge and don't risk low batteries. Replace questionable switches or connectors. Lastly, be philosophical - It's all part of the hobby. ■

Flight School for Thermal Klutzes or Hand-Launch Topics

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

Rejoicing!!!

My arm is back. Thanks to all of you that wrote; I've shared all of your encouragement and ideas in this column. I hope that the information is as helpful to all of you as it has been for me.

11th Prestige Riverside Contest Results

Last Saturday, June 4, was the annual Inland Soaring Society extravaganza. Attendance was down at 25 due to lack of publicity, but those that showed up were greeted by very good conditions. Wurts won, of course, with a "heavy" Monarch at 12 oz. Don Van Gundy finished second, and Steve Condon third. No surprises here.

Yours truly finished 21st due to a plane that had grown tail-heavy and a pilot that had not practiced at all for months. Only about 20% of my throws were finding thermals, and most of those were on thermals that others had already found. However, my arm was better, if weak, and I had a lot of fun along with the frustration.

A salute to Merrill Farmer whose simple built-up plane gives a real go for the money. Merrill consistently surpasses me in the contests (including when I do well) even though he hasn't been at it for as long as I have and his plane "shouldn't" work as well as my "more high tech" model.

Flight School by the Master

After the contest, Joe Wurts took his Monarch back out on the field and started catching thermals. A couple of us wanted to just watch him do it, so we went out with him. The wind by now was blowing steadily, a strong sea breeze. Lots of cool air. Exactly the conditions I feel most helpless in.

Joe, seeing what we wanted, gave us a demonstration.

He started by saying simply that he routinely tracks thermals on the field all the time. Watch, he said.

He identified the first thermal ahead of us to the left over a culvert some hundred-fifty feet away. The thermal wasn't there yet but would be when he threw his plane and flew there. Then he threw and flew as he had stated. When the plane arrived at the appointed spot, it rose like a cork.

Joe rode that for a few seconds, then announced another thermal that would arrive ahead and to the right halfway to the palm trees. Then he penetrated his plane there and voila: up like a cork. He rode that one for some time until it was pretty high.

Then he announced that there was another thermal that would arrive directly behind us. He brought his plane, which was now well downwind, back up to just downwind of where we were and, man, the guy was popping champaign all over the place.

Suffice it to say that he had our full undivided attention. Joe then explained how he did it, and the following is my paraphrase (Wasn't there a hand-launch model with this name?) of his explanation.

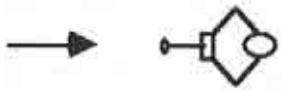
Joe's Version of Thornberg's River of Air

There are three useful sources of information for locating the closest thermal (excluding, of course, coattail riding the thermal other fliers have found):

1. The direction and velocity of the wind where we are standing
2. How the objects around us are responding to the wind
3. The drift of our sailplane as it flies through the air

Let's consider the first source: the wind where we are standing.

Presume that the wind is steady and blowing into our face as shown. The arrow represents the direction and its length indicates the wind velocity.



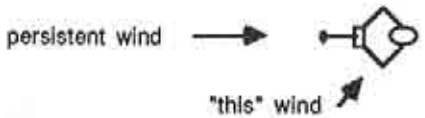
As you can see, our stick-figure stand-in is holding his transmitter facing directly into the wind.

In the field, it is important to monitor as best you can the "average" wind speed. This is because how the wind blows with reference to the average wind speed and direction will give you a broad idea of where the closest thermal is. A thermal deflects the wind flow towards itself as it draws surrounding air into itself to form the column of lift. This deflection will transiently change the wind velocity and direction where you are standing.

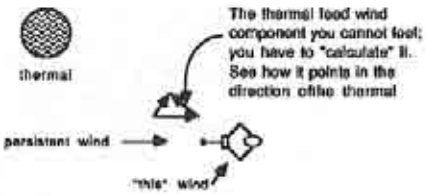
Again presuming that you are standing facing into the wind, if the wind speed is less than the average, then the thermal is "in front" of you. If the wind speed is more, then it is in back of you. A gross oversimplification, but true much of the time nonetheless.

Moreover, if the wind is blowing in somewhat a different direction from "normal", then the thermal is on the side that the wind is blowing towards. Note that the wind direction where you are standing will be substantially downwind of where the thermal actually is, because of (You math fans will like this!) the vector addition of the persistent wind component and the wind component that is feeding the thermal.

For example, watch what the wind is doing to us while a thermal passes us on the right:

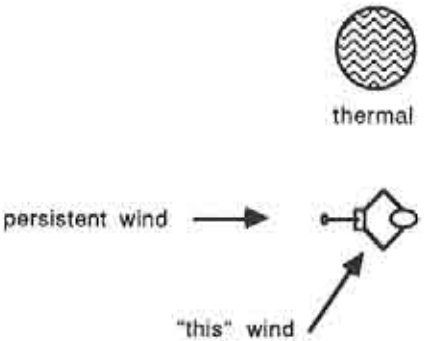


"This" wind is what we are feeling right now with the thermal in its shown position. We feel that the wind has significantly less velocity than the normal "persistent" wind; this is because the thermal is drawing air "backwards" from where we are standing. We feel the wind is blowing at an angle; this is because the thermal is sucking air to the side. In other words, "this" wind, which we are feeling right now, is the vector sum of the "average" persistent wind we've sensed over a period of time, and the wind component the thermal is generating on its own. In the next drawing, I've placed the persistent component vector and the thermal component next to each other to show how that results in "this" wind, the wind you are feeling right now.



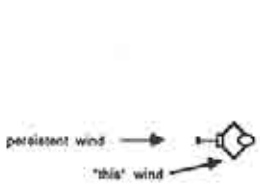
As the thermal passes by, you experience that "this" wind is blowing much harder; its direction may change a bit depending upon how strong the thermal is and how close it blows by. Notice that the wind always is a "vector sum" of the persistent

wind velocity component and the wind component that is the rush of air into the thermal. (Drawing the thermal vector is left as an exercise for the reader.) In any case, it might look like this:



At this point, the wind speed is probably at maximum but in any case will stay above average until another thermal blows in.

Meanwhile, the thermal blows on downwind, and so "this" wind's direction will straighten out some and slowly drop in velocity. Note that its direction still points downwind of the thermal.



All right, we now know approximately what direction to look for the thermal. At this point, how do we more closely pinpoint the thermal's location? Here is where the surroundings will give us some clues.

Joe showed us the effects of thermals passing through vegetation. When the thermal passed by a shrub, the shrub's leaves would vigorously and NOTICABLY shake from the rush of the upwind air feeding the thermal. The thermal was just downwind of the shrub at this point. It was eye-opening to watch the thermal pass over tree, then bush, then tree, then another tree; all of the sudden it felt like I was wearing "thermal glasses".

(See Diagram 1.)

What is important to note here is that the thermal is NOT over the area where the leaves are rustling; rather it is over the area immediately downwind where things are calmest.

I must confess that I was surprised at how many thermals there were. I also felt chagrin at realizing how many thermals I had needed and missed during the contest just an hour before.

Finally, Joe showed how the flight of your plane itself gives "homing" indications for a thermal that is close to your plane. Simply watch the plane's drift or crabbing. If your plane is crabbing to the left, turn left NOW. If your plane is accelerating, let it ride directly into the thermal. This is because when the thermal is near, it is drawing a lot of air into itself, including the air that your plane is riding in.

(See Diagram 2.)

In summary, the wind where you are standing will tell you which direction to look for a thermal. The terrain in the direction you are looking will often tip off the thermal's location. Finally, when flying towards where you think the thermal should be, the plane's sideways drift will indicate the final turn you must make to fly into the thermal.

Remember that in a steady breeze the thermal is moving. Therefore you should plan your destination to be where you expect your plane to eventually intersect the moving thermal.

Joe, thank you. You explained, you demonstrated, and you showed. I hope this article comes close to conveying what you taught us.

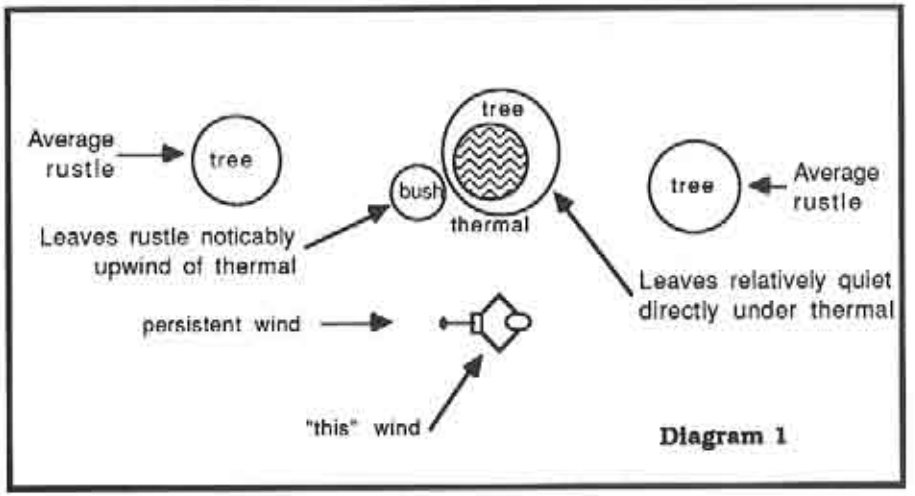


Diagram 1

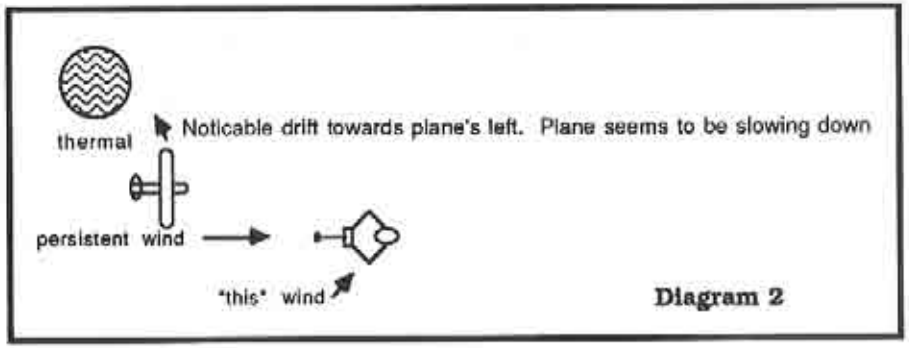


Diagram 2

Crash-Proofing Helps

So I tried using Joe's principles. I calibrated the average wind and direction, then waited for the wind to die down a bit. I then noticed that the wind shifted slightly and so I threw and turned perpendicularly to the average wind direction. Bamm, hit the thermal dead on about 70 feet out to the side! Eureka! Joe's a friggin' genius! This stuff works!

From then on, I practiced. I noticed that, while I lacked consistency, I was locating far more thermals than I was able to before. My hand-launch future looked bright.

Then my receiver's battery ran out of juice.

Oops.

The plane's orientation was steeply down at about 10 feet off the ground. Naturally it augured into the hard packed dirt. I sheepishly walked over to the model and examined it. Remember the blue rubber nose I described in this column a few months ago? It saved my ship. The blue nose was now caked with brown dirt and dust, but the plane was intact. Whew!

Next Month

How Joe's thermal hunting techniques work for me in the June Poway contest. Also, Pete Young of nearby Garden Grove sent in an article by Marc Gellart describing an inexpensive, easy-to-make shoulder exercise tool. ■

Understanding Sailplanes

...by Martin Simons

13 Loch Street, Stepney,
South Australia 5069

Centre of Pressure and Aerodynamic Centre

When the older ones of us were young it was generally accepted that there was a point called the centre of pressure, which was where the lift and drag forces produced by a wing in flight, acted. We were taught that in the normal flight trim of our free flight models the centre of pressure or c.p. would be at about one third (33%) of the mean wing chord from the leading edge.

But the centre of pressure moved about. We were warned that the c.p. would shift aft if the model pitched nose down. This aft movement, tending to raise the tail, must be counteracted by the stabilising surface or the model aeroplane would go into an ever steepening dive as the c.p. moved further and further back. C.p. movement had a big influence on stability and balance.

Some wing profiles, we heard, were trickier than others because the centre of pressure moved more in these cases.

Those of us who probed a little further discovered that wind tunnel test charts on wing sections did show the centre of pressure movement, plotted in chord percentages. At high angles of attack, near the stall, the c.p. of many sections (not all) was indeed shown near 33%, give or take a few digits. In the case of the famous Clark Y profile, it was 30% at the stall (Figure 1).

It was puzzling, however, to see how the c.p. curve ran off the chart as the angle of attack reduced. The c.p. moved gradually aft at first, so that with the Clark Y profile it was about 40% chord when the angle of attack was one degree. But after this the curve turned rapidly down, indicating a rapid backward shift of the centre of pressure, reaching 100% of the chord (i.e., **the extreme trailing edge** of the wing) when the angle of attack was minus 4 degrees.

At such an angle, measured geometrically from the base line of the section, the Clark Y was still producing positive lift. It was not at aerodynamic zero, so it was perfectly possible for an aeroplane to fly with the wing in this attitude. If a model was trimmed for high speed flight it might well be so, with the lift force apparently acting at the extreme trailing edge.

More puzzlement followed. The Clark Y section, on the chart, did not reach zero lift until approximately minus 5.5 degrees geometric angle of attack. Where would the centre of pressure be then? The curve had plunged off the bottom of the graph.

Further reading of the textbooks revealed that **with the wings at zero lift, the centre of pressure is an infinite distance behind the wing**. out of this world entirely, not even on the moon, or on edges of the solar system, nor even on the fringes of our galaxy, not even fifty million light years beyond the billionth galaxy, out of the universe altogether, ***an infinite distance behind the model!!***

How can the centre of action of the forces on a wing be an infinite distance behind the wing that produces the forces?

Aeroplanes do not spend long periods with the wing at zero lift, but this is the case in vertical dives (and vertical climbs too) and it is obvious that there are considerable aerodynamic forces on the wing at such times. In a prolonged vertical dive a wing is quite likely to break up under the stresses. The point of action of the forces is obviously not an infinite distance away. Even if we baulk at the idea of infinity, the test charts still showed that at very high flying speeds and low angles of attack, the centre of pressure of

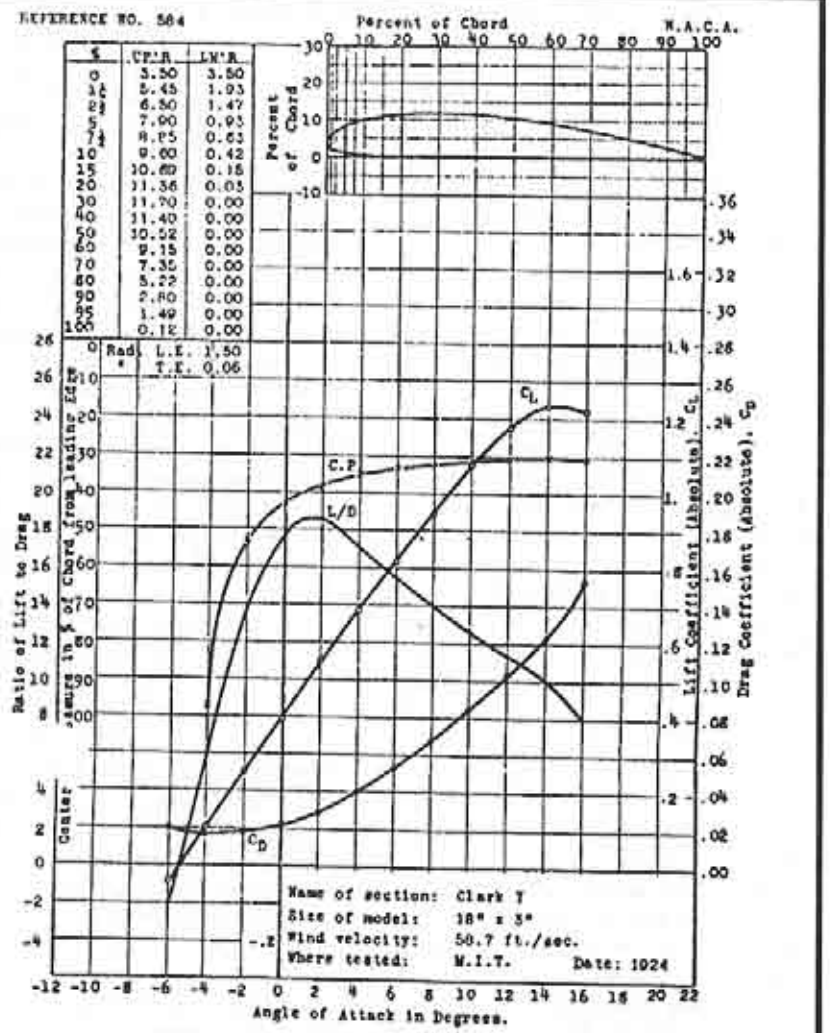


Figure 1. The Clark Y wing profile tested in 1924 at Massachusetts Institute of Technology. As was customary at this time, the chart shows lift coefficient C_L and drag coefficient C_D, together with the lift to drag ratio as these vary with angle of attack. The centre of pressure (C.P.) is shown at 30% chord near the stalling angle, then it moves aft slowly at first, but then moves rapidly towards infinity at low angles of attack.

the wing would usually be some distance behind the wing, behind the tail, perhaps several miles away. Yet the wing itself still produced lift to carry the weight of the aircraft, the stresses and strains in the aeroplane's structure were still felt directly, not in the next county.

Symmetrical profiles

Another puzzle awaited us when we studied the wind tunnel charts for a symmetrical wing profile, such as the NACA 0012 (Figure 2). Here the centre of pressure hardly seemed to move at all, remaining stuck around 25% of the chord

over the entire range of angles of attack from the stall upright to the stall inverted. (Note that with a symmetrical section the chart for negative angles of attack is merely a mirror image of the positive side of the graph.) Some specially designed profiles with reflexed camber, produced roughly similar results.

Why should one wing section have its c.p. moving from 30% back to an infinite distance behind itself, while another had it more or less fixed at about 25% chord?

There were even some profiles which showed the c.p. moving the opposite way from the rest at low angles of attack, towards the leading edge instead of aft at low angles of attack. It was all very confusing.

Could there be something wrong with the centre of pressure theory?

In a pragmatic sense, certainly not. Many successful and safe aeroplanes, and model aeroplanes, were designed using this theory and it apparently worked quite well. The theory still works and older aeromodellers still use these ideas. But an abstract theory which produces such problems and puzzles is not very satisfactory.

What the centre of pressure really is: unreal!

Some explanation is necessary. In the early days of wind tunnel research, it was quickly discovered that a wing placed in a steady stream of air would not stay automatically at any fixed angle of attack. Without some restraint it would always twist round to a different angle. Left entirely to itself, the test piece would settle down at some trailing position like a weathercock or, in a few cases it might even spin round and round rapidly like the vanes on some toy rotor kites. Before any lift or drag forces could be measured the wing had to be held firmly at a chosen angle of attack.

So the first important force found to be acting on the wing was not lift or drag, but a pitching force tending always, or nearly always, to turn the wing away from the angle the wind tunnel engineer wanted it to hold. Whatever the lift and drag forces might be, this had to be taken into account. The pitching force was measured. Sometimes it appeared large, sometimes small, sometimes acting in one direction, sometimes another, and very occasionally it was not there at all.

A good deal depended on how the test wing was mounted and which reference point was used for the measurements. The forces might, for example, be assumed to act about the mid chord point. The leading edge could be used as the base for measurements, or somewhere else. Trying to standardise the results was difficult, especially when wind tunnel in different places used different methods.

After some time sense began to appear. The pitching effect, tending to rotate or twist the wing to a different angle, could be regarded as a *moment*, the product of a force multiplied by a distance.

If we take hold of the end of a pivoted lever and apply a force to it, the force we apply multiplied by the distance from the pivot, is the *moment* of the force. For instance, a force of 2 units applied at a distance of 5 units produces a *moment* of 2 x 5 = 10 units. A force of 6 units at a distance of 10 units produces a *moment* of 6 x 10 = 60 units and so on.

The *pitching moment* of the wing section was measured simply by finding how much resistance was needed to keep the test piece at the required angle in the tunnel airstream. It was then **assumed** that this effect was caused by the wing lift acting some distance away, like the hand pushing at the end of the lever. Since a moment is the product of a force *multiplied* by a distance, then *dividing* a measured moment by a force yields a distance. For example, reversing the numerical examples given above, if the moment is 10 units, and the force is 2, the

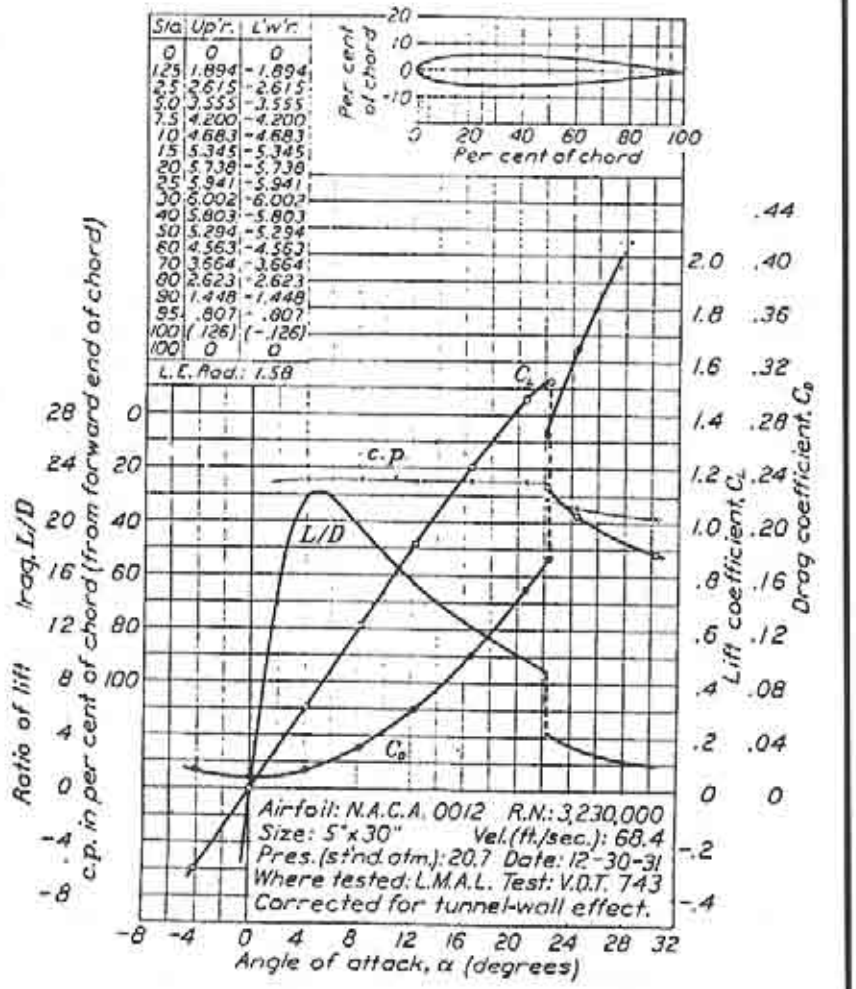


Figure 2. A Symmetrical profile, the NACA 0012, tested at NACA Langley. As with the previous chart, lift, drag and lift/drag ratio curves are shown. The centre of pressure is constant at all angles below the stall, at 25% chord.

distance must be 10 / 2 = 5 units of distance. If the pitching moment is 60 units, and the lift force is 6 units, then the distance of the supposed point of action, or **centre of pressure**, must be 60 / 6 = 10 distance units away.

The lift force in the wind tunnel increased and decreased with angle of attack. It was thus possible to use the measured variations of the lift force and the measured pitching moment, to produce a theoretical centre of pressure distance at each angle of attack and each value of lift.

It was **as if** the point of action of the wing lift was moving about. It is important to understand that the moving centre of pressure was not an observed fact. It was always a calculated abstraction produced simply by dividing the mea-

sured pitching moment of the wing by the lift force. The centre of pressure is not a reality, it was a convenient fiction.

The zero lift condition

A very important point is that when an ordinary cambered wing section, such as the Clark Y, is **at zero lift angle of attack the pitching moment does not suddenly vanish**. The wing will still tend to rotate out of position and has to be restrained. The centre of pressure theory, confronted with the continued existence of the pitching moment at zero lift, required the pitching moment to be divided by the lift force to arrive at a distance. But the lift was zero.

Dividing any number by zero gives infinity as the answer. Hence the theory indicated that most ordinary aerofoil sections had the centre of pressure at infinity when the lift was zero.

The aerodynamic centre

The difficulties were cleared up more than sixty years ago (when we were very young indeed!) and wind tunnel engineers began to produce different charts. The idea of the centre of pressure was supplemented and eventually almost replaced with something much more realistic, the **aerodynamic centre** of a wing. (As a matter of history, the fundamental research had been done even earlier, about ninety years ago, by the Russian Joukowsky and the German Kutta, but it took a long time for their work to be understood everywhere.)

Going back to the wind tunnel test situation, it had become clear by this time that there was something special about the quarter chord point. If the test wing was mounted with a pivot at 25% of its chord from the leading edge, in the case of symmetrical sections there was no pitching moment. The symmetrical wing suspended at this point would stay in any position without a restraining force unless it was stalled. (If it did stall, it would automatically turn itself back to an unstalled position and stay.) The pitching moment of all unstalled symmetrical wing sections turns out to be **zero when measured at 25% chord.**

This is what the old test curves were really showing all along. The centre of pressure of an unstalled symmetrical wing section is at 25% chord and stays put. There is no pitching moment here so there is nothing to be divided to discover the centre of pressure distance. Nothing divided by the lift force produces nothing: no distance of the c.p from the 25% reference point. Even at zero lift, zero divided by zero produces zero, the c.p, is therefore zero distance from the 25% measuring point at all times and angles less than the stalling angle.

Cambered profiles

It was shown by measurement (and supported by the Kutta - Joukowsky predictions of an earlier generation) that, using the 25% chord point for the reference, **with a normal cambered section, the pitching moment in the wind tunnel is practically constant in value and negative in direction.** The negative direction meant the tendency was for the wing to pitch nose down. This was previously explained as caused by the backward shift of the centre of pressure. Now it was understood to be produced, not by the lift shifting about, but by the camber of the wing profile. While the angle of attack changed and the lift force increased and decreased accordingly, the measured pitching moment in the tunnel airstream remained the same.

Wing sections were not always perfectly obedient to the Kutta - Joukowsky mathematics, often because the airflow tends to separate slightly somewhere on the wing, which upsets things a little. Even so, in every case, a point very close to 25% chord was found where **the pitching moment was constant.** This point was thereafter called the **aerodynamic centre** of the section and wind tunnel charts began to show the position of this point. The aerodynamic centre is defined precisely as **that point**

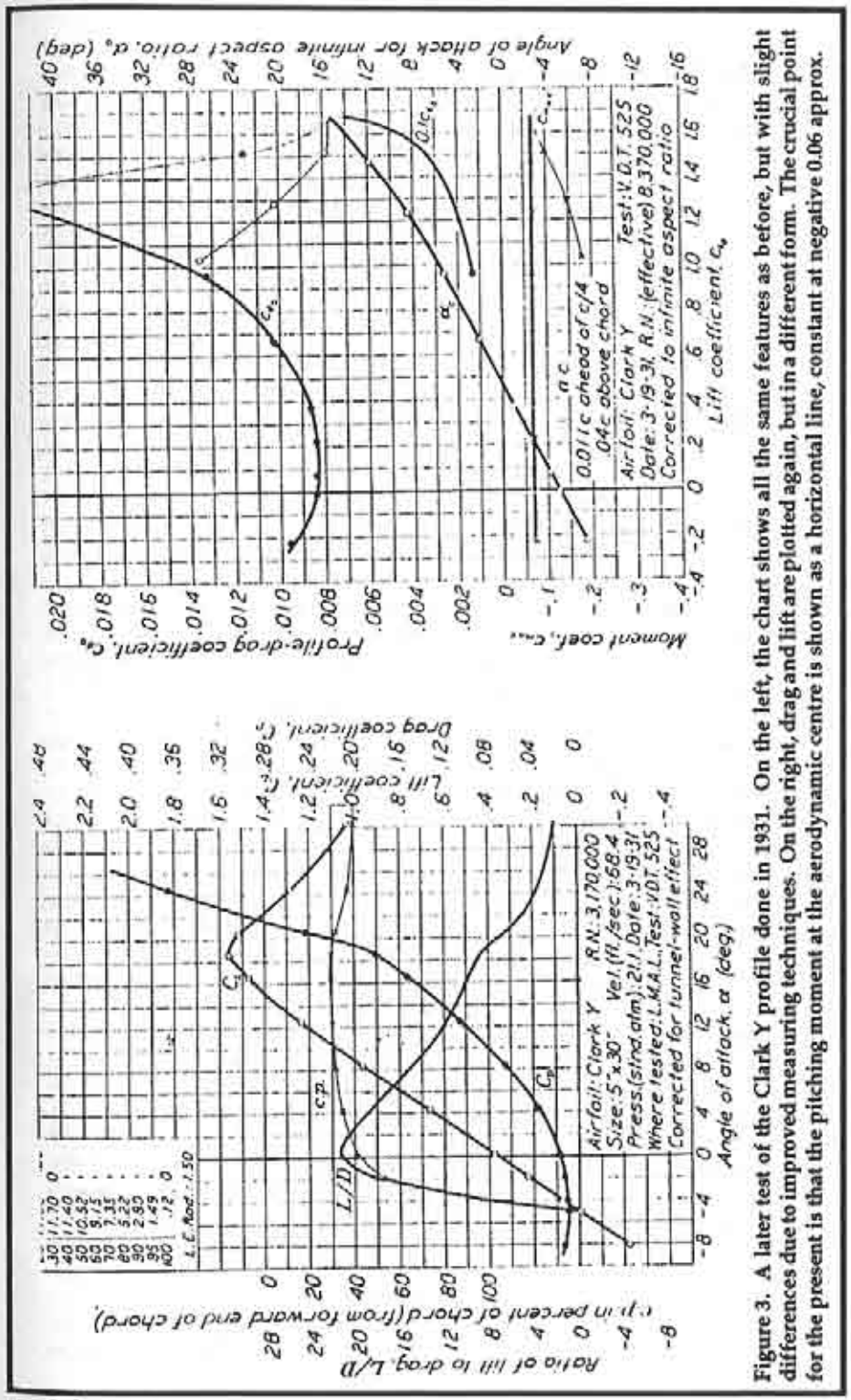


Figure 3. A later test of the Clark Y profile done in 1931. On the left, the chart shows all the same features as before, but with slight differences due to improved measuring techniques. On the right, drag and lift are plotted again, but in a different form. The crucial point for the present is that the pitching moment at the aerodynamic centre is shown as a horizontal line, constant at negative 0.06 approx.

where the pitching moment coefficient is constant. The fact that this is for practical purposes at 25% chord, is now well known and accepted.

It is no longer necessary to imagine the centre of pressure shifting about. The lift and drag forces produced by a wing act at the quarter chord point along with a pitching moment. Broadly, the greater the camber of the wing, the stronger the negative pitching moment. Zero pitching moment with zero camber, slight pitching moment with slight camber, more pitching moment with more camber. Figures 3 shows how the pitching moment for the Clark Y came to be plotted from wind tunnel tests done in 1931, seven years after the chart of Figure 1. A more or less horizontal line shows the constant value of the pitching moment at the quarter chord position or very close to it, but for the sake of old timers, the left hand side of the chart showed the traditional calculated abstract c.p. curve as well.

A wing section with a reflexed trailing edge can produce zero pitching moment like the symmetrical section. With extreme reflexing, the pitching moment can be reversed in direction, i.e., positive, nose up. This explains some of the strange features noted previously. (An ordinary cambered profile upside down, behaves like a strongly reflexed section, it has a nose up pitching moment. The consequence for model flying is that a cambered wing is to some extent automatically stable when flying upside down.)

It is no longer necessary to imagine the centre of pressure shifting about. The lift and drag forces produced by a wing act at the aerodynamic centre along with a pitching moment. It is the pitching moment which has to be balanced out by the stabiliser.

In flight

The wind tunnel charts are produced under artificial conditions in which the speed of the airflow over the test wing is kept constant, the density and temperature of the air itself is standardised, and various corrections are made for interference and constraints within the tunnel. (See Figures 2 & 3, where it is noted that tunnel wall effects have been corrected and the air pressure is given in terms of the standard atmosphere.) In actual flight the airspeed varies, the air density and temperature change with height and from day to day, the wing of a real aircraft is seldom as perfect as a wind tunnel model and so on. It is also usual now to correct the figures to those that would be produced by a wing of infinite aspect ratio (infinity again!) rather than for a wing of limited span. (The old tests of Clark Y and hundreds of other profiles, were not corrected for aspect ratio at all.)

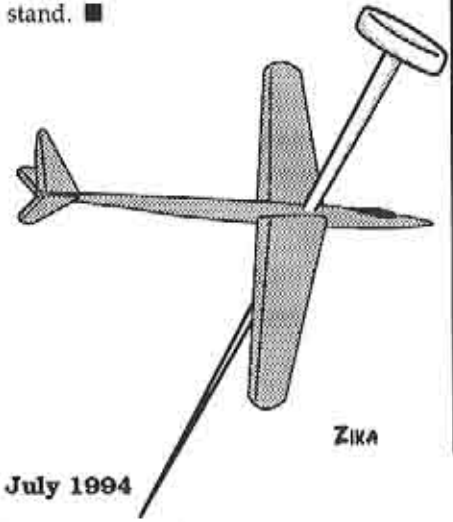
For all these reasons, what the wind tunnel charts show is not the actual forces that are felt in flight. The lift and drag, for instance, are expressed as coefficients, and so is the pitching moment. When the chart shows the lift curve rising with angle of attack, this does not mean that in flight a wing with this section would feel an increasing lift *force* as the angle of attack was increased. It might do so during manoeuvres and aerobatics, but in ordinary level flight all the wing lift force has to do is to support the weight of the aircraft. The weight does not change substantially (unless ballast is jettisoned or fuel is consumed). Hence in level flight at different airspeeds, the total lift *force* remains the same, equal to the weight at different angles of attack, even though the *lift coefficient* of the wing changes.

With the pitching moment, the reverse is true. The pitching moment *coefficient* at 25% chord remains constant at virtually all useable angles of attack and all airspeeds. But the pitching *force*, created by the wing camber, varies greatly, increasing rapidly with airspeed.

Consider a model aircraft with a cambered wing in a vertical dive with the wing at aerodynamic zero, zero lift force. The pitching moment *coefficient* is still the same as at any other angle of attack but because of the high airspeed, the pitching *force* (negative) is very large and becomes larger and larger as the airspeed increases. Left to itself, the wing would rotate further, beyond the vertical. (Tuck under.) To prevent this, the stabiliser must produce a balancing nose up force and, since the airspeed is high, the stabiliser comes under severe bending loads (down bending for a tailplane, up bending for the forewing of a canard.). If not strong enough, the stabiliser will bend and break.

In addition, the cambered wing itself will feel increasingly powerful twisting forces as the airspeed rises. (Constant moment *coefficient*, rising speed, increasing *force*.) If not stiff enough, the wing will twist off altogether. It is sometimes a question of which will give way first: the wing under torsion, or the stabiliser under bending. Or they may both go together when they go!

All these effects were recognised in the days when centre of pressure movement was invoked to explain them. Once it is realised that the wing experiences the pitching moment directly at its 25% aerodynamic centre and not at some mysterious point far away beyond the stars, the whole situation becomes easier to understand. ■



Airfoils are for Foiling the Air

...by Pancho Morris
Mesquite, Texas

In an Eastfield Boomers newsletter, Chuck Fisher admonished us to get out the glue and sticks and start building since it is winter. I decided to do that. I decided on a conventional 100" aileron design similar to what I have been flying. I got my chainsaw and ads out and got to work.

I had to decide on an airfoil for my new world beater. After looking over all the kits and ads in the magazines to see what was the hot number in use these days, I noticed that everything was a "computer enhanced Eppler" or an "optimized Selig" or a "modified 205" or an "improved Ritz". Being a guy that is turned off by fads and doesn't want to fly what everybody else is flying, no matter how good it looks, I decided to try something completely revolutionary! Never before tried! I was going to use a box stock airfoil, exactly designed by the designer. I figured, "Why not? It might work!"

This also got me to thinking about getting back to the airfoil series I had been developing several years back. I had good luck with airfoils like my "Addidas 71/2" and my "Sears/Winner 8E". A "Converse 9" and an "Old Keds 7" gave pretty good results, also. The airfoil biz, being so trendy and fashionable as it is, I know I will have to go to some of the new foils like "Rebok", "Avia", and "New Balance". "British Knights" and "Puma" might work. If any of you have tried any of these, let me know your findings. Maybe we can get all of this on a floppy and go somewhere with it. ■

1994 Masters of Soaring

...by Don McColgan
Claremont, California

The Silent Wings Soaring Association, SWSA, hosted the sixth annual Masters of Soaring competition May 14 and 15, 1994 at the SWSA field in Covina, California. This contest typically draws a number of the country's top fliers and presents a very challenging format. Contestants were subjected to sixteen tough rounds to compete in during the two day event. To participate in this contest a flier must have achieved LSF level V or level IV and all contest points for level V, hold a national record, or have won a major two day, national, or regional contest.

The rounds were made up of eight "precision", five precision duration, and three rounds were devoted to 4, 7, 10 minute triathalons. The precision task demanded an on-time arrival at the landing spot; 30 seconds either way from the goal resulted in a zero flight score! The same error in the triathalon cost about 200 points. Landings were both runway and spot, the spot being a 12 foot diameter circle subdivided into 10, 20, 30 and 40 point areas. The runway was 25 feet long and 12 feet wide with the same scoring possibilities as the spot.

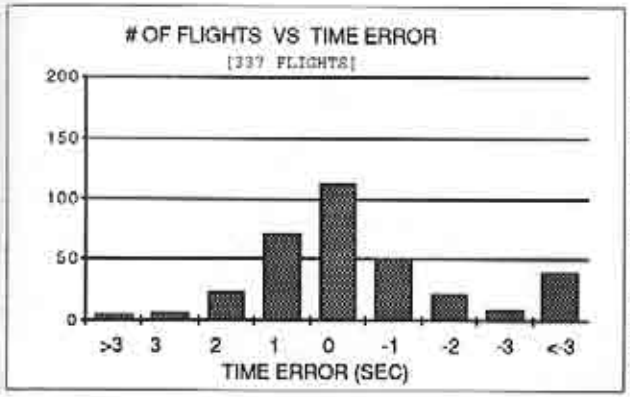
The table lists what equipment these guys are using this year along with some other interesting parameters. Airtronics is the leading choice in transmitters and the Eagle family in planes. Although most planes were full-house, high-tech and of composite construction, sticks are not dead! Larry Jolly said he is planning to kit his 2.5M Viper, soon. He had to retire early due to a wing folding on launch.

Saturday's tasks demanded 52 minutes of flying for each of 22 fliers. The SWSA crew got the job done between 9:00 AM and 4:05 PM. Joe Wurts stepped up first to fly into the thick morning overcast and had altitude left to burn for the opening 3 minute precision duration task. After the other fliers saw how easy it looked they all queued up at the winches. Joe was not so anxious to launch in the next round as the air was still, offering no clues as to the whereabouts of lift. Joe stood so long at the winch, B.J. Weisman brought him a lawn chair to sit in. He eventually launched and flew from it. In a later round, Daryl Perkins was flying at about 2000 ft. and lost sight of his plane in the overcast for almost 20 seconds. He casually asked the other fliers if they had seen it. After finding it and regaining control he resolved not to fly unnecessarily high!

Round one resulted in a 7 place tie for first and a 6 place tie for second. Less than 20 points separated the first 20 places. There was a dog fight between Wurts, Perkins, Spencer, Kindrick, and Lackey all day. The tenth round ended with Perkins ahead of Kindrick and Wurts by 16 points. There were 16 perfect 1000 point rounds flown.

Sunday dawned even gloomier than Saturday with a very light drizzle. The free coffee and donuts provided by SWSA helped get the guys going. Daryl Perkins shut out the competition by flying 6 perfect rounds beating second place Wurts by only 59 points. There were 24 more perfect scores earned during Sundays six rounds.

How do these guys get such high scores? They make their time and landings precisely. Look at the chart showing the flight time errors for all fliers. There were 112 on-time arrivals. Landing performances were just as good.



What did we learn by watching these fliers? First, the launch technique has changed. Two years ago a typical launch was: Pre-load the line until the winch stalled, give a mighty heave at a 50 degree angle and stand on the pedal all the way. Most of the launches this year used a light pre-load, many were nose on horizon at release, and a few (Joe Wurts included) even pulsed on the climb out. The launches were plenty high, there were fewer broken planes, and the winch lines didn't break as often.

The second thing we noticed was the landing strategy used. Gone forever are the days of 45 degree approaches to the spot with flaps down and ailerons up. The approaches this year were much more conventional. Typically it went something like this: Cross over your shoulder on the down wind leg at 20 - 25 seconds, adjust altitude to 25 feet at the final turn (in this case about 50 yards downwind.), make the final turn at 12 to 15 seconds to go, line up and adjust altitude to about 3 feet at 25 feet out and 2 seconds to go, pound the nail holding the tape into the ground with the nose. (That's right, aim not at the tape but at the nail.)

Lastly and most important, we learned that the great fliers are also great sportsmen. Through two days of intense competition we heard not one gripe; everyone was relaxed and having a good time and anxious to help the competition if asked. The SWSA team was privileged to play host to such a swell group of fliers. ■

Masters Of Soaring - 1994 - Equipment Preferences

Contestant	Plane	Wing Loading	Radio	#	Constr.	Span
Frank Lepla	Eagle	11	Vision	6	Composite	118
Mike Regan	Eagle	10	Vision	6	Composite	118
Jim Markle	F3b Eagle	14	Vision	6	Composite	118
Keith Kendrick	Falcon 880	10.5	Vision	6	Composite	113
Joe Wurts	Falcon 880	12	Infinity 1000	6	Composite	108
B.J. Weisman	Falcon/Eagle	10.5	Vision	6	Composite	118
George Joy	Genesis		Vision	6	Composite	113
Mike Aguirre	Mako	11.4	Vision	6	Composite	114
Roger Lackey	Mako	11.5	Vision	6	Composite	114
Ben Clerx	Mako	10.7	Futaba 9z	6	Composite	114
Dan Tatum	Nutrino	10	Airtron 7sp	3	Sticks	118
Bill Nibley	Paragon	6	Futaba	2	Sticks	120
Daryl Perkins	Spectrum	11.5	Futaba 9z	6	Composite	104
Tony Stark	Super V	11	Airtron 7sp	6	Composite	114
Steve Addis	Thermal Eagle	8.7	Vision	6	Composite	118
James Mccarthy	Thermal Eagle	11	Infinity 1000	6	Composite	118
K.Finkenbiner	Thermal Eagle	10.3	Vision	6	Composite	118
Ian Douglas	Vigilante	12	Vision	6	Composite	118
Tery Koplan	Viking	8	Futaba	3	Sticks	118
Larry Jolly	Viper 2.5m	8	Vision	6	Sticks	106

Functions

RESULTS

Place	Pilot's Name	Sat. Score	Final Score
1	PERKINS,D.	8920	14920.0
2	WURTS, J.	8903.7	14860.9
3	LACKEY, R.	8864.5	14864.8
4	SPENCER, R.	8887.7	14746.5
5	AGUIRRE, M.	8853.8	14726.6
6	KALLEVANG, T.	8786.5	14665.9
7	McCARTHY, J.	8807.1	14612.6
8	REGAN, M.	8671.6	14594.7
9	KINDRICK, K.	8903.9	14589.4
10	MARKLE, J.	8481.2	14317.7
11	CLERX, B.	8208.6	13934.5
12	JOY, G.	8060.4	13860.5
13	FINKENBINER, K.	7720.5	13564.5
14	WEISMAN, BJ	7629.5	13511.0
15	TATUM, D.	7677.3	13509.0
16	STARK, T.	7691.7	13506.2
17	DOUGLAS, I.	7383.5	12892.1
18	ADDIS, S.	7284.8	12794.4
19	LEPPLA, F.	6814.8	12450.4
20	KOPLAN, T.	8546.0	8546.0
21	JOLLY, L.	7844.3	7844.2
22	NIBLEY, B.	4620.0	4620.0

NASSA News

Viking Models, USA Nimbus 2

...by Michael Mellor
Eugene, Oregon

I've often felt I should contribute to *RCSD*, but never have. In hopes of generating some interest in scale gliders, and hopefully also generating interest in NASSA, I would like to share with you my recent experience in building one of Viking Models' scale fuselage and plans kits.

Let me give you a little background about how I got interested in scale. I've been a modeler most of my life. It's the one hobby I have always come back to, and the building part of the hobby has always been as important to me as the flying part. My first exposure to scale gliders came at the first Mid-Columbia Scale Fun Fly. I had been a glider flyer for some time, and was looking for something more out of the sport. I went to the Scale Fun Fly as a spectator, and like many who go, I was completely blown away. I had no idea that you could do what some there were doing with scale gliders. I left the fun fly with a new enthusiasm for our sport, and a desire to experience scale for myself. So I set out to build a scale glider for the next year's Scale Fun Fly.

My first scale model was a Viking Models USA 1/5th scale ASW 17. I was a bit nervous at first, as all of my models to that point were complete kits. While I felt I was a competent builder, I think the first time out with a fuselage and a plans only kit made me a little nervous. Jerry's kits have no instructions and while the plans for the ASW 17 are complete, they are dated in respect to current building techniques. By that I mean they show built-up structures and all mechanical controls. I had gotten to the point in my building that to go back to built-up wings was not that appealing. I was looking for a challenge, and there were some new things I wanted to try, so I jumped in with both feet. After some thought I got started and to my surprise it wasn't as bad as I had anticipated, and was more satisfying than following someone else's instructions. I have since built only three complete kits, all Multiplex scale gliders, and the rest of my building has been fuselage only projects. I know I have grown more as a builder, and my satisfaction from this hobby has been greater since I quit building from complete kits. Besides, I wanted something different, something others didn't have. I was tired of showing up at the flying field with a plane just like everyone else's.

Well, I finished my ASW 17 and I figured it would be an OK slope glider. I wasn't really expecting it to be much of a thermal glider, being heavier than I was use to, and having an airfoil that wasn't in current vogue. I did fit it with a tow hook, because I needed to get the balance right and I wanted to get use to flying it before the Fun Fly. I'll never forget my first launch; I flew into a thermal right after I got off the tow line. I remember thinking, "This thing will never thermal." Well it started going up, and I was truly amazed at how well it flew. It was much smoother and more solid feeling than anything I had ever flown before. The more I flew that glider the more I liked it. Not only did it fly well it looked like the real thing, and watching it fly past was more satisfying than anything I had experienced with a glider up to that point. I was ready for the Fun Fly, or so I thought.

Fun Fly day finally came and there I was with not one glider but two. I had also built a P-51, my first real all out sloper and I had never flown on a big slope; I had only seen others do it the year before. Boy, was I nervous. Well I finally got the courage to launch, and my glider experience has never been the same. I think anyone who experiences Eagle Butte or something similar for the first time will tell you it's like stepping into an entirely new realm of the sport. It was the most significant experience of my modeling life. I flew and flew and flew, and I happened to make friends with a guy from California who kept eyeballing my P-51 like I kept eyeballing his 1/4th scale DG-300. We finally both said, "You can fly mine if I can fly yours." That was my first experience with a large well designed scale glider and I was beside myself. I had never flown anything that flew like that glider flew. It was smooth and rock steady, and it could do way more than I was safely capable of at the time. From that time on my view of our hobby changed. I realized what others had discovered. Scale gliders are as good as, and in some cases better than the thermal gliders I had been used to flying. With wanton abandon I flew my P-51 and my ASW 17. I kept flying faster and faster, until I learned how fast an ASW 17 won't go. I had supported my push rods for the rudder and stab only in the middle of the fuselage and I learned the hard way how fast flutter will rip the stabs off the tail and how quickly a beautiful glider can turn into a guided missile. It was a hard but useful lesson, as I haven't made that building mistake again.

That brings me to the point of this article: my latest scale project, a Viking Models Nimbus 2. I had two things in mind when looking for this project. I wanted something with a modern airfoil, and I wanted something that might be a good thermal glider. For some time now I have had a desire to fly a scale glider in thermal contests here in the Northwest. While I don't expect to be competitive with an all out thermal contest glider, I do hope to open some eyes to the possibilities for scale gliders. I also think we sometimes take thermal contests too seriously, and forget why we got involved in this sport in the first place. I know I got involved for the fun of the sport and the challenge of me against mother nature.

I chose the Nimbus because the fuselage does not have a moulded root section, allowing me to use any airfoil I wanted. I wanted to experience a high aspect ratio wing and the Nimbus has a aspect ratio of 28. I plan to build a 1/4 or 1/3 scale high aspect ratio scale glider for cross-country in the future and I hoped to learn from this project. In real life, the Nimbus line of gliders are very impressive.

Wing, Stab and Rudder

I almost always build my flying surfaces first because I like to know exactly where everything connects. I build all of my sheeted surfaces pretty much the same way: blue foam cores with some sort of glass layup and obechi skins. I used Jerry's plans for outline shape and trailing edge layout.

The rudder is a foam core with obechi skins and a shaped balsa leading edge. I made two rudders: a scale sized rudder and a larger one. The larger of the two was shown on the plans as the prototype size. The larger one looked too large when mounted to the fuselage. While I finished both rudders, I've made my initial flights with the smaller scale rudder and have found it to be more than adequate. The stab was straight forward, in that it is an all flying stab with two halves joined in the center via two wire pins: one larger pivot pin and a smaller alignment pin. I didn't really like the way the plans showed how to mount the stab to the top of the fin, but I couldn't think of a better way, so I did it the way it shows and it worked out fine. I used a SD 8020 section for the stab.

The wings were an interesting challenge. The wing has full trailing edge control surfaces and spoilers. My intent was to mount servos in the wing for flaps and ailerons, and run the spoilers mechanically from the fuselage. I used a titanium wing rod in brass carrier tubes, built into spar boxes with spruce spar caps. The spar boxes are about six inches long with four inches of brass tube cut into a slot with the dihedral angle cut into the box. I glued the spar caps, which are 1/8 X 3/8 spruce to the top and bottom of the solid wood core of the box, and then plated both sides with 1/32 ply. The top and bottom caps are staggered in length, the top being longer than the bottom. The caps are let into the foam cores flush with the surface, and the foam acts as the shear web. With such a long skinny wing, I found that the servos and spoiler cut outs all end up on the spar line. I drew the wing in detail so I could map out the exact location and route of everything. The flap servo butted up to the spar caps. The spoilers were mounted directly behind the spar caps, and the aileron servo ended up directly under the top spar cap. I fit everything in, but I had to cut holes in the bottom of the wing right along the spar line, and since I knew I would be winch launching, I wasn't feeling too good about the possibilities of a hard winch launch. I had some unidirectional glass cloth left over from a full size experimental aircraft project and decided it would be perfect for spanning all these holes. I used one layer of unidirectional cloth on the bottom of the wing, and a carbon fiber spar cap on the top, with obechi skins all laid up in a press. The wings turned out nicely and have a realistic wing flex in flight. I have several winch launches with mild zooms and the wings appear to have just the right amount of flex. The airfoil I used for this project was an HQ 3/15 at the root transitioning out to a 2/10 at the tip.

Fuselage

As Jerry states in his advertisement, his fuselages are custom made to order. I told him I wanted to fly in thermal contests, and my experience with T-tails and contest style landings has been that T-tails take a real beating at the wrist, or juncture of the vertical stabilizer and boom. For those not familiar with T-tails, the weight of the stab on top of the vertical stabilizer creates a twisting action at the base of the fin during a hard landing and over time tends to crack the fuselage at the base of the fin. This can be avoided by reinforcing the boom and the fin with a strip of kevlar or graphite. For a small additional fee Jerry ran strips of kevlar from the cockpit area down booth sides of the boom to the base of the fin and up to the tip of the vertical stabilizer. This makes for a really nice stiff boom and vertical stabilizer, at no real weight gain. I have to say that Jerry does glass work as good as anyone I have ever seen. In fact, everything Jerry makes is first class.

One of the harder things to do with a scale project that doesn't have a canopy tray, is to come up with an easy way of making one that gives the model that look of realism. My efforts up to this point have been one of scale, so I've tried to keep it simple and light. The method that I've used to make my trays is as follows. I take two layers of 1/6th balsa with the grain running at 90 degrees to center line of the fuselage; you know, so it bends easily at the radius of the front and rear of the cockpit area. These pieces of balsa, stacked one on top of each other and running from past the forward most edge to the rear ward most edge of the cockpit area, are wetted out and weighted or taped to the cockpit area and left to dry. This hopefully leaves you with two layers of balsa shaped to fit against the fuselage flange at the cockpit. I mark and cut or sand these to flush or close to flush with the fuselage sides. I then layup these two pieces with glass cloth and epoxy between the two pieces of balsa and tape the whole mess tightly in place on the fuselage. I do paint mould release on the cockpit flange so as not to glue the layup to the fuselage. When dry you have a perfect fitting balsa canopy tray base to work from. I make a simple instrument panel out of balsa or plywood, and then make a instrument console cover out of 1/64 ply. My friend Wil Byers kept telling me I needed to put pilots in my cockpits, and I have on my last two projects. Wil was right; they do fly better with a pilot in the cockpit. Actually, just a little effort makes a lot of visual difference in the realism you can give a glider.

The rest of the fuselage was straight forward, with a plywood servo tray for the elevator and rudder servos. A servo tray at the wing root for the spoiler servo, and I usually put a bulk head in the nose with a hole in it for lead shot for balancing, and as a back rest for the battery and receiver. I used Sullivan carbon fiber pushrods for the first time, as they are supposed to be thermally stable and they come in 48 in. lengths. Pushrod length always seems to be a problem in larger gliders, as music wire, around here anyway, only comes in 36 in. lengths. I have bought some 60 in. lengths from Bill Liscomb, but I wanted to try the new Sullivan pushrods. So far I haven't noticed any trim changes. Some of my favorite building techniques are ones I learned from building Mark Allen's Falcon 880. The idea of using foam bulkheads to support control tubes and strengthen the fuselage works great and I use it on most of my projects.

Flying

My first few launches were winch hand throw launches. Anyone who has done this with large heavier gliders knows what a heart in your throat experience this can be. No matter how hard you try, it seems you can never get enough momentum going to keep the tail from dropping, and all your hard work teeters on the verge of disaster. Once I gained flying speed, the Nimbus was rock solid and climbed beautifully. I later switched to rise off ground take-offs, which were much easier on my heart rate. The Nimbus can be safely hand launched, but you have to pay attention to what you're doing. A flying companion pointed out to me that I was throwing the Nimbus at an angle when I launched, thus causing one wing to drop and veering the glider off to one side.

I assumed that the roll rate would be on the slow side due to the wing span of 159". I was pleasantly surprised to find it not much slower than my open contest glider. It did beautiful tight figure eights with a crisp entry and exit. Its glide was truly an impressive sight, both from the standpoint of having a flat and very efficient glide, and those long skinny wings were really something when the glider was in a visual attitude where you could appreciate what an incredible flying machine an open class glider is. The Nimbus flew beautifully, and I found no bad habits. Next to my two Core One's which are open contest planes, My Nimbus is or was the second best glider I've ever flown. I say was because unfortunately for me I had a mishap on a hasty ROG launch. I caught a wing tip in some high grass and flipped the Nimbus over and broke both wings. I was really looking forward to flying it at the World Soaring Jamboree. Oh well, that's part of the sport too; it happens to all of us no matter what our skill level.

Well, I hope I've generated interest out there somewhere for one of you to either try scale for the first time, or for those who already know how great scale gliders fly, to start another project or just finish the one you have sitting in the corner. As for me, I'm hooked on scale. Martin Simons stated at the end of his series on cross-country flying, that he felt we were on the verge of a new era of R/C flying, with cross country as the ultimate challenge. I think scale gliders are going to open a lot of eyes in the future. ■

R/C Soaring Resources

The contacts listed here have volunteered to answer questions on soaring sites or contests in their area.

Contacts & Soaring Groups

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

California - California Slope Racers, John Dvorak, 1063 Glen Echo Ave., San Jose, CA 95125; (408) 259-4205.

California - Northern California Soaring League, Mike Clancy (President), 2018 El Dorado Ct, Novato, CA 94947; (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 & Europe), Jack Sile (Editor), 21 Bures Close, Stowmarket, Suffolk, IP14 2PL, England; Tele. # 0449-675190.

Florida - Florida Soaring Society, Ray Alonzo (President), 3903 Blue Maidencane Pl., Valrico, FL 33594; (813) 654-3075 H, (813) 681-1122 W.

Illinois (South & Southwest) - Silent Order of Aeromodeling by Radio (S.O.A.R.), Jim McIntyre (contact), 23546 W. Fern St., Plainfield, IL 60544-2324; (815) 436-2744.

Illinois (North & Northwest) - S.O.A.R., Bill Christian (contact), 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (708) 259-4617.

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

Kansas - Wichita Area Soaring Association, Pat McCleave (Contact), 11621 Nantucket, Wichita, KS 67212; (316) 721-5647.

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

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

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

Nebraska - S.W.I.F.T., Christopher Knowles (contact), 12821 Jackson St., Omaha, NE 68154-2934; (402) 330-5335.

Nevada - Las Vegas Soaring Club, Jeff Burg (President), 853 Shrubbery Lane, Las Vegas, NV 89110; (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; (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, Tx 75041; (214) 271-5334.

Utah - 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, WA 98178; (206) 772-0291.

Seminars & Workshops

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

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

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: $14 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

The Vintage Sailplane Association

Soaring from the past and into the future! The **VSA** is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. VSA publishes the quarterly **BUNGEE CORD** newsletter. Sample issue: $1.00. Membership is $15.00 per year. For more information, write to the:

Vintage Sailplane Association
Route 1, Box 239
Lovettsville, VA 22080

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

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $18.00 (US) or $22.00 (Foreign) per year for twelve issues.

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

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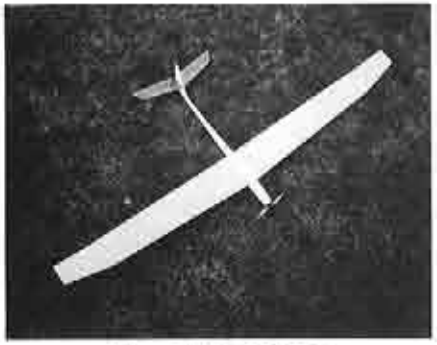
282 Jodie Lane
Wilmington, OH 45177
(513) 382-4612

Schedule of Special Events

Date	Event	Location	Contact
July 9	MTS Contest	Milwaukee, WI	Al Scidmore, (608) 271-5500
July 9	10th Annual HL (A)	Dayton, OH	Gale Leach, (513) 429-2543
July 10	Open B&D	Dayton, OH	Bob Massman, (513) 382-4612
July 10	XC Fun Fly	Mead, NE	Christopher Knowles, (402) 330-5335
July 16-17	COGG XC - Cookstown, Ont., Canada		Jack Nunn, (705) 728-4467
July 16-24	AMA NATS	Lubbock, TX	AMA
July 17	S.O.A.R. Contest	Illinois	Rich Burnoski, (708) 759-5220
July 23-24	Inter Glide F3J	Birmingham, England	Jack Sile, 0449-675190
July 24	1.5M HL Contest	Dominguez Hills, CA	Merrill Farmer, (310) 923-2414
July 28-3	EAA Fly-In	Oshkosh, WI	
July 30-31	20th Annual Thermal	Montreal, Canada	Etienne Dorig, (514) 449-9094
Aug. 6-13	LSF Nationals	Muncie, IN	Mike Stump, (616) 775-7445
Aug. 6	Hand Launch	Poway, CA	Bill West, (619) 222-5296
Aug. 7	Sailplane Contest	Appleton, WI	Al Scidmore, (608) 271-5500
Aug. 8 (eve.)	1.5m Mini Hi-Start	Muncie, IN	Ray Hayes. (810) 781-7018
Aug. 13-14	2m - Unl	Morriston, FL	F. Strommer, (813) 844-7225
Aug. 13-14 & Aug. 20-21	Holland Glide	Amsterdam / Amay Belgium	Jack Sile, 0449-675190
Aug. 14	F3J	Modesto, CA	Dave Darling, (209) 521-5412
Aug. 20-21	Summer Soaring Festival	Carson, CA	Kevin Andersen, (310) 372-2585
Aug. 21	S.O.A.R. Contest	Illinois	Bill Christian, (708) 259-4617
Aug. 27	NASF Fall Soar	Huntsville, AL	Ron Swinehart, (205) 883-7831
Aug. 27	Sailplane Contest	Milwaukee, WI	Al Scidmore, (608) 271-5500
Aug. 27-28	2m - Unl (Hand Tow)	Morriston, FL	E. Wilding, (904) 375-0918
Sept. 2-5	USA F3B Team Selection		
Sept. 3-4	Unlimited	Morriston, FL	K. Goodwin, (904) 528-3744
Sept. 10	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Sept. 10-11	F3J - Germany - Heerieden, Bavaria		Jack Sile, 0449-675190
Sept. 17	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Sept. 17-18	SIG/EISS Glider Contest	Blakesburg, IA	Jim Porter, (800) 524-7805
Sept. 18	S.O.A.R. Contest	Illinois	Wayne Fredette, (708) 532-3904
Sept. 24	SASS Novice Classic	Seattle, WA	Sherman Knight, (206) 455-2345
Sept. 24-25	TNT	Austin, TX	George Parks, (512) 443-7029
Sept. 24-25	2m - Unl	Orlando, FL	Ed White, (407) 321-1863
Sept. 25 & Oct. 2	2m Postal - Details 5/94 RCSD - Everywhere		Steen Hoej Rasmussen
Sept. 25	F3J SOAR-IN	Madison, WI	Al Scidmore, (608) 271-5500
Oct. 1	Fall Slope Fun Fly	Madison, WI	Al Scidmore, (608) 271-5500
Oct. 1	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 1-2	CVRC Fall Soaring Festival	Visalia, CA	Phil Hill, (209) 686-8867
Oct. 8-9	2m - Unl	W. Palm Beach, FL	J. Wilson
Oct. 9	SASS Novice Classic	Seattle, WA	Sherman Knight, (206) 455-2345
Oct. 9	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 9-10	S.O.A.R. Fun Fly	Illinois	Stan Watson, (708) 448-6371
Oct. 15	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 22-23	2m - Unl	Morriston, FL	Bob Wargo, (813) 938-6582
Oct. 23	S.O.A.R. Contest	Illinois	Wayne Fredette, (708) 532-3904
Nov. 6	S.O.A.R. Turkey Shoot	Illinois	Tom Blood, (708) 377-8641
Nov. 25-27	22nd Annual Tangerine	Orlando, FL	Ed White, (407) 321-1863
Dec. 3	Hand Launch	Poway, CA	Bill West, (619) 222-5296

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*.



The LASOAR 650

...from Perret's Studio

The LASOAR 650 is a high performance Class "A" or "B" electric sailplane designed by Paul Perret. Capable of "edge of your sight" launches in 45 seconds on .05 geared motor and seven cells, the LASOAR 650's light wing loading (11 oz. per square foot) gives excellent cruise distance and thermal indication, along with a rapid rate of climb in lift. Landing approaches are very controllable with the effective "spoilerons" on the lightly-loaded airframe. Wins include the Southern Electric Fly-In and the Memphis-in-May Electric Fly-In.

This electric airplane flies like a true glider with its 92" wingspan, Eppler 387 airfoil, wing area of 650 sq. in., ready-to-fly weight of 50 oz., and wing loading of 11 oz./sq. ft. Comes with pre-sheeted Obechi wings, pre-cut ailerons and servo wire holes, epoxy glass and kevlar reinforced fuselage, prefabricated motor mount, all balsa and hardware needed, and rolled plans. Perret's Studio, 1780 Prytania St., New Orleans, LA 70130; (504) 524-3442. ■

Sky Shine

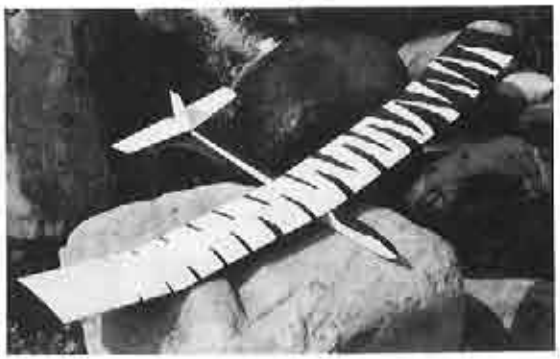
...from PEP Aviation

Sky Shine is a highly reflective, holographic self-sticking mylar film for making high/low flying models more visible. It is available for $4.00, check or M.O., for a 3" x 9" strip OR $.15 per sq. in. For more information, send SASE to PEP Aviation, 111E Geneva Dr., Tempe, AZ 85282-3638; (602) 966-6384. ■

Commoner

...from MM Glider Tech

The Commoner is a hand launch glider designed for fun flying and hand launch competition. It has a 59.5" span, 480 square inches of wing area and weighs about 13.5 ounces flying. With the flying weight at 13 ounces, the wing loading is at 3.95 oz. per sq. ft. The constant cord SD7084 wing provides the best combination of lift and performance with good penetration in windy conditions. It also enables you to stretch those last few seconds to get your needed time and stall it right in your hand for an immediate relaunch. The long tail moment and large stab makes the Commoner very stable and maneuverable. Quick and simple construction of the built-up wing and fuselage means you'll be flying in no time. Kit features machined parts, piano wire pushrods, nylon bolt wings, and assorted hardware. Kit is available now for $41.95 plus $5.00 S&H of US Post or UPS (add 8.25% sales tax if Calif. res.). For more information, send a SASE to MM Glider Tech, P.O. Box 39098, Downey, CA 90239, or call (310) 923-2414. ■



Diamant

...from Dynamic Modelling, Don Edberg

I am glad to inform you of a new molded sailplane now available. The model is called the Diamant and is imported from Slovakia, eastern Europe, by my company, Dynamic Modelling. The Diamant has a bunch of great features, as you'll see below!

You will not believe the quality of this kit. All of its parts are precision made from molds. The wing and tail surfaces are hollow-core pieces with a complete gel-coated surface, white on top with either red or blue on the bottom. The fuselage is epoxy-fiberglass and is also gelcoated white. None of the parts require any finishing or sanding. All surfaces are cut and hinged, and completely ready to fly!

The Diamant has a two-piece, 96" span wing, but flies like an unlimited ship with its Eppler 193 airfoil and glass-smooth finish. The slight polyhedral of the wing combined with the ample tail area and length provide a model that is as easy to fly as an Oly II yet with a glide rivaling the best molded ships, and the low-drag design launches and zooms like an F3B ship. The wing loading of the model is approximately 12 oz/sq ft, making maxes easy during contests.

The model comes with a rectangular carbon-fiber blade wing joiner, moving gap seals on both ailerons and flaps *pre-installed*, and custom pushrod covers for the aileron drives to reduce drag and protect the servos during landings. The molded canopy fits perfectly, and is another example of the tremendous workmanship put into the Diamant. It takes about four hours to install the radio — that's all that's needed to get one of these beauties ready to fly.

Specifications

Wing Span	96"
Area	691 sq. in.
Airfoil	Eppler 193
Empty	47 oz.
Flying Weight	67 oz.
Loading	14 oz./sq. ft.

Although a computer radio may be used, any standard radio will work just fine. In fact, the pretty lines of this fuselage provide ample room for any radio equipment. The Diamant (can't call it a kit) comes with all control surfaces hinged and ready to go. The stabilator bellcrank is pre-installed, as are all of the pushrods in the fuselage. A single servo is used for both flaps, and the linkage and drive mechanism is *already* installed. To fly this beauty, you will need only five servos (one for each aileron, one each for flaps, elevator, and rudder).

The introductory price for the Diamant is US$550, through September of 1994. For further information or a 3-view, please write Dynamic Modelling, 4922 Rochelle Ave, Irvine, CA 92714-2941, or call 714-552-1812. ■

"Old Buzzard Goes Flying"

...from Soaring Stuff & Pony XPRESS

Old Buzzard comes to television, featuring Dave Thornburg, author of the "Old Buzzard's Soaring Book", with "Old Buzzard Goes Flying", the first in a series of Old Buzzard soaring videos.

Dave Thornburg of Pony XPRESS and Taylor Collins, proprietor of Soaring Stuff, have collaborated with their sixty years of combined experience on a new 55 minute video on R/C soaring. Launching, thermaling, the theory of the River of Air, hand launch techniques, and trimming for max performance, video includes everything you need to know for successful soaring flight. Lots of live, flying footage, animation, and graphics make this a must have for the serious sailplaner. Available in NTSC (American), PAL, and SECAM formats. Cost is $24.95 + $3.00 shipping. Visa, MasterCard and American Express accepted. Contact Soaring Stuff, 9140 Guadalupe Trail N.W., Albuquerque, NM 87114; (505) 898-8281. Or, Pony XPRESS, 5 Monticello Drive, Albuquerque, NM 87114; (505) 299-8749. ■

Classified Advertising Policy

Classified ads are free of charge to subscribers provided the ad is personal in nature and does not refer to a business enterprise. Classified ads that refer to a business enterprise are charged $5.00 per month and are limited to a maximum of 40 words. The deadline for receiving advertising material is the 5th day of the month. (Example: If you wish to place an ad in the March issue, it must be received by February 5th.) *RCSD* has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs.

Personal ads are run for one month and are then deleted automatically. However, if you have items that might be hard to sell, you may run the ad for two months consecutively.

For Sale - Business

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. $29.95 + $4.00 shipping. Sky Bench Aerotech, 58030 Cyrenus Lane, Washington, MI 48094; (313) 781-7018.

GLIDER RETRACTS - high quality, 1/5, 1/4, 1/3 scale made in U.S.A. 1/4 are standard or heavy duty. Contact Bill Liscomb, 7034 Fern Place, Carlsbad, CA 92009; (619) 931-1438.

PRECISION COMPUTER CUT FOAM CORES for your sailplane. Any airfoil combination, washout, taper, sweep, skin thickness. No templates required. $32 for typical four panel 2M. For complete info. send SASE to: Wings!, 3198 Shady Oak Lane, Verona, WI 53593; (608) 845-7961, eve. or leave message.

"When you build a model plane from scratch: You put part of your life into the effort..." One of over 670 quotes and stories by Frank Zaic in **FRANKLY SPEAKING.** $6.95 plus $1.25 postage. Model Aeronautic Publications, Box 135, Northridge, CA 91328.

Thermo Flügel, fine scale detail, high quality German craftsmanship, scale models in stock now at low prices: DG-600s, SALTOs, ASW-24s, ASH-26Es & more (3.5 - 4.4m span). Also avail.: The AMIGA 4000, Europe's most versatile competitor. Mark Foster @ (213) 257-4573, after 5:00 pm or weekends, S. Calif.

Wanted

Latest version of Tekoa Feather Cut. Marshall McClung @ (703) 989-9494, Virginia.

Mark's Models Windward kit, NIB. Jim Wiseman @ (909) 629-8048, S. Calif.

Need a left wing inner panel or complete wing for Rowing LS-5. John Higgins @ (707) 552-7892, N. Calif.

Advertiser Index

For Sale - Personal

Ace Micro Pro 8000 with 6 receivers & charger, ch 00 (50.80), AM radio... $400.00. Paul Thompson @ (512) 251-7076, Texas.

SATURN 2.9T, fully built, never flown, only hand launched to set trims. Includes custom made glider bag. Will sell with or without servos (6). No transmitter or receiver. Also NIB Airtronics heavy duty high start. Brian Peters @ (201) 327-5227 or (201) 444-7633, NJ.

Start your own kit manufacturing. All molds and related tooling for the following sailplanes for sale: 1/3 scale ASW-20 (winner of the 1984 NATS), Sailaire (LSF nostalgia legal), Mini Bird of Time, Pilatus B-4 (2 meter), LS-3 (66" wing span), Phoebus (48" wing span). Serious inquiries only, please! Gary @ 875 Maple Drive, Goldendale, WA 98620; (509) 773-5257.

All glass Multiplex DG-300 w/servos, excellent... $975.00; Robbe ASH-26E w/wing servos, excellent condition... $850.00; KA6E Multiplex w/servos, excellent condition... $850.00; all glass Rowing LS-4 w/wing servos, excellent condition... $1400.00; Custom EAGLE RG-15, natural obechi, arrow shaft hinges, nice, w/wing servos... $600.00; FALCON 550E, servos, cobalt 05 w/batt & speed control... $450.00; ASW-17, 3.5 m, w/flaps, Quabeck 2.5/13... $350.00. Ray Franz @ (714) 362-5545 eve., (714) 830-8928 day, Calif.

Weston "Two", 2 meter sailplane with 4 NS-80 micro servos, brand new condition, flies great, 38 oz. RTF weight... $300.00 + shipping. Call Jack at (215) 547-4243 aft. 5 pm, PA.

THERMAL EAGLE sailplane, RG-15 airfoil, flown only 2 months, never crashed, includes all servos (2) NS-80 nylon, (2) NS-80 MG, (2) Airtronics 94831], flight pack, 66 oz. RTF weight, beautiful, flous. red fuse & wing tips, clear finished obechi top surface, black bottoms... $575.00 + shipping. Call Jack at (215) 547-4243 aft. 5 pm, PA.

Ready to fly: 2M DUCK, triple-taper planform, S-3021 foil... $300.00; Micro-Spirit handlaunch... $75.00. NIB kits: MARIAH... $125.00; Dodgson PIXY... $150.00; Original HOBIE HAWK... $250.00. All prices include shipping except Micro-Spirit. Jim Thomas @ (206) 488-2524, Washington.

GENESIS, NIB...$425.00; SHADOW, NIB...$325.00; F3B EAGLE fuse, 7003 wing & stab cores... $175.00. All for $900.00 postage paid. Jim Wiseman @ (909) 629-8048, S. Calif.

Fiberglass cloth: Hexcel #6781 S-glass satin weave, 8.9 oz., 50" wide, superior to regular E-glass cloth.. $6.50/yd.+S&H. Have large quantity. John Higgins @ (707) 552-7892, N. Calif.

Ben Clerx MAKO... $200.00; SATURN 2.9T... $250.00; Canadian NATS winner MISTRAL... $150.00; CMP PHOENIX... $150.00; CMP MARIAH... $100.00; SAGITTA 600... $75.00; Off The Ground Models PRODIGY....$85.00; SAGITTA 900... $100.00; GRAND ESPIRIT... $250.00; LEGIONAIRE 140... $250.00; LEGEND... $175.00; AQUILA GRANDE... $160.00; Bob Smith SUNDANCER II... $100.00; SPIRIT 100... $50.00; HEAT SEEKER plans, fuse & cores... $75.00. Contact Tom after 7:00 PM MDT @ (303) 979-8073, Colorado.

DG-200, finished, very scale, flaps & fixed wheel, nearly 15 feet of wing span... $350.00 + shipping; 5 ch Futaba PCM radio w/receiver... $100.00. Mark Foster @ (213) 257-4573, after 5:00 pm, S. Calif.

GENESIS, RTF, all gear, with Airtronics servos in wings (141's flaps, 3102's for ailerons), no receiver... $375.00. Negotiable if you don't want gear. Plus UPS shipping. Leigh Hodgdon @ (415) 858-3582 day, (408) 243-7250 eve., N. Calif.

SONIC (mid-tail prototype for Spectrum), RTF, thermal version, 100" foam/obechi bagged wings, RG-15 nose cone, 58 oz. up weight... $375.00 w/elev. servo in fin - all gear (Airtronics) but negotiable; SONIC, F3B version, 116" wing, RG-15, blue foam, carbon fiber skins top & bottom, bagged wings, meets F3B sportsman (SMT) limits, excellent slope racer, all servos, no receiver or switch harness, Dave Squires 1/2" rod for ballast if desired... $350.00. Leigh Hodgdon @ (415) 858-3582 day, (408) 243-7250 eve., N. Calif.

Dodgson WINDSONG w/LOVESONG spar, contest winner, nicely built, needs recovering on wings... $300.00 or $450.00 w/6 Airtronics 831 servos; Airtronics Championship transmitter, flap-elevator compensation, dual rates, exponential, servo reversing FND point adjustment, aileron rudder coupler and most desired features at a fraction of the cost, needs new batteries, meets 91 specs, FM... $75.00; Astroflite cobalt 05 w/folding prop set-up... $75.00; speed controller for 035 & smaller motors... $25.00; Agnew Models BANSHEE, Model Builder kit review... $300.00 or $550.00 w/6 Airtronics 141 servos. Servos for sale: Airtronics 141s, 401s, 102s & older mini & standard size servos. Futaba 133s, call or write for quantities & details. Trades considered on all above items. George Voss, 1403 Lincolnshire Rd., OKC, OK 73159; (405) 692-1122 after 4:00 pm..

R/C Soaring Digest
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A Publication for the R/C Sailplane Enthusiast

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RAIDER

Unlimited Class Racer

Runner Racer $419.95 Thermal Runner $439.95

The Raider is the latest soaring masterpiece from designer Charlie Richardson. This plane is a direct and more potent decendent of the incredibly successful and blazingly fast "Renegade" slope racer. Charlie has succeeded in designing a multi purpose Unlimited Class Slope Racer or Thermal Duration plane that has an outrageous L/D, fast acceleration, hands-off high speed stability, agile turning ability, and a super strong structure.

Everything on the Raider has been optimized for fast acceleration, high energy turning, thermalling, mid-air survivability, and fast ballast adjustment.

The Raider's modular design allows for plug-in replacement of any damaged parts. Flaps come down a full 90 degrees so it can be landed in small areas with high wing loadings. For those who don't need to wipe out the competition, the Raider is the best big speed machine around and just loves to speck out in thermals.

The Thermal Raider has more span, area, and aspect ratio than the Racer version. Even with such a light wing loading the Thermal Raider retains the fantastic speed range and crisp handling of the Racer.

Raider Racer

Span: 96"
Airfoil: RG-15
Aspect Ratio: 11.8
Surface Area: 900 sq. in.
Wing Loading: 18-19oz. sq ft.

Thermal Raider

Span: 104"
Airfoil: RG-15
Aspect Ratio: 12.5
Surface Area: 970 sq. in.
Wing Loading: 10-11oz. sq ft.

A Highly Prefabricated Plane Requiring Little Assembly

Features

- High Quality Molded Epoxy/Fiberglass/Kevlar Fuselage With Slip On Nose Cone
- Vacuum-Bagged RG-15 Composite Wings Featuring Blue Foam Cores Skinned With Carbon Fiber And Glass
- Pre-cut And Hinged Ailerons And Flaps
- Servo Bays Pre-Cut
- Bolt-On Modular Tail Surfaces With Bagged Glass Stab
- Optional 1000 mah Battery Pack And Replacement Parts

CLIMMAX

High Performance 60" Span Hand Launch Thermal Glider

Kit Price $59.95
Pre-Fab Price $159.95
Fiberglass Kit $99.95
Pre-Fab FG Price $169.95

The Climmax is designed for Hand launch Thermal Competition and slope and thermal sport flying. The outstanding SD-7037 airfoil has been modified to prevent tip stalling and enhance upwind penetration in breezy conditions. Its clean aerodynamic profile allows for maximum altitude hand launches and it's high-aspect ratio flying rudder gives Climmax the ability to make tight, flat turns in small thermals. Climmax is also excellent for minimum-lift slope sites where only the lightest planes will stay aloft.

An outstanding speed range and tight turning ability make Climmax a fun choice for light lift slope aerobatics such as snap rolls and loops.

The new fiberglass/kevlar body gives the competition pilot the ultimate edge in handlaunch thermaling performance and dead-air glide ratio.

Specifications

- Airfoil: SD-7037
- Wing Area: 400 sq. in.
- Wing Loading 5.0-6.0 oz. per sq.ft.
- Two Channel: Rudder, Elevator
- Flying Weight 12-14.5 oz. (FG)
- Machine Cut Balsa, Spruce, And Plywood
- Quality Feather-Edge Foam Wing Cores
- Flying Weight 14-18 oz (all wood kit)

C.R. Aircraft offers a full range of sailplane parts, services, and accessories. Call for information and price quotes.

High Quality CA's and Epoxies
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60" Span Class Slope Racer

ARF Kit $269.95

RENEGADE

The Renegade is the new "Bad Boy" on the Slopes of California, winning everything in the new 60" span racing class. The RG-15 airfoil gives the Renegade a blistering speed range and the ability to carry a massive ballast load if needed. Its flaperon system cranks the plane through high-G pylon turns with little energy loss. Don't let Renegade's bad attitude scare you off because it is very stable at all speeds and has remarkable light lift and thermaling ability. This rugged plane gives you big plane speed at a small plane price.

Highly Prefabricated Requiring Little Assembly

- High Quality Molded Epoxy/Fiberglass/Kevlar Fuselage With Slip On Nose Cone - Installed Elevator Cable
- Vacuum-Bagged RG-15 Composite Wings Featuring Blue Foam Cores Skinned With Carbon Fiber And Glass
- Pre-cut And Hinged Ailerons
- Bolt-On Wing And Tail Surfaces - Optional Ballast Kit

Renegade sweeps 60" Class and gets SECOND Overall in Unlimited Class Slope Racing At '93 Torrey Pines Speed Week

The Contender is designed for those who desire the ultimate in speed and aerobatics, featuring three channel control with wingerons, elevator, and full flying rudder. Contender's long tail moment and stabilizer design give it hands-off stability even at extreme speeds. The airfoil and wing design allows for an incredible speed range with the ability to turn or climb sharply with unmatched energy retention. Wings are constructed with blue foam cores, Carbon Fiber, and plywood wing skins and spars. The fuselage is designed with a large ballast compartment over the C.G. where up to 20 ounces of ballast can be placed for high lift conditions or slope racing. At the standard flying weight of 50 ounces, the Contender is very fast and will fly great in winds averaging as low as 5-7 m.p.h.

Specifications

- High Speed 2 Meter Aerobatic Wipe Plane
- Transition Modified SD8016 Airfoil
- Wing Area 420 Sq. Inches
- Flying Weight (unballasted) 50 ounces
- Wing Loading 17.0 to 24.0 oz. per sq. ft.
- Three Channel: Wingeron, Rudder, Elevator

Features

- Machine Cut Balsa, Spruce, And Plywood
- Quality Blue Foam Cores And Carbon Fiber
- Wingeron Linkages And Control Cables
- Hardened Steel Wing Rod
- Complete Hardware Package
- Rolled Plans And Detailed Instructions

The Ultimate Aerobatic Speed Machine

FiberGlass/Kevlar Body Now Available !

CONTENDER

Wood Kit $109.95
Glass Body Kit $169.95 .. Composite ARF $289.95

The Renegade kit has all of the high performance flying ability of the composite version but at a lower price. Each kit features precision cut foam cores, full hardware kit, full size plans, and can fit any type of radio gear. The Renegade is one of the most versitile slope planes anywhere and can be built very light to accomodate those small slopes or thermal flying areas.

Features

- Airfoil: S-3014
- Wing Area: 390 sq. in.
- Flying Weight 25-32 oz. (unballasted)
- Two Channel: Aileron / Flaperon Elevator
- Bolt On Wing - Foam Wing Cores
- Pre-cut Wood Parts
- Hardware Kit - Full Size Plans
- Standard Or Micro RC Compatible

Wood Kit $65.95
Pre-Fab $159.95

RENEGADE

THE KIT

High Performance C.R. Aircraft Sailplanes

- California Residents Tax 7.75%
- Shipping & Handling $5.00

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