RC Soaring Digest

November, 1991
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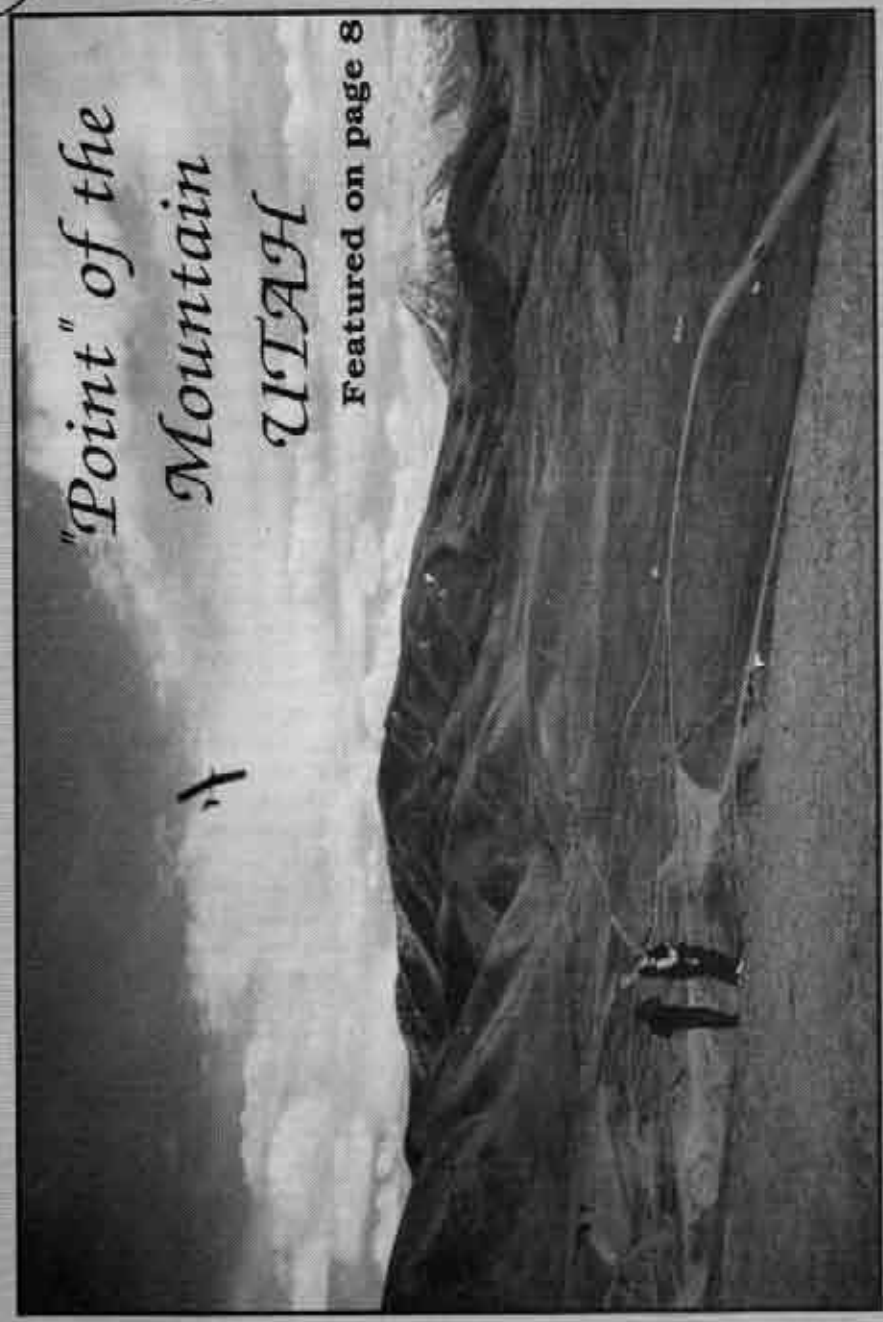
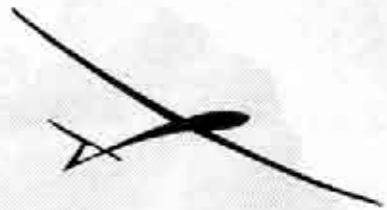


"Point" of the Mountain UTAH

Featured on page 8

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 submitted 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

We recently received more art work from Curt Nehring, and have taken the liberty of including three of his new masterpieces in this issue of *RCSD*. We laughed so hard when we saw them that we just could not resist sharing them in the same issue.

Curt Nehring is a member of the Harbor Soaring Society in Southern California. He sent the first artwork to *RCSD* earlier this year. We discovered that in the past most of his artwork was of a more serious and professional nature because he was required to do true pen & ink with acetate overlays for a camera-ready set-up. The final work was usually silk-screened in multi-color and used on shirts or mugs...sometimes matted and framed. Most of it was photographed and processed for multi-image (rapid-slide) presentation. Through the encouragement of family and friends earlier this year, Curt is once again putting his artistic talent to work. He has started a cottage industry called Soar Toons and offers a new line of greeting cards with additional items planned. We hope you enjoy the artwork he is sharing with *RCSD* as much as we do. Thanks, Curt! (Soar Toons, 469 N. Central Ave., Ste. #261, Upland, CA 91786; (714) 920-1261)

VOR 2500

We received a request from George Siposs. He says, "I have a VOR-2500 model. It was manufactured in Italy. I am trying to buy parts for it but don't know their address or the dealer's. If you know could you tell me or put a small notice in the *Digest*? Maybe one of the readers knows. Thanks." If anyone has the answer to this one, could you drop us a line or contact George at 2855 Velasco Ln., Costa Mesa, CA 92626 U.S.A.; (714) 966-1272.

New Addresses

Dave Aker (Dave's Wood Products),

Dave Squires and Brian Agnew have recently moved and their addresses are as follows:

Dave Aker, Dave's Wood Products, #7 Creekpark Ct., Roswell, GA 30076; (404) 642-0645

David Squires, 668 Robin Dr., Santa Clara, CA 95050; (408) 243-3388

Brian Agnew, 1275 Bennett Dr. #113, Longwood, FL 32750; (407) 260-6223

A Request from South Africa

We received the following letter from Cameron Ninham of South Africa:

Dear Jerry Slates,

"I am looking for the profile coordinate table of the Quabeck HQ-3.0/13-10-13 airfoil as used on the Robbe ASW 24. And I would appreciate it even more if I can obtain some wind tunnel results of this particular profile. I have both airfoil plotting routines of Foiled Again by David Fraser and Model Design by Chuck Anderson, but neither of them seem to contain this particular profile.

"Lastly, I am trying to obtain some models (like the Airfix plastic models) on the more modern glass sailplanes such as the ASW 24, Discus, Ventus C, etc. As far as I can gather, there aren't any such models available...Can anyone help me on this please?

"Thanking you in kind anticipation.

Yours Sincerely, (signed) Cameron Ninham, 2 Polkadraai Street, Pellissier, 9322, BLOEMFONTEIN, South Africa

The profiles for the HQ-3,0/13 and 10 can be obtained from the German book MTB 7 (Modell-Technik-Berater) and the books can be obtained from Verlag Für Technik Und Handwerk, GMBH, as I think they're still available. MTB 7 covers the HQ profile of Dr. Helmut Quabeck. I have not seen a HQ-3,0/13-10-13 airfoil, but in the event I'm wrong, one of the readers can set me right. If anyone can help Cameron, his address is included above, or drop *RCSD* a line. Jer

The White Sheet

In the July issue of *RCSD*, page 1, we said that the subscription costs to *The White Sheet* were £30.00 (U.S.A./Canada and other distant points). Well, Sean Walbank says, "Dear Jerry, Thanks for the plug in *RCSD*, but you did get one point slightly wrong! The subscription is $30.00 and not 30 pounds! I'm afraid the sub. will have to increase slightly in 1992 as postal charges have gone up yet again, but I certainly don't intend doubling it! Cheers, Sean."

If you thought the cost a bit high, you were right! Our appologies for any inconvenience this may have caused.

"Flying Rainbow"

Were you looking through an old issue of *RCSD* and decided to order Walter Panknin's program "Flying Rainbow"? Did you send off an order to Lee Murray in Wisconsin but it has been awhile and you haven't received a response. If so, he's looking for you, so please drop him another line or give him a call. ■

Curt Nehring & 3M Gnome

Jer's Workbench

Designing a Sailplane

The Test Bed has been completed and performed its first test flights. I'm quite satisfied with the design. In setting up the new model for its initial flights there were several things that I did.

First, before covering the wings, I balanced the Test Bed laterally and found that I needed to add 1/4 oz. to the left wing tip. By doing this first I would not have to cut into the covering after it was covered. The Test Bed was then completed by painting the fuselage, and the wings and stabilizer were then covered with an iron on film. Next, the tow hook was installed. I located the tow hook 30 degrees in front of the approximate center of gravity. The radio and servos were installed earlier. I then balanced the Test Bed. With the approximate balance point at 33.3% of the wing cord, I added 12 ozs. of lead shot to the nose. To be on the safe side I added another 1/2 oz. of lead to the nose. Why? I would rather test fly a new model that was a little nose heavy rather than tail heavy.

With the static testing completed it was time to file a flight plan. The flight plan was to start with one or two hand toss to check the trim, and then to put the Test Bed up on the winch. The plan for the first flight was to go up on the winch and look for lift by flying straight out off the tow; if there was no lift I would make a left turn and, if there was sufficient altitude, perform a dive test to check the balance and land with no flaps used on the first flight. Although that was the flight plan, I changed my mind later...

At the flying field I assembled the Test Bed and checked the controls; right was right and up was up and so on. Satisfied that everything was working correctly, I did two hand toss. The Test Bed was a bit nose heavy and some up trim was required. Looking up I saw three buzzards circling at the far end of the field. So onto the winch I went. On tow, the Test Bed went straight up; no rudder was required but I did use some up elevator. Coming off tow I did a 45 degree turn to the right and up the Test Bed went with the buzzards. The Test Bed drifted with the buzzards in their thermal for about 5 or 6 turns, then broke away and came back over the field to do the first dive test. The Test Bed did prove to be nose heavy. Still, having good altitude I circled a bit and found some more lift, but I couldn't keep my hands off the flaps. I pulled about 4 clicks of flap and went up again. The first flight lasted 13 minutes and 59 seconds.

After landing, I removed that extra 1/2 oz. of lead that was in the nose. The next flight I didn't use any flap and did another dive test that showed the Test Bed was still a bit nose heavy. This flight lasted only 4 minutes.

Now that the first two flights and most of my nervousness had subsided after flying a new model, it was time to get into some serious test flying. The next 6 flights were to get time onto the Test Bed using the flaps on launching, thermaling and landing.

I do not have any optimum numbers for the flap settings yet as I'm still working on that, but what I can tell you is that a little flap on launch is better than no flap and, as I encountered lift, I would lower and raise the flaps while circling in a thermal in order to see the difference. And, there is a difference. But, what I really liked about using the Test Bed flaps is that coming down from a high altitude, I would pull full flap, drop the nose and watch the Test Bed come down in what looked like slow motion under full control making left and right turns

and setting up for landing.

Conclusion

The Test Bed appears that it could be a competitive contest glider. These last 6 test flights were all 11 to 17 minutes flights. However, a bit of fine tuning is still required. Another 1/2 oz. of lead will be removed from the nose, and the tow hook will be moved back another 5 degrees.

Texas National Tournament (TNT)

Southern hospitality is great. This last month Gordon Jones invited me to Texas for the TNT. Because Gordon was at work his wife Peggy picked me up at the Dallas Airport. After arriving at the house Gordon came home and we talked a bit and then went to The Hobby Counter Hobby Shop where I was introduced to Pancho Morris, who is the manager. Later that evening we went to the home of Dale and Marge King for a Texas barbecue. After years of correspondence and telephone calls I finally got to meet with Don Chancey and his wife Marilyn. To the ladies who prepared the barbecue, THANKYOU! It was great!

The next day a group of us formed a caravan and headed south to San Antonio for the TNT. At the flying site the first thing I saw was a group of young people on riding mowers preparing the field for the two day contest. Living in drought stricken Northern California where we are on water rationing I haven't seen that much green grass in one spot for a long time. It was kind of a treat for me.

Saturday the contest got under way with the usual pilots meeting. 2 meter was to start on Saturday and open class on Sunday with four rounds in each class. There were to be time outs for lunch breaks and intermittent raffle drawings during the two days of flying. What made this contest move smoothly were the Rahm winches with retriever systems, extra batteries lined up behind each winch along with a winch master at each. Also, each winch master had a 30 second timer with a bell. Each pilot was called to the ready area, stepped up to the winch and had 30 seconds to launch. This system works very well. There was one stoppage for a rain shower, just after lunch on Saturday followed by a heavy rain just past 4 o'clock that stopped the contest for the day. Sunday was clear with no interruptions. To the people who put the TNT together and their sponsors, I had a great time!

I don't want to bore you with a blow by blow of the contest but, as for what airplanes were flown, there were a lot of Don Chancey's Bounty Hunters and Mark Allen's Falcons, 2 meter and standard versions. One thing that did impress me was how many vacuum bagged wings I saw. These Texas glider builders have their act together for vacuum bagging wings. Don't know if Julian Tamez (Channel 1 Productions) has any influence over these guys or not, but if you are interested in vacuum bagging, contact Julian. Julian showed me one of his newest wings with a Kevlar hinge that is very impressive. He lays a strip of Kevlar on the top side of the wing at the hinge line when he vacuum bags the wing and afterwards, very carefully using a router and a small cutting tool, cuts from the bottom of the wing up to the Kevlar, but not into the Kevlar. This makes a very smooth top surface of the wing.

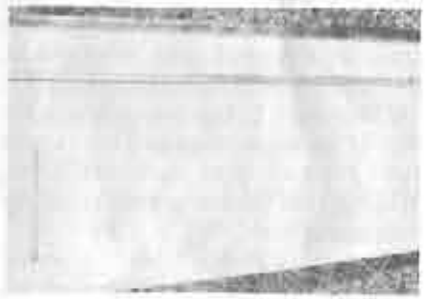
Photo by Bill Maserang, Fort Worth, Texas
(L-R) Jerry Slates, Dale King, Tom Peadon, Gordon Jones, Jack Hamilton, Chuck Fisher

The rain shower found people headed for cover. The tent afforded great shelter and is cleverly designed. It goes up quickly, has a solid structure and, as seen in the photo, the removal of the back legs provided shelter from the wind and rain. The trailer was specially designed to transport the winches and tent.

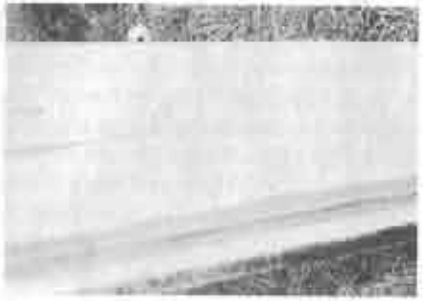
Julian Tamez and his 9 lb. Texas Shooting Star.

Another Composite Source

Received a package from Rick Palmer of Springerville, Arizona the other day. Rick tells me of another source for composite building material. "Try a Surf Board or Wind Surfing Shop. They carry epoxy, fiberglass cloth and Kevlar." Rick also sent me a tube of "Solarez", a ding repair used on surf boards. Solarez ding repair is a combination of photocuring polyester resin and chop-strand fiberglass which durably repairs fiberglass, plastics, wood and metal. Has a 5-15 minute cure time, and no catalyst is required. It is distributed by Wahoo International, Oceanside, California. Looks like something for the tool box for those field repairs. ■



Wing bottom after router cut.



Julian's new wing with Kevlar hinge.

F.Y.I. — Quiet Flight™ by Don Edberg is now available. This full-size sourcebook is packed with a wealth of information on all aspects of R/C soaring and electric flight. It is available from Dynamic Modelling, 4922 Rochelle, Irvine, CA 92714; (714) 552-1812; Orders: (800) SEND FYI. Cost is $19.95 postpaid (CA res. please add tax).

Electric Flight

...by Ed Slegers
Route 15, Wharton, New Jersey 07885

I've been getting many phone calls and letters from beginners in electric conversions. One of the most asked questions is what motor to use.

Geared Astro

Unfortunately this is not an easy question to answer. There are many factors to take into consideration: size of the model, weight, airfoil, what type of performance you want, pilot's skill in both flying and building and how much time and money you want to invest.

I have some suggestions that I feel will help the beginner in electric power get started and wind up with good results. I know that some of these suggestions could be improved upon by an expert, but remember these guidelines are for the beginner. One person wrote in his letter, "I don't know an amp from a watt but I want to try an electric sailplane. What do I do?" These suggestions are for people like him.

If you have an ARF electric powered glider that just barely flies there are two things that will really help. One is to reduce the weight, and the other is to increase the performance. To increase the performance, replace the stock motor with an Astro FAI .05 cobalt motor. This alone will make a tremendous improvement. To reduce the weight use smaller batteries. Most ARF's call for a 7 cell 1200ma battery pack like those used in RC cars. I think the manufacturers recommend these because they are readily available in most hobby shops. By replacing these with a 7 cell 800 or 900ma pack you'll save a couple of ounces. Try Astro Flight, Hobby Horn or CS Flight Systems for the smaller batteries. If there's enough room in the nose of the fuselage you could also use a geared motor. What this does is allow you to swing a larger prop which will give you much more pulling power. These changes will make a marginal flying plane become a very good flying plane.

For those of you thinking about converting a sailplane into electric, I would recommend a two meter to start with. There are many to pick from. The .05 motor works well in this size plane. The 7 cell battery pack is a common size and does not need a high tech charging system. A thermal type two meter with a light wing loading would make an excellent choice. The only thing I've found that takes some planning is the amount of room in the nose. A lot of the two meter fuselages do not have enough room to put an Astro .05 because of the brush hoods that stick out of the side. The only choice you have is to cut out the fuselage or go to a motor like the Keller. The Keller line of motors is excellent. What's nice about the Keller is that they fit into a smaller fuselage and they have the advantage of being able to swing a large prop without having to use a gearbox. An example of this would be the Falcon 600 in the July issue of *RCSD*. If you do not want to cut holes in the side of the fuselage and don't have room for a geared motor but want to use a large prop, try a Keller. On the Falcon 600 I used an 11X7 prop on 7 cells with the Keller 35/5 and got excellent performance. The only disadvantage is that the Keller costs about twice as much as the Astro .05.

Mark Allen of Flight Lite has been doing a lot of experimenting with motors for some of his future planes. In one of our many phone conversations he mentioned that he was getting very good

(L - R) Keller, Astro, Trinity

results with the Modified Marine motor from Trinity. I purchased one and have to agree with Mark. This is going to make a very good motor to put into a plane. The advantage of the Modified Marine is that it's available in most hobby shops, the brushes do not stick out the sides, it has lots of power, and costs less than the Astro. As I get more time on this motor I'll let you know what the results are. So far it looks very good.

Some of the RC car motors work fairly well. The ones that seem to work the best are between 18 and 20 turns. Most work but not as well as the motors designed for airplane use only.

In summary, a two meter thermal type sailplane with an Astro .05 on 7 cells with a 900ma battery pack and an 8X5 prop, or a narrow fuselage a Keller 35/5 on a 7 cell pack with an 11X7 prop will give the beginner a good sound set-up. If any of you have a sailplane that you've converted into an electric and want to share your findings with the rest of the readers, send me a picture and specs.

Great flying! ■

"Point of the Mountain — Utah"

...by John M. Salevurakis, Holladay, UT
President Intermountain Silent Flyers
Photos by Bob Harmon, Sandy, UT

The "Point of the Mountain" lies between Salt Lake and Utah valleys, in Northern Utah, and was created by Lake Bonneville many thousands of years ago.

IMSF looking Southwest off the slope at Utah Lake.

The ridge was caused by wave action against the Traverse Mountain which created a huge sand and gravel bar that is more than 300 feet above the valley floor. The "Point" is unique in that it can be used for soaring when the wind is from the North or South. As a rule the prevailing wind during the morning hours is from the South and then switches to the North during the latter part of the day allowing soaring flights from both sides of the ridge on most days.

The North facing side of the ridge has two distinct levels which historically made it ideal for ridge soaring for full size gliders and sailplanes. The flat lower terrace is the old Lake Bonneville level which was ideal for winch or auto tow launches. After takeoff, the glider or sailplane would move over against the first level. After gaining two or three hundred feet above this level, it could then move over against the main portion of the mountain. A good pilot could then climb to about 1000 feet above the point of takeoff and slope soar at that altitude as long as the wind continued.

The first gliders known to fly at the "Point" were primary gliders copied from a German design and built by students in about 1929. Frank Kelsey was one of these students and built his primary glider in a shop class at West High School in Salt Lake City. The whole class became enthusiastic about the project and took the glider to the "Point" where several of the students learned to fly it. Nearly every day the glider was flown it would be damaged and have to be brought back to the shop and repaired for the next weekend's flying. Over a period of time, several improvements were made to the glider such as extending the wings, making a primitive enclosure and adding wheels. Finally, when the wind was strong enough, they were able to actually ridge soar. Launching methods also improved with primitive bungee launches and auto tows later becoming common. After World War II, Frank and several others flew a Schweitzer 2-22 at the "Point" from winch launches for a

short time.

A variety of hang gliders, para-sails and remote-controlled sailplanes have become increasingly popular over the last several years at the "Point of the Mountain". Today many hang glider pilots and para-sailors from all over the country stop in Salt Lake to fly at the "Point".

The Intermountain Silent Fliers R.C. sailplane club was formed in the mid-1970's in Salt Lake City. In the first years of the club, most of the flying was slope soaring at the "Point". It wasn't until a few years later that Don Harbon, from the Torrey Pines club, moved to Salt Lake and exposed local flyers to winch launching and thermal flying.

Ray Carter launching his P-51 power scale sloper on the South side.

IMSF looking North into Salt Lake City after a brief January Storm. Coveralls, goggles, face masks and insulated boots and hats are required clothing.

IMSF pilot in shock after the near fatal crash of his Dynaflight Freedom.

Today, IMSF has approximately fifty members and a full activities calender. The club meets on the third Tuesday of every month at a variety of locations depending on the season. We attempt to have a thermal or slope activity almost every month of the year, weather permitting. If you get a chance to stop in Salt Lake City, don't hesitate to look us up – either at the slope or during one of our meetings – visitors are always welcome. ■

Should you find yourself in Salt Lake

IMSF club activity at the "Point" looking Southwesterly at Utah Lake.

City, contact Bob Harmon of the Intermountain Silent Flyers, 10424 Golden Willow Dr., Sandy, Utah 84070; (801) 571-6406. On October 4th John M. Salevurakis died of injuries sustained in an auto accident in Lovelock, Nevada. He was on his way to the Visalia R/C Fall Soaring Festival when the accident happened. John's article speaks to his enthusiasm for the hobby and his job, Chief of Field Services for Wildlife Resources in Salt Lake City, Utah, tells of his concern for others and the world around him. John Salevurakis will be greatly missed by us all. ■

Schedule of Special Events

Date	Event	Location	Contact
Nov. 9	Duration 2M & Open	San Antonio, TX	Tom Meeks (512) 590-3139
Nov. 10	3-6-9 2M & Open	Dallas, TX	Gordon Jones (214) 840-8116
Nov. 10	Dual Elimination	Houston, TX	Julian Tamez (703) 540-3944
Nov. 17	Hand Launch	Dallas, TX	Gordon Jones (214) 840-8116
Nov. 29-12/1	2 M & Unlimited - Tangerine Soaring Champs	Orlando, FL	C. Baylor (407) 699-8750
Dec. 8	2 Meter Only	Dallas, TX	Gordon Jones (214) 840-8116
Feb. 1-2	Southwest Winter Soaring - Unlimited - 444 (D)	Scottsdale, AZ	Iain Glithero (602) 831-1905
Mar. 14	Hand Launch	Irvine, CA	Scott Smith (714) 651-8488
May 29-31	Mid Columbia Scale Int. Fun Fly	Richland, WA	Roy (509) 525-7066 Gene (509) 457-9017

A Special Event

1992 Mid Columbia R/C Scale Soaring International Fun Fly

May 29, 30, & 31 1992

Prepare now to Attend the 1992 Mid Columbia R/C Scale Soaring International Fun Fly; a Fly In Event featuring a **Non-Competitive, Relaxing, Social, Fun, Scale Glider and Soaring Machine flying format.** A pilot/builder's opportunity to witness, display, and fly with some of the best scale R/C soaring modelers anywhere. This year's event will provide entrants the opportunity to participate in our **Friday Night Wine Tasting**, a Saturday Night Banquet with a special guest speaker, as well as a soaring merchandise raffle. New this year, the event will offer scale enthusiasts a chance to fly their scale creations in a cross country format. No prizes or places are awarded for this part of the event, it will just be for fun. Also, **Tug launches will be available** for those who would like to try something that may be new to them. This is a scale event only! Further notices and registration forms will appear in *RCSD*. For information send a SASE to:

Skip Johnson, 2626 Eastwood Ave., Richland, WA. 99352

You may get information via the phone by calling Roy at (509) 525-7066 or Gene at (509) 457-9017.

Room reservations can be made now at Cavanaugh's Inn at (800) THE-INNS or (509) 783-0611. Be sure and indicate you are with the TRICS soaring party. Remember this event is just for Fun!!!!!

Understanding Thermal Soaring Sailplanes

Part 4 of 4 Parts Continued

(This column began in January, 1990. Each part covers several months.)

...by Martin Simons

Martin Simons, 13 Loch Street, Stepney, South Australia 5069

Interference drag

Wherever two different bodies, such as a wing and a fuselage, or a fin and a tailplane, join, the airflow for some distance all round the junction is disturbed. This has several unfortunate effects, particularly for the wing root/fuselage area. Not only is the total drag increased because of the disturbed air but the wing lift over the centre section is reduced. One important reason for reducing the fuselage cross section, and paying special attention to the flow over the nose, is because a badly designed fuselage front end will have a proportionately greater disturbing effect on the wing.

Ever since the importance of fuselage interference at the wing root was recognised, aerodynamicists have tried to discover ways of reducing the disturbances. These have varied from the simplest, mounting the wing on a tall pylon to remove it as far as possible from the fuselage, to working out highly elaborate fairings to blend the body into the wing smoothly. No conclusive results have appeared but it is consistently reported that a mid wing mounting is better than the alternatives, with relatively small fairings filling the angles where the wing joins the fuselage sides. If the fairings are increased in size too far, they apparently cause more drag than they save.

Some recent wind tunnel test work done on models very close to the sizes and speeds of radio controlled model sailplanes, indicates that the leading edge of the wing root should be extended in the manner shown in Figure 51.[1] The shape of the extension is not accidental and if used, should be followed as closely as possible. Note that there is little attempt to fill in the corners where the wing abuts the fuselage behind the leading edge, or to extend the trailing edge. Rather, the wing root section is stretched forward progressively and the leading edge is slightly sharpened. This reduces the percentage thickness of the wing section at the root and, according to the wind tunnel results, inhibits the worst disturbances which develop, above and below the wing, with the unmodified junction. Such a modification, it is claimed, reduces the total drag of an already very efficient sailplane by as much as 2 - 3%. As usual, this claim should be treated with caution.

To indicate how careful the designer must be, tests done with fairings which at first sight appear to differ only slightly from that shown, actually increased the total drag, in some cases quite seriously.

It must not be forgotten that additions to the wing root, of the kind described, might, under contest rules and interpretations by scrutineers, be regarded as additions to the total surface area of a model. This could lead to disqualification, so when calculating the total wing area, aspect ratio, etc., any such areas should be included.

Interference drag at the tail is, of course, subject to the same type of effects but little research has ever been done on this. The V tail, which involves only two surfaces, has inherently less interference drag than the orthodox cruciform design, but the T tail is probably as good.

Controls

Large sailplanes have been flown successfully with two main controls, rudder and elevator, but it would probably be

agreed by most pilots that effective ailerons are advantageous, giving more positive control, especially when coming in to land.

The larger aircraft is less disturbed by rough air, but at the same time if there is a bad landing, damage is more likely because the total mass of the aircraft is greater. When a small model strikes the ground it may bounce or cartwheel, yet escape serious damage. The larger model arriving in similar fashion is likely to break. Hence ailerons are to be preferred. As with all control surfaces, more effect results if the control surface area is of high aspect ratio. That is, long, narrow ailerons are more effective than short, broad ones. Ailerons reduce the need for the large dihedral, or polyhedral, angles which are essential for the 'rudder only' type of turning control. However, five or six degrees of dihedral on a model thermal soarer, although not absolutely necessary, are of considerable value for stability in circling flight. The effectiveness of the ailerons is not reduced by such moderate dihedral.

Brakes

Another significant requirement for a thermal soarer, especially a large one of high efficiency, is a powerful set of airbrakes, not only to ensure an accurate landing, but to bring the model down safely from great heights. The brakes should be speed-limiting for this situation, rather than merely lift spoiling. A speed limiting brake is one that may be opened fully and kept open at any airspeed, creating enough drag to keep the model's airspeed to a safe figure even when diving very steeply. The sailplane may then be brought down quickly from any altitude, without damage. Some types of brakes, and spoilers, will not remain fully open at high airspeeds because they are blown back by the force of the airflow. Apart from their failure to limit speed, such brakes may also cause the servo driving them to stall, with consequent severe drain on the model's batteries.

It is almost as important to make sure that the brakes do remain fully closed when they are supposed to be shut. Many

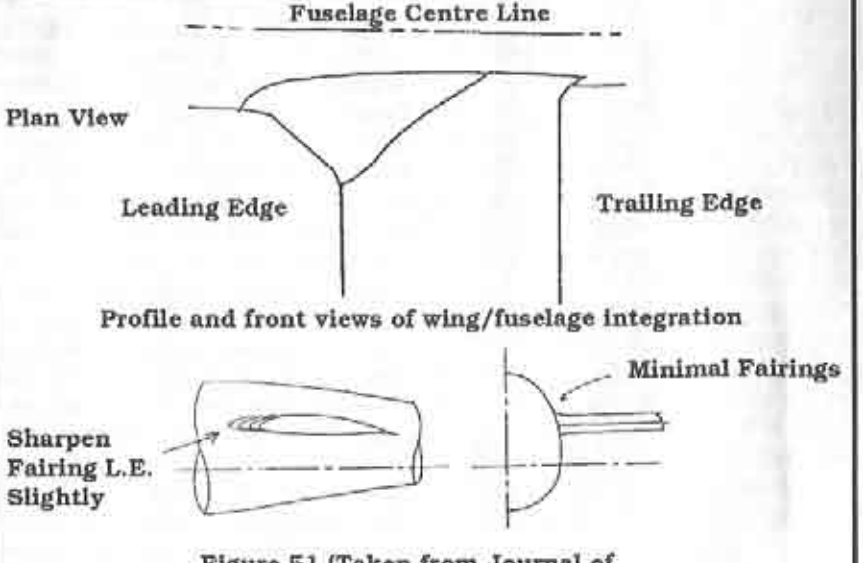


Figure 51 (Taken from Journal of Aircraft, August 1989)

of the simpler types of hinged spoiler, on the upper, low pressure side of the wing, are almost permanently blown partly open in flight by higher pressure air leaking round them from inside the wing.

The detailed design of speed limiting brakes will not be considered here. The best advice available is to make them big enough, and then add another 50%. It is, in fact, hardly possible to have airbrakes that are too powerful, but of course the pilot must be prepared for changes of airspeed and trim in proportion to the power of the brakes, when they are opened.

Conclusion

The F3J thermal soaring sailplane should be as large as the rules permit, with a span between 4 and 5 metres, and the maximum allowed total surface area. An aspect ratio of about 15, with wing span of 4.5 metres, should be satisfactory. There do not seem to be any advantages in tailless, canard or tandem layouts, though there remains scope for experiment.

There should be provision for adding ballast, up to the maximum 5kg limit. Ballast is best carried in the form of extended rods within the wing, adding strength to the wing as well as additional mass.

The wing profile should be chosen, preferably from those proved in the wind tunnel, with camber around 1.5 - 2.5% and thickness about 8-10%. More camber might produce a 'single speed' floater but this would not be suitable for any but the lightest soaring conditions. Reasonably good standards of workmanship are apparently enough to produce a good result. Probably a smooth and polished wing skin will give a superior performance all round, but turbulators or textured wing skins may have desirable effects on control and stability. It does not seem that very precise, moulded wing skins are required.

Simple flaps extending across the whole span, should improve the speed range slightly. More elaborate types of flap, and variable area wings, remain to be tried and developed.

The horizontal stabiliser should be as small as possible, combined with a forward centre of gravity position. A thin symmetrical or very slightly negative cambered profile is required. No measurable advantage in terms of aerodynamic efficiency seems to lie with the all-moving type of elevator as against the fixed tailplane with hinged control surface. Both have advantages and disadvantages from the structural point of view. A T tail layout, or a V tail may yield a slight saving in drag, compared with the orthodox cruciform type.

The vertical tail surfaces should be tall and of aspect ratio as high as practicable.

The fuselage should be of minimal cross sectional area, rigged close to zero degrees angle of incidence to the wing, and carefully streamlined, with a carefully fitted smooth nose cone and contraction of the cross section aft of the wing root.

There is some justification for small leading edge extensions at the wing root, but more elaborate forms of root fairing are not recommended.

Powerful, speed limiting airbrakes are essential.

Full controls, rudder, ailerons and elevator, are to be preferred to the rudder-elevator only system, although given sufficient dihedral, the simpler control system can produce satisfactory results under most circumstances.

For launching such models to maximum heights at maximum weight, special athletic towline runners may be required. Training programs should begin now.

It is probably safe to say that all the above principles have already been discovered by experience among those model fliers who have specialised in thermal soaring, and who have developed models along these lines already to a high degree of aerodynamic and structural sophistication.

[1] See *Journal of Aircraft* Vol 26, No. 8, August 1989, pp 705 - 711.

THE END ■

on the Wing

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Early in 1991 we received a package and letter from Willie Bosco, of Garberville, California. The package contained a small balsa model constructed of some scraps left from a completed kit. Willie asked what we thought of the design and asked if we could make some suggestions concerning airfoil(s), location of CG, and methods of assuring stability in all three axes. The balsa model, although small and having just a flat plate airfoil, flew surprisingly well.

Willie has told us he has watched and flown with birds for years. Buzzards, Red Tailed Hawks, and Black Eagles are all in evidence in Northern California. At one time Willie considered getting a falconer's license to keep and train a Red Tailed Hawk. That dream was never pursued, but Willie did get involved in RC sailplanes. Little wonder Willie's 'ship looks like a bird!

Willie's original drawings showed a rather novel method of roll control involving moveable wingtips. Since this was a new planform, and Willie's first flying wing, we suggested he stick with more conventional control methods. Failures would thus be traceable to basic difficulties with the design itself rather than being complicated by too many other variables.

The next package to arrive was a full sized drawing of what is now known as Red Tail. We made some other suggestions, such as location and size of the ailerons, setting up the elevator, and an easy method of gaining some directional stability, and printed some airfoil plots to be used for templates. The plans were then returned to Willie.

The next letter we received from Willie was most gratifying:

"I appreciate your strong advice about all my wild ideas I had at first. I told my wife while I was building one night, 'Even if this doesn't fly it's been a great design and building process.' It was easy to bring my own ideas into reality once I could visualize what I had in mind. The project moved right along and I finished it up last Sunday night on a marathon finish.

"I couldn't believe how the whole thing went from the time I cut the cores and

Red Tail designed, built and flown by Willie Bosco. Photo by Gerald Myers.

sheeted them with veneer, to when the radio gear functioned, 'til when it balanced with only one ounce of lead in the nose, 'til when - and I'm not lying - it flew right out of my hand.

"I finished very late Sunday night. Monday, today, I went half way up my slope out my back yard for a hand toss. I didn't know what to expect. You can imagine my cool as it moved out, floated up, covered ground, rolled over and banked up, leveled out and sped home to my feet. That's when I knew that all your advice and my hard work paid off.

"The thing is a total success. It looks so good in the air and it is fast! It has already met and surpassed my expectations. I'm really happy!"

Red Tail operates on two channels: ailerons and elevator. Span is 82 inches, wing area is 468 in^2.; at a weight of 22 oz., the wing loading is under 7 $oz./ft^2$. As mentioned above, Red Tail utilizes a foam core and veneer skin; the body is fiberglass and epoxy, wrapped over a styrofoam mold; the elevator is sheet balsa. All radio gear is located within a removeable "nose cone" for accessibility. Construction is very rapid. Since Red Tail is capable of high speed, yet has a low wing loading, Willie feels he has a slope 'ship and a thermal machine all in one airframe.

We met and talked with Willie and saw Red Tail for ourselves at the Mid-Columbia Cup slope race in Richland the end of May. Willie's currently drawing up full sized plans for Red Tail and blueline prints should be available through our plan service, B² Streamlines, by the time you read this. ■

How to Improve Your Landing Scores Part II

...by Frank Deis
Pikes Peak Soaring Society (PPSS)
Colorado Springs, Colorado

(The following article appeared originally in the Journal of the Pikes Peak Soaring Society, *The Spoiler*, in July of 1990. It is reprinted with the permission of Frank Deis. Ed.)

Now that you have the entry into the landing down pat, we are ready to talk about the down wind leg. We have to talk fast because it doesn't last long.

The Down Wind Leg

Typically, the down wind leg is a fast, flat glide, directly down wind, lasting 5 -10 seconds and ending in a high banked 90 degree turn onto the base leg. The only decision you have to make is how long it should be. The length of the down wind leg has two important effects. First it establishes the length of the final approach leg - the further down wind you go, the further you must come back to reach the spot. Second, it strongly affects the time to complete the landing pattern.

Let's consider the length's affect on the final approach first. There are many things to do on the final approach leg. First, we must recover from the turn ending the base leg and beginning the final approach, we must get lined up with the spot, and adjust the glide slope. Then we must fly back up wind keeping everything lined up and finally we must kill off the speed to minimize the slide. All of this takes time and airspace. So the first secret is - don't make the down wind leg too short. If you do you will find the final approach leg too cramped to get everything in. Now, can it be too long? Probably not, at least as far as its affect on the final approach is concerned. It is important to use the same length each time (normally 30 to 40 meters) so that the times for the turns are consistent, Once the length is selected, adjust the altitude and time to go at the entry point to go with it and you are in business. For example, if you like a long down wind leg you may have to hit the landing pattern entry point with 35 - 40 seconds to go before touch down and 10 ft. more altitude than is typical.

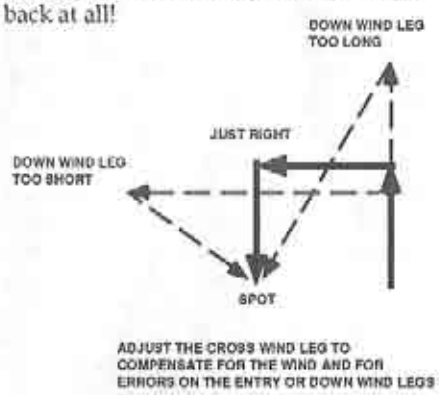
The other concern is the impact of the down wind leg length on the total time in the landing pattern. We are forced to adjust the length of the down wind leg in flight to compensate for the wind. In fact, this adjustment is the most important and easiest way to account for the wind. Let's consider two flights with an airplane that has an airspeed of 20 MPH. The first flight occurs in no wind. If the down wind leg is 10 seconds long then the final approach will also be about 10 seconds long totaling 20 seconds. Suppose the second flight takes place in a 10 MPH head wind. The ground speed on the down wind leg is 30 MPH and on the final approach leg is 10 MPH - a factor of 3 difference. If the down wind leg is 10 seconds long, the final approach will be 30 seconds long (totalling 40 seconds) and the landing will be 20 seconds late. The down wind leg must be shortened to 5 seconds giving a final approach leg of 15 seconds to total 20 seconds again and an on time landing. Note that, even though the down wind leg is half as long, there is still plenty of time on final approach to get everything done. In summary, pick the length of the down wind leg to allow a comfortable final approach leg in average wind conditions and then compensate for higher or lower winds by extending or shortening it in flight.

Turning Onto the Base Leg

The turn from the down wind leg onto the base leg is my favorite part of the landing pattern. If this goes well the landing is in the bag! If it goes poorly I am usually in serious trouble. Most of all it is a thing of beauty to execute with a sailplane. I set up the down wind leg to be a fast flat glide, typically one of the fastest part of the entire flight. (Recall the down trim adjustment made prior to entering the landing pattern?) At this speed and with this trim, the airplane has little tendency to pull up and stall. The nose is low, the tail is high, it is moving fast and the control response is quick and accurate - this sailplane means business! The turn we want is quick but not so quick as to kill off any speed. The airplane should roll up quickly into a 90 degree bank, execute a smooth fast 90 degree turn, level the wings again exiting the turn with the nose down 2 - 5 degrees and no loss of speed. You know you have done it properly if it acts like it is on rails! (I get excited just talking about it.) If it starts to climb, the turn was messed up or it was going too fast on the down wind leg. Get the spoilers out fast, or crow or execute a fast 360 degree turn to kill off the excess speed and get back into the landing pattern. If it exits the turn nose high in a stall, the turn was too tight or the airspeed was too low on the down wind leg. Forget the landing and start worrying about getting down in one piece.

The Base Leg

We are now into the base or cross wind leg. This is where you can breath a little if you survived the turn of the down wind leg. A smooth base leg confirms that most of what we wanted to accomplish in the last 20 - 30 seconds went well. If the base leg is long enough (typically 10 seconds or so and determined by the cross wind distance to the landing pattern entry point that started this whole thing) it should be fairly uneventful. It is not even affected by the wind very much. Best of all it is the place to make landing pattern adjustments to correct for any mistakes up to this point. The most important correction available during the base leg is the adjustment to the total landing pattern time. If the down wind leg was too long, immediately turn onto the final approach (see the diagram) and fly a "V" type landing pattern to save 5 - 7 seconds. If the down wind leg was too short, fly on by the normal point to turn onto the final approach, stretch the base leg 5 -10 seconds over normal and get back on schedule (see the diagram). The base leg is usually slightly slower than the down wind leg and the airplane loses 1/3 to 1/2 of its altitude. If there is a strong wind, the base leg can produce an illusion that can get you into big trouble. What counts is the flight path direction, not the direction the airplane is pointed. In strong winds the airplane may have to be pointed at you in order to fly the base leg at right angles to the wind. If you don't compensate this way the wind will blow you so far that you could double the length of the final approach if you get back at all!



The Turn Onto Final

The base leg ends with another smooth, fast, high banked turn onto the final approach although not quite as spectacular as the turn that started the leg. The trim hasn't changed and only a little airspeed is lost, so the airplane should corner smoothly, roll out quickly and enter the final approach with decent speed and an altitude of 10 - 15 ft. Its nose should be pointed at the spot. It is now about 10 seconds away from landing. All-in-all it has been a pretty good leg.

The Final Approach

The final approach gets busy again but not in the way most pilots believe. A strange thing happened as we rolled out of the turn onto the final approach. We lost control of the time of the landing!!! I know, this is when most pilots start to control the time of arrival! And I am saying the game is already over! Here is why. First of all our goal is to land at one of three times 1:59, 2:00, 2:01 to use two minute precision as an example. Landing anywhere in this three second period will net a score within one point of perfect and that is good enough, remember? The airplane is moving at about 15 ft per second so it will travel about 45 ft during the three second target period. That is the full diameter of the 25 ft landing circle! Hence, touching down anywhere in the circle will give us a great flight score! Second of all, when we rolled out of the turn we were some distance away from the spot and closing at some speed and about 10 seconds away from landing. There is almost nothing you can do to speed up the rest of the flight (save diving into the ground) and there is almost nothing you can do to slow it down (save breaking out of the pattern and going around to try it again). If you can not control it and if it will come out alright even if you don't control it, then stop worrying about it. Focus entirely on a smooth approach ending as close to the spot as possible. FORGET THE TIME. This is a very important concept because it allows us to stop worrying about some things and to focus more single minded on what is left.

Getting close to the spot is largely a matter of being solidly in control of the airplane for the next 10 seconds. The nose should never come above the horizontal - remember we are supposed to be coming down. The down trim inserted prior to entering the landing pattern should cover this. Usually the nose will be too low upon rolling out of the turn onto final and you will have to flatten the glide a little. If you have to pick the nose up too much you probably messed up on one of the previous legs or on the entry conditions. You can easily be lulled to sleep on this because stretching the glide on a calm day is easy and even pretty. If you try it in a wind the airplane will jump up in altitude, its ground speed will fall way off and you will find yourself 10 ft straight up over the spot with no way to recover. Keep the wings level and the fuselage pointed at the spot. Set the crab angle if it is not coming straight up wind. When you get it crabbing into the wind with the nose low and sideslipping directly toward the spot you know you are in control. With 10 - 15 ft to go it is time to think about setting it down.

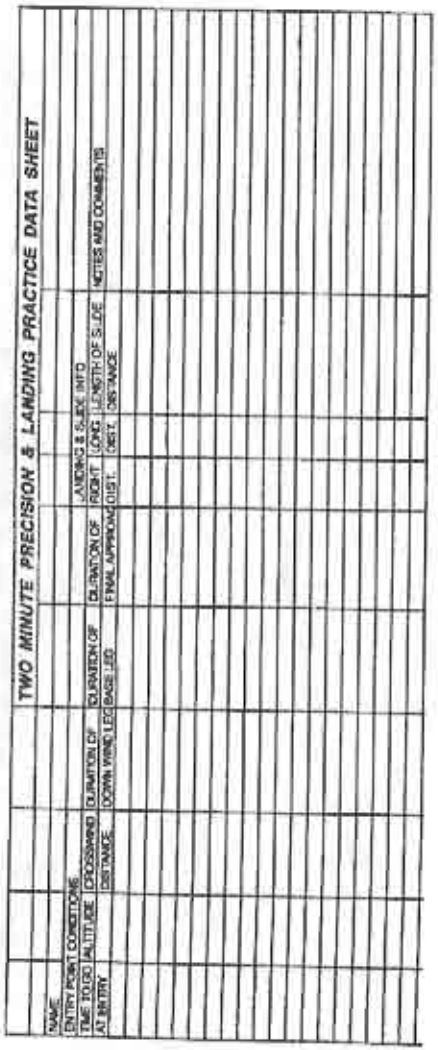
A common phenomena encountered on the final approach is the boundary layer lying next to the ground. In affect the air next to the ground sticks to the earth and doesn't move with the wind. As you move up from the surface the air in the boundary picks up speed until it is moving at the true wind speed. The way this affects you is that as you start your approach high it looks like the wind will cause you to land short so you stretch the glide. Then, as you get close to touch down, the airplane shoots forward and you land long wondering why the wind stopped just when you were landing. The truth is the wind kept on blowing, you just dropped into the boundary layer. The depth of the boundary layer depends on the kind of wind that is blowing and how strong, but you can usually see its effects below about 3 feet. Knowledge of the boundary layers existence can keep you out of trouble and can even save you on occasion. If you are running late or perhaps falling short of the spot in a high wind, just dive into the boundary, hug those grass tops and you will be surprised how far forward you can go. THIS IS NOT FOR THE FAINT AT HEART!

Touchdown

We expect the airplane to slide and from experience we know how much - remember you recorded it on each practice flight. So, pop the spoilers, drop the flaps or ease in the down elevator and set it down 2 to 5 feet short and let it slide up to the spot. I like to dive the airplane gently after completing the turn onto final to get some speed and get down close to the ground - a foot or so - for most of the flight across the landing circle. Then, I can set it down with elevator without going into a dive. I use the same procedure with spoilers except I start at 2 - 3 ft and as I come up on the spot I ease out the spoilers while adding up elevator. The airplane will lose speed and rotate to a stall and flop down on the spot with little or no slide. This is much prettier than spearing the landing and, for me, gives consistently higher scores. The airplane has to be in perfect trim. If it has a tendency to wander off course or to climb or dive you will be fighting it the whole way in. If it is warp free and correctly trimmed, it will follow the grove all the way to the spot.

Defining Your Personal Landing Pattern

So much for theory! How do we taylor this process to your needs? It is really pretty straight forward but it may take several flights. Initially just shoot a few landings without concern for timing. Try to fly a clean rectangular pattern and have someone time the airplane from the entry point to touch down. Have them note the entry conditions including altitude, cross wind distance, speed and trim for each test (see the data sheet). Try different cross wind distances and altitudes at the entry point as well as different down wind leg lengths until you find a combination you are comfortable with. Be sure to try increasing the entry point cross wind distance to something that seems too large because there is a natural tendency to make it too short. When you find a combination that feels good, fly it a few more times to pin it down, recording the results each time. Average the results over the flights and decide on the entry conditions you want to use. Your timer can tell you how long your pattern is from entry to touch down (say 25 seconds). Now you know that, if you hit the entry point with the 25 seconds to go, you will have a comfortable natural feeling landing pattern. Some pilots count down to the entry point and then don't want to hear any times thereafter. Their



pattern is so consistent they don't need it! You timer can also give you the times of the turns onto the base and final approach legs and now you are ready to practice. You have a combination you like and all you have to do is fly the same approach every time. If you find something you don't like or a place where you feel rushed, don't hesitate to adjust the pattern. It should be right for you and your airplane.

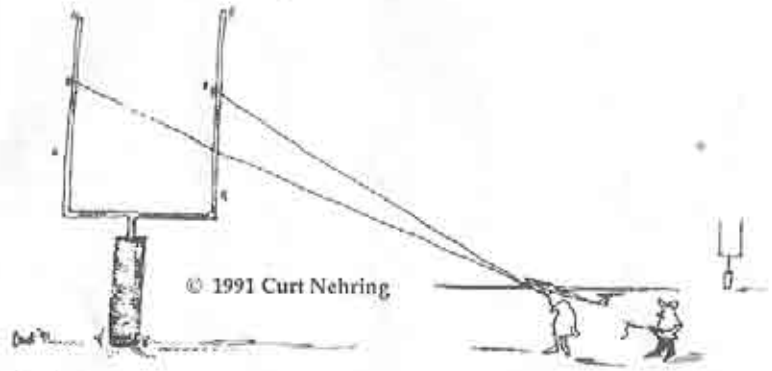
Practice

The easiest way to practice is to fly as usual and when you get tired of riding that boomer ask someone to give you a 1 or 2 minute count down (or count up) for a landing. I find it useful to talk myself through the process like a pilot with a check list. It sounds like this:

Timer	Pilot
1:30 to go	I think I will stay in this thermal a while longer.
1:00 to go	I will ease out of the thermal and start back.
0:50 to go	Two clicks of down trim in, spoilers 1/2 out, start a steep dive back toward the entry point.
0:40 to go	In the middle of the high speed dive headed back - adjust the cross wind distance and aim at the entry point.
0:30 to go	Lost all altitude down to the entry point but airspeed too high, open spoilers full to reduce airspeed, flatten glide and prepare to enter the landing pattern.
0:25 to go	Hit the entry point on time, on speed, on altitude, spoilers in. Watch out for sluggish control feel indicating airspeed problems.
0:20 to go	Count to two and start turn onto base leg. Bank angle 90 degrees, smooth fast turn, exit with nose down and correct any tendency to climb, quickly determine adjustments to the base leg length to compensate for the wind - gee that was pretty!
0:15 to go	Hold course, count to 4 and turn onto final. Get wings level and point the fuselage at the spot- nose down.
0:10 to go	Dive down toward the circle and pull out close to the ground, ease the spoilers out to kill off the speed and compensate with elevator to keep from landing.
0:05 to go	Speed good, altitude 2 ft, wings level, set crab angle into the wind.
0:04 to go	Speed decreasing and altitude dropping, crab angle set.
0:03 to go	Glide path set and airplane in the groove.
0:02 to go	Enter the landing circle, pick out a point short of the spot to start the slide.
0:01 to go	Holding course ready to touch down. Open spoilers to set down and slide.
0:00 to go	Touch down - stop time - stay on the elevator and rudder to control slide. Prepared to pick up - touch and go if necessary. Hold direction straight into the wind, don't flip over, come to a stop.

Now write down the time, entry conditions, the length of the slide and where you stopped along with the wind conditions and any other comments that come to mind (i.e. stayed in the thermal too long) for future reference and thank your timer.

If this sounds more exciting than a typical fun fly landing you are right. When everything works it is a real thrill!! If you will take the time to master this process it could give PPSS the edge in the duration portion of the Challenge Cup competition. (If you can land within 1 second and 1 foot most of the time, you can land within 1 meter all of the time.) Besides, you will be a better pilot, have more fun, and dazzle the other pilots. If you have any problems ask a club member - that is why we have a club. See ya at the field. ■



Fox Models Scorpion

...By Sherman Knight
Bellevue, Washington

I had been flying sailplanes for little over a year when I finally made the decision to step up to a sailplane designed for competition.

After a fair amount of research and watching many of the planes in the local flying field, there were several design elements that I was looking for in a new sailplane. These were:

A. The SD-7037 Airfoil.
B. 8020 Stab Airfoil.
C. Slip-off nose cone.
D. Epoxy-glass fuselage.
E. Foam core wings.
F. Full flying T-tail.
G. Large flaps.
H. 100 inch wing span.

Finally, after months of looking, I read Mike Fox's article in a recent issue of AMA Magazine and immediately ordered his new kit "Scorpion". Mike had been selling his two meter version (Li'l Scorpion) for the past year or so and the plane had placed third in the 1990 nationals. Mike has also been flying the standard Scorpion for a couple of years and has just made it available in kit form. The standard version has also done quite well in national events placing 7th in standard class in the 1990 nationals; 9th in standard class and 3rd in unlimited class at the 1991 nationals. The Scorpion swept 1st, 2nd, and 3rd at the Ace R/C sponsored contest and overall award for both days combined.

Scorpion Specifications

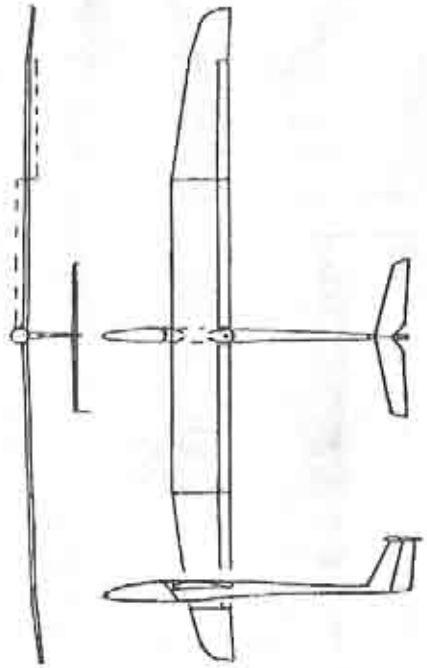
Wingspan	99 3/4"
Wing Area	814 Sq. In.
Airfoil	SD7037
Weight	48 Oz.
Wing Loading	8.6 Oz./Sq. Ft.

Manufacturer: Fox Models, 115 N. Thornwood Avenue, Davenport, IA 52802; (319) 322-1244 home (eve.)

Kit Contents

The kit comes carefully packaged in a large, sturdy box containing many pre-cut plywood parts, pre-cut balsa parts, and an epoxy fiberglass fuselage. The kit supplies foam wing cores, 1/32 inch balsa stabilizer sheeting and 1/16 inch balsa wing sheeting. The wood stock and shaping work are of a very high quality and small parts are organized and protected in small plastic bags.

All essential hardware is supplied, including a tow hook and servo connector fittings using high quality brand name parts. Also included are nylon wing hold down bolts and all the necessary metal parts. The aileron push rods already include a z-bend on one end. The only additional materials needed to build the kit are CyA glue, epoxy glue, hinge tape, and covering material. A blue line drawing and an instruction manual containing twelve photographs and sixteen sketches are included to guide you through construction. Mike assures me that the quality of the instructions and photographs will improve in the next few weeks.



The Wing

The wing is built in five separate pieces. The four foot long center portion of the wing bolts directly to the fuselage. This portion contains a full length spar that is built in place inside the wing core. The center section also contains full length flaps. The outer, plug in, wing section consists of an eighteen inch long inboard panel with a tapered leading edge, full length ailerons and a 7 7/8 inch long outboard tip panel which is tipped up slightly. The spar continues midway through the aileron sections. There is a slight dihedral break at the center of the wing along with a polyhedral break at the outward 7 7/8 inch wingtips.

All the spars are built in the foam cores. I added 1/4 inch x .007 carbon fiber to both spar caps. As a result, the wings flexed very little on launch. Once the spars are completed and the joiner rods and tubes installed, the panels are ready for sheeting.

I had never built a foam core before and found many of the members of the local soaring club quite helpful. Troublesome however, is the fact that there are many different methods of applying balsa sheeting to foam cores. Finally, I selected the following vacuum bag technique that worked quite well.

A. Once the spars and inserts are assembled in the foam cores and sanded to match, prepare and pre-cut the 1/16 balsa sheeting 1/8 inch larger on the ends and leading edge. Sand the finished sides of the balsa very smooth.
B. Mix very slow setting epoxy (Hobby poxy 2 or similar type of slow setting epoxy) and apply it to the balsa surfaces. Completely cover and then scrape as much epoxy off as you can using a four inch plastic scraper.
C. Impregnate a two and one-half inch wide piece of fiberglass with epoxy resin. Prepare enough to install in both the upper and lower balsa sheets. (1.5 oz. fiberglass is provided, pre-cut to two inch width in the kit .)
D. Place the lower balsa sheeting in the lower bed aligned with the trailing edge. Install the epoxy impregnated fiberglass with approximately 1/8 inch extending past the trailing edge.
E. Lay the foam core in the lower bed, carefully aligning the core with the bed.
F. Place the upper two and one-half inch wide piece of epoxy impregnated fiberglass on the trailing edge of the foam core.
G. Place the upper balsa sheet on the foam core aligned with the lower sheet trailing edge. Align the trailing edge with the edge of the lower foam core bed.
H. Place the upper bed on top of the balsa sheeting.
I. Insert several straight pins approximately 1/2 inch from the trailing edge through the foam beds and balsa sheeting, but not through the core. Now carefully align the foam core so that it lines up with the alignment marks on the ends of the foam

beds. Insert several straight pins in various locations through the beds and core to hold its alignment. Place the foam core, balsa sheeting, and foam beds inside the vacuum bag. Slowly apply the vacuum, continuously checking the alignment. Once the vacuum is set and the alignment is true, let the bag sit overnight. The next morning withdraw the foam beds, pull out the alignment pins, and the wing sheeting is complete. Install the leading edge, sand to the proper shape (wing section profiles are provided at all wing taper breaks for the construction of airfoil templates), cut out the flaps, ailerons, and servo locations and the wing is ready to cover.

J. I did not place any additional weights on the bag and the wing sections were straight and true.

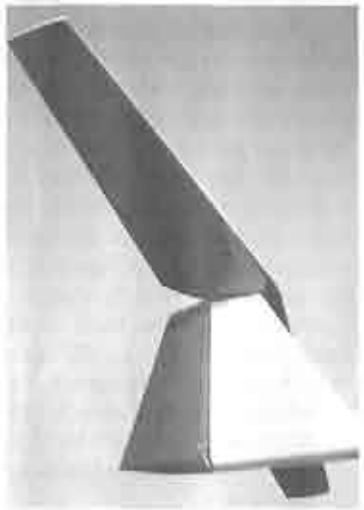
Although I had never done vacuum bagging before, I found the system exceptionally easy to use, and was able to complete all five of the wing sections in three evenings.

I used the Composite Structures Technologies, Mighty Mini-Vac bagging system. The system includes an electric pump, plastic T-fittings, rigid vacuum line, three yards of nylon bagging tube, thirty feet of tacky tape sealing strip, and twenty four feet of breather felt strip. Nothing else was needed to complete the vacuum bag process. I was extremely pleased with the system.

Ailerons and flaps should be cut from the completed wings using a blade no thicker than a bandsaw. Capping material provided in the kit is 1/64 inch plywood leaving very little if any room for over cutting. Mike recommends scotch tape for fastening the 7 7/8 inch outboard wing tip panel in place. This is apparently all that is necessary to withstand the vigor of zoom winch launchings and yet provide a great amount of crash resistance and tip shape experimenting.

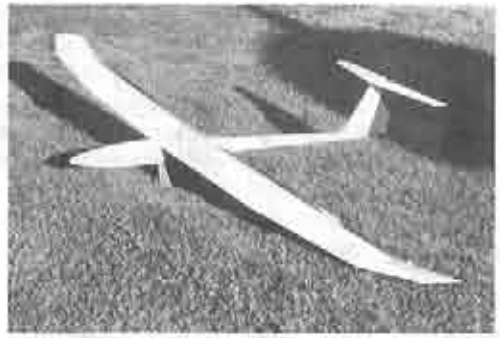
Fuselage

The Scorpion fuselage is of one piece molded epoxy-glass construction with a slip-off nose cone. No bulkheads or formers are required. The fuselage former for the wing attachment pins is already epoxied in place. CyA can be used for all connections to the fuselage. However, during hard landings, I have often had the glue seam break. I chose to make all fuselage connections using epoxy mixed with 25% of Bob Violette Models milled 1/32 long glass fibers. Pin holes were filled using Bob Violette Models pin hole filler. The rudder and T-tail support is extremely simple but rugged. The pivot point and all working connections of the horizontal stabilizer are inside the rudder or the stabilizer and does not create any drag penalty. All plywood parts for the tail and horizontal stabilizer system are pre-cut and fit very well. All of the



Bell-Crank hardware and push rods are already cut and assembled and ready to install.

A smooth joint at the slip off nose cone is easily accomplished. Mix 2/3 micro balloons in epoxy. Coat the joint end of the slip off nose cone with a water soluble jelly. Spread the epoxy mix around the joint and slip on the nose



cone. Press it firmly into the epoxy mix. When the left over epoxy becomes firm, pull the nose cone off. When the epoxy becomes fully cured, slip the nose cone back on and sand the joint smooth.

The Fuselage is reinforced immediately behind the wing for those who like to grip the fuselage there for launching. If you typically grip the fuselage at the center of gravity for launch, you may need some additional reinforcement.

Tail Surfaces

Construction of the stabs and rudder is straight forward. The stabilizer is foam core sheeted with 1/32 inch thick balsa. The receiving tubes in the stabs are installed through plywood ribs that are pre-cut to fit in slots which are already pre-cut in the foam stab cores. The system works very well and provides a very true and straight stabilizer. The rudder is of traditional built up construction and all of the balsa, hinges, and related hardware are supplied.

Servo Installation and Set-up

There are five servos in the Scorpion. Micro servos are imbedded in each outer wing panel for the ailerons. A larger servo is imbedded in the center portion of the wing that operates both flaps. There is one servo for the elevator and one servo for the rudder. Elevator is controlled by a traditional pushrod system. Rudder is controlled by a simple, but effective pull-pull cable system. Installation is very straight forward and provides for a very quick and slop free control surface response.

Flaps and ailerons are hinged using clear hinge tape. This model was fitted with JR 917 servos for the flaps and elevator and the RCD Apollo "electro-glide" servos for the ailerons and rudder. Although a computer style radio is not necessary, it is certainly recommended. With a 550 mAh battery pack the model balanced at the point recommended for test flying with the addition of 1 1/2 ounces of nose weight. Control throws are clearly specified in the instructions. "Ultra-coat" was used to cover the wing and tail surfaces. "Zynolyte" epoxy spray paint was used on the fuselage. (I find that this paint has similar abrasion resistance as Black Baron Epoxy but dries in a much shorter period of time.) Mount the tow hook exactly as shown.

The total ready to fly weight was 49 ounces. This is 1 ounce heavier than the weight specified in the kit. However, this still yields a very low wing loading of 8.7 ounces per square foot. Because of the low weight, I chose to install Ballast tubes in the center wing section as detailed in the plans.

Flying

The wing breaks down into three pieces and the stab into two. All the parts and fuselage fit easily in the trunk of my Honda Accord. The Scorpion assembles quickly and easily and is ready for flight in minutes.

Initial trim flights were very surprising. With a firm hand toss, the Scorpion flew straight and level for over 250 feet. The model is stable and flew hands off for most of the initial flights. Stalls are straight and gentle with no tendency to tip stall.

Initial test flying was done in light wind off a weak high start. The initial flights required no more than a click or two of trim adjustment. Landing with flaps took some adjustment with significant down elevator programmed for pitch compensation. Flaps are large

enough that you must be careful to maintain flight speed or you can actually make the plane fall out of the sky at slow speeds.

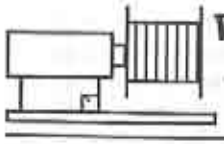
The second launch was off a much stronger high start which resulted in a 19 minute flight. The model is very well behaved and responds well to small control inputs.

My first winch starts were with this airplane the Friday night before one of the local contests. By the third winch launch I was able to perform my own launch and control the winch. The model is very stable on the winch and is capable of a healthy zoom upon release.

Launch flaps (without elevator compensation) are very effective. Several high-start launches (into a 5 to 10 knot breeze) have left all of the surgical tubing within ten feet of the stake. This plane is a blast to fly, thermals well, and the large flaps provide great launch lift and exceptional landing control. Although the instructions call for Crow on the ailerons, it has not been necessary with 80% flaps. The SD-7037 air foil not only shows every "bump" that you fly through, but it penetrates well and covers ground quickly. The Scorpion's ability to cover ground, downwind, while loosing very little altitude is amazing.

The Scorpion is billed as an "all out competition sailplane", however, it is not difficult to fly. Although the construction details may sound difficult, believe me, they were not. After building my first foam core wing, I will probably never do another balsa built-up wing. The epoxy fiberglass fuselage was simple to work with, easy to paint, and both CyA and epoxy bond well to it. I would strongly recommend this model to anyone who wants a well flying standard class sailplane or anyone looking for a "high performance, all out competition sailplane".

The model costs $175. In addition, you need to supply glue, hinge tape, and covering materials. The outstanding quality of the kit and the Scorpion's superior flight performance makes it one of those rare model airplanes that you can really fall in love with. ■



Winch Line ...by Gordon Jones

Gordon Jones, 214 Sunflower Drive, Garland, Texas 75041; (214) 840-8116

Foam Wing Construction - Part 1

Sheeting foam core wings is a relatively straight forward process and with a little experience easily accomplished. As with everything else in our hobby there are a great number of ways to accomplish the sheeting process. Every modeler has building techniques that he/she is comfortable with and at ease performing. The same is true with sheeting foam wings. We have each been taught or learned by doing certain building techniques that work very well for us, and we don't like to change techniques in the middle of the stream. That is a natural part of life and it isn't going to change any time soon.

The best thing about foam wings is that you can obtain a fiberglass fuselage or design and build your own from wood. Then design and build a wing for that fuselage. Or if you have a fuselage from another plane you can make a replacement wing from foam. If you want an airplane that looks like X airplane you have more options than just going out and buying the kit. You can build your own from scratch. And if you prefer the flying characteristics of a couple of planes you can take the good points of each and put together your own world beater.

There are other advantages as well; first, you can obtain a truer airfoil without the valleys and humps that degrade the performance of the wing. With the computer generated airfoils that are available today you are not limited to what is in the kit. Secondly, with some practice you can build a foam wing faster than the built-up construction version.

Many modelers have shyed away from foam wing construction as too complicated, and requiring too many new tools and techniques. While to some degree this is true, most of the techniques and tools are readily available in the average shop today. Foam core wings are available pre-cut, if you prefer not to jump into that part of it, at reasonable rates. Plus, there is usually someone close by that is cutting wings already. (Plus, you can get some help here too.) The tools are mostly standard with the exception of the wing press or vacuum set-up, but these are easily put together and don't cost all that much.

First let's look at the process from a construction standpoint. The steps involved may seem like a lot, but most of these are the same ones that you are already performing in balsa construction. In constructing a built-up wing you make the ribs, you build the spar assembly, you add cap strips for the top of the ribs, and you cut out and finish control surfaces. These same processes are performed in constructing a foam wing.

The following is a basic list of those steps that would be used in construction of a foam wing. You will note that some options are listed in various steps and will be discussed later.

- Preparing the foam cores with the spar assembly and running any troughs for wires or pushrods.
- Preparing the sheeting material whether it is balsa, obechi or whatever.
- Preparing the sheeting adhesive (epoxy resin, 3M 77, white glue, or tape).
- Preparing the press or vacuum set-up.
- Preparing any stiffening materials such as Carbon Fiber or fiberglass.
- Applying the adhesive to the sheeting.
- Installing any strengthening material to the core or sheeting.
- Installing the sheeting on the foam core.
- Putting the sheeted wing into a press or vacuum bag to cure (if necessary).
- Trimming the excess covering material

from the foam cores.

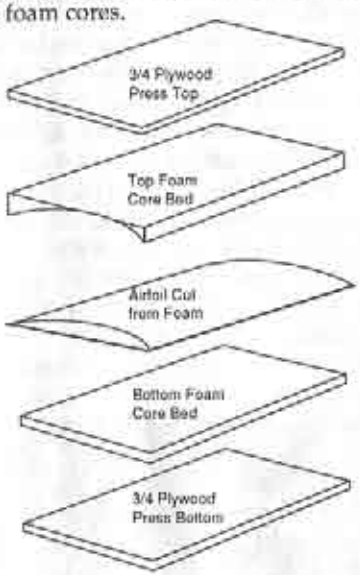
- Cutting and installing the leading edge material.
- Cutting out any control surfaces.
- Preparing the control surfaces (aileron angles, capping).
- Cutting and installing the root rib.
- Installing the wing tip.
- Sanding the wing.
- Covering the wing
- Installing servos and control surfaces.

First lets look at the tools that are involved in foam construction. Most are already available in the work shop such as: X-acto knives, sandpaper, straight edges and triangles, saws, and the like. The only real new tools will be squeegees for applying epoxy or epoxy resin, and a press or vacuum pump (if you want get exotic). Yes that is all!

Next let's look at the building materials you will need for this project. Again most of you are familiar with the basic materials such as balsa, spruce, carbon fiber and epoxy. The only new items are the foam and fiberglass cloth, and, maybe, the epoxy resin. Once again not a long list of unfamiliar items.

OK, how do I build this foam wing? Naturally the best place to start is the design of the wing that you want for a replacement or for that new fuselage. I am not going to touch on that here as there are more articles on design out there than I care to count. For the sake of this discussion we will assume that you are making a replacement wing for an existing fuselage and that you are going to use the planform and dimensions of that wing. If you want to design a wing or use a wing design from another plane that is fine as the processes are basically the same.

At this point lets discuss the wing press. All that is required to construct a good wing press is two pieces of 3/4 inch straight quality plywood, or if you can find them wide enough some hard wood. These pieces or planks are the foundation of the press and must be warp free. They should be approximately 2 inches larger than the outside dimensions of the wing panels that you will be sheeting. In order to clamp the foam cores in the press you will need either some C clamps large enough to clamp the foam cores inside the planks of the press. Or you can drill holes along the outside of the planks and use bolts with wing nuts to secure the cores while the epoxy resin is drying. The illustration depicts the press with the foam cores.



To properly secure the foam cores in the press I recommend eight C clamps or the same number of bolts with wing nuts. If you use the bolt/wing nut arrangement be sure to use some washers so you don't destroy the planks. Space the C clamps or bolts equidistant along the sides of the plank so that the pressure will be applied equally across the entire press.

While you are at it, cut four wood blocks that are the same height as the foam core to use as spacers when you are actually pressing the cores. These will keep you from crushing the foam and allow you to press all the cores with the same pressure for a more uniform sheeting application.

The other new tool that you will be using is a squeegee. You can get these at almost any automotive store or you can use business cards, old credit cards or an assortment of other items. The one thing you want to look for on whatever you use is that the edges are relatively smooth so that you do not gouge the sheeting material or snag the fiberglass cloth that we will use along the trailing edge. ■

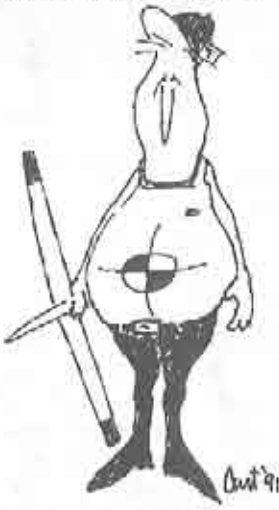
Some Weighty Ideas

When it comes time (at long last) to balance that new airplane; most gun shops carry shotgun pellets (shot) in nice, large quantities. If you and a couple of friends go in together you will have plenty for all as it comes in 10 pound sacks.

To initially balance the airplane use a small plastic zip-lock bag to hold the shot. When you have got the Center of Gravity where you want it after a couple of flights or so epoxy the shot in the nose. Or just leave it in the bag, but put some tape around it for any hard landings.

Fishing weights are another source of weights for balancing or ballast. They come in a variety of sizes and are premeasured so that you can add the amount of weight you want.

And, many folks are using model rocket tubes for ballast tubes in the wing! ■



Can You Recognize the Parts of This MOTOR GLIDER?

...by Ray Reiffer, Zeeland, Michigan

It has been many years since I've flown motor gliders. Actually, in 1975 I had my last flight with this type of R/C flying.

Now, due to my health situation and in an attempt to continue flying often, I have reconsidered this mode of soaring.

I'm sure most of you recognize the Sagitta wings right off and, maybe, the OLY tail feathers. But, the SMG 1-30 fuse. must have stumped a few. I made a low profile canopy of a different design so the entire looks are changed, but the 1-30 is there. With my basement full of relics it didn't take long to mix and match parts. With the addition of one o.s. surpass .26-4 stroke engine the project was ready to fly in two weeks at night after work. This has turned out to be a wonderful flier. The loading is 13 oz. per square foot and is very soarable. To keep me honest, I installed a small 4 oz. fuel tank and this gives very nice flight times at idle speeds in neutral air. This is no excuse for the purist of course, and I do prefer traditional sailplanes but for various reasons there is often a slot for this aspect of soaring.

Good Soaring! ■

Ridge Writer

...by Wil Byers

RT. 4 Box 9544, W. Richland, Washington 99352; (509) 627-5224 (7:00 PM - 10:00 PM weekdays, after 9:00 AM weekends)

Are you flying your model too slow? Are you landing your slope ship at the bottom of your favorite hill more often than you might otherwise like?

If this is the case, you probably are doing just that. As a result of this slow flight regime, the model has a higher sink rate than it would otherwise. Accompanying this high sink rate, is a lower lift over drag (L/D) ratio than if the model was flown at a higher rate of speed. This may be a basic understanding for many of us, but often beginning flyers need to learn this elementary aeronautical fact. So, this month we will concern ourselves with how and why to avoid flying too slow.

Let's begin by looking at the airfoil polar data provided. By the way, this data is from Soartech 8. Soartech 8 is the latest and the greatest compilation of airfoil data produced by the research team of Michael Selig, John Donovan, and David Fraser. This book is published by Herk Stokely the soaring columnist for *Flying Models*. You can purchase it from H.A. Stokely, 1504 North Horseshoe Circle, Virginia Beach, VA 23451. If you haven't seen it, it is worth the few dollars it costs just as a learning tool.

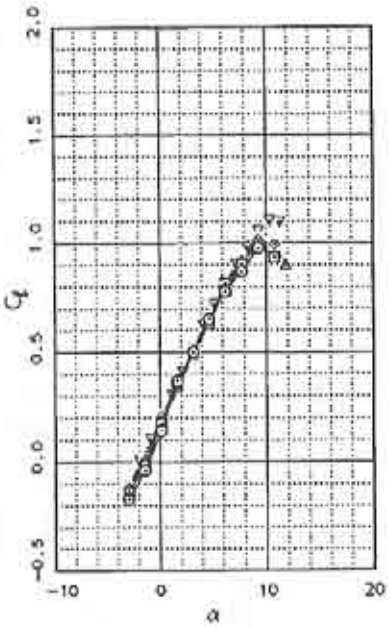
Now to that airfoil polar. Begin by looking at the polar and focus on the left part. This is the part which plots C_l versus C_d or lift versus drag. It is very important to point out that this data is a representation of what happens for a two dimensional section only. That is to say, the section is representative of one that only has thickness and chord. Chord being the distance from the leading edge of an airfoil to its trailing edge. And, thickness is of course the distance from the top of the airfoil to the bottom. In other words, an airfoil that has a chord of 10 inches and is 10% thick would have a distance of 1 inch from the top to the bottom. Therefore, a two dimensional section is one not corrected for aspect ratio and, as such, does not accurately represent what an airfoil will do when it is performing on a glider or airplane wing.

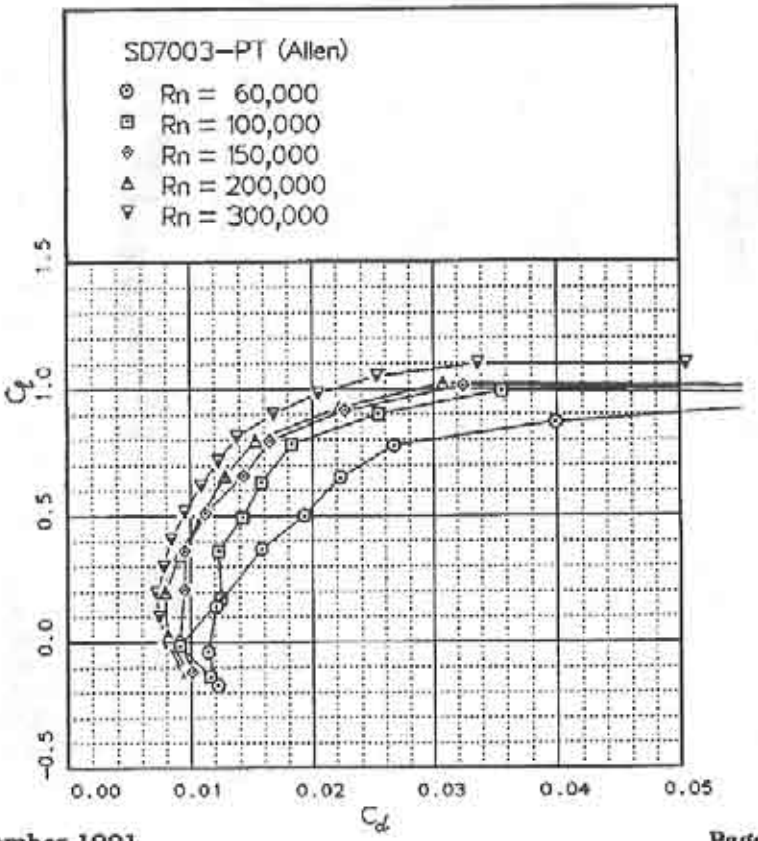
For those who don't know what aspect ratio is, here is a simple explanation. Basically, aspect ratio (AR) is a ratio of the span (b) of the wing divided by the mean aerodynamic chord (MAC). Note: The MAC is the chord length along the wing where the results of all the aerodynamic forces may be assumed to be concentrated. The AR can also be calculated as b^2 divided by the area (S). As an example, when a model has a 100 inch span with a MAC of 5 inches it has an aspect ratio of 20. However, if that model has a reduced MAC of only 4 inches for the same span it will then have an AR of 25. The important point to make here is: as the AR ratio increases, the slope of lift curve increases. And, as the lift curve increases we can consider this positive for performance, because it means the wing will have more lift for a given amount of drag.

But now for the sake of this explanation, we will only consider the data represented in the two dimensional representation. So, looking at the polar you will see that there are a number of lines on it. Some of these lines cross over one another or even lie on top of the other. Note that each line is identified separately from the other by a unique symbol. The symbol we will concern ourselves with is the symbol for a RN of 300,000, which is the inverted triangle. (Later in the article we will jump back to discuss Reynolds number RN.) I am picking this figure only because it is the lowest on the drag polar.

Focus now on the adjoining polar. This polar is a graphical depiction of C_l versa angle of attack of the airfoil section. Note how this line climbs fairly linearly. Pay special attention to what the line does as it approaches its top. This is because as the airfoil's angle of attack increases it will eventually reach a point where the C_l will begin to erode and the line will either abruptly or gently turn downwards, indicating that the airfoil can no longer produce lift. And, further this turn in the polar indicates the airfoil is starting to stall. The stall normally indicating that the air has become turbulated over the top of the airfoil and has separated from any laminar attachment.

The point at which the airfoil has stalled is





usually one that most flyers can recognize. So it is not the stall that we will concern ourselves with in this discussion, but rather, a condition which is not nearly as pure. The condition of flying too slow is more subtle and can result in a hike to the bottom of the hill, when none was required. Let's talk about why and then speed up!

If you look at the L/D polar you will see that as C_d increases so does C_l. Well, it does at least for a while, then it tends to level off and climb only slowly. This characteristic is important to note and one that will explain a great deal as we move along in this discussion.

Now, if you stop reading for a minute and rotate your magazine 90° counter clockwise you will notice something about this graph that is important. That detail is that this polar has a bucket or hook to it. We will call this the drag bucket. And on this airfoil it is fairly wide and gently climbs with increasing C_l. The drag bucket of any airfoil is important because it tells one the useful operating range of any particular airfoil. It does as well help one to understand why a particular section will work well for one design type but not for another. Also, the drag bucket will be different from section to section, with some having wide gently climbing polars and others having narrow steep polars. If you are interested in this type airfoil data, I suggest you purchase an airfoil book and study the information contained within.

Now let's look at what happens to the airfoil as it moves through its operating range. Look at the L/D polar where the C_l equals 0.0. This point is known as the zero lift line and is the point at which the airfoil generates no lift. Note also that the airfoil must have relative angle of attack of -1.5 degrees to the flow to do this. In other words, this airfoil begins to generate lift at a negative angle of attack rather than a positive one. It is also generating drag even though it is producing no lift.

The drag that our reference section is generating is profile drag (D_o). Because our section is operating only as a 2D section it can be considered to have infinite aspect ratio. Thus the drag coefficients for infinite aspect ratio are profile drag coefficients or sometimes referred to as section drag coefficients. In this example the D_o refers to the shape and the thickness of the airfoil as it moves through the fluid of air. Also, these values will change when they are corrected for aspect ratio, because then another drag coefficient will come into play. That drag coefficient is induced drag (D_i) and total drag for any section is $C_D = D_o + D_i$. So for this article we are not going to consider D_i but only the two dimensional data.

If the angle of attack is changed for a given section the C_l will also change with an accompanying change in C_d. So, if we move up the lift line to the point where C_l equals .2 the C_d will also equal ≈.0075. This value will result when the section has an angle of attack of ≈.5 degrees positive. It will also yield a two dimensional L/D of 26.67. Notice that in terms of C_d this is the lowest value this section will have.

Next we move up the polar to where C_l has a value of .4. Our accompanying C_d has increased to ≈.0085 and the angle of attack of the section is ≈2 degrees. Thus, the 2D section is now yielding an L/D of 47.06. Notice what is happening to the performance of the airfoil in 2D flow. It is increasing with angle of attack. Remember though that this is only 2D data. Data that this is neither the performance you will achieve on your sailplane, nor that is realistic for the angle of attack of that the airfoil as it applies to a working environment. All of this will change though when RN is taken into account. This data can, however, certainly generate a graphical representation of how the airfoil will perform versus comparative section.

Let's move up the polar even further to the point where the section is generating a C_l of .6. Again the angle of attack will increase. That angle is ≈4 degrees and the associated C_d is now ≈.011. When the numbers are calculated the 2D performance is now an L/D of 54.55. (Wouldn't you love to really obtain that kind of performance from your model?) The airfoil is increasing in performance with angle of attack and interestingly the L/D has doubled over just a few degrees angle of attack.

What is the **MAX L/D** for this airfoil? Look at the polars again and notice where the polar begins to break over. This is at the point where the airfoil is generating a C_l of ≈.825 with a C_d of ≈.01375. (One needs a magnifying glass to read these polars.) Wow! What performance! The airfoil is now generating an L/D of 60. (This is Nimbus III performance we are talking about.) Notice that the airfoil has an angle of attack of 6.5 degrees, which is certainly not really where the airfoil would be flying in a real world design. One more time, this data is not corrected for RN.

Now, let's take one more data point for comparison. Jump up the polar to a C_l of 1.00. Even though we have only increased the C_l by approximately .2 the C_d has increased disproportionately. It jumped to .02175. Therefore, what happened to the L/D? Yes, it dropped off to ≈46. If you look at what happened to the angle of attack it had to increase to ≈9 degrees. Thus, the airfoil is now in a flight regime that is hurting the aircraft's overall performance. Notice also that from that point upwards performance becomes progressively worse. Finally, the airfoil will reach a point where upper surface flow will separate and the accompanying stall will ensue. Of course when the stall occurs the sink rate will climb dramatically and the airfoil's angle of attack must reduce to reestablish laminar flow to the wings upper surface.

I'll stop here, I've used about all the room I can for this discussion for this month's column. We will continue from here next month. We will then discuss RN, sinking speed, and more on angle of attack.

Slope Scene

Tim and Ed show off their very lightly loaded slopers at Kiona Butte.

Remember back a few months ago when we talked about flying different kinds of models off the slope? Then we said that even the lightest of models could fly slope under the proper conditions. This month's pictures depict just that.

The slope where the pictures were taken is Kiona Butte. It is 1286 feet high and has a face that rises up at a 60 degree angle. It faces northeast for about 7 miles and then turns to the North and Northwest and runs for another 25 or so miles. It can generate tremendous lift. It also propagates very laminar gentle lift under the proper conditions.

The two flyers pictured enjoying the lift of Kiona, on this particular day, are Tim Davis and Ed Sadvar of Tacoma, WA. Tim is flying a Gentle Lady and Ed is flying a Spirit. Both models are quite light and, of course, have a limited wind speed they can operate in. But on this day the fellows were able to get flight times on their ships of 35 minutes. Their models would have been able to stay aloft much longer but they arrived late in the day and the lift was just ending after

blowing most of the day.

The thing that impressed these two beginning pilots the most was the ability to keep their models aloft long enough to sort things out and develop their reflexes for flying R/C gliders. This was especially true since prior to this slope outing they had not been able to stay aloft for more than seven minutes. Thus, the slope flights were a great way for them, as beginners, to get some long flights and develop the confidence required to fly in other formats.

If you are at all interested in slope soaring, it might do you well to copy these fellows and give it a try with your thermal design. If you are just beginning to fly R/C gliders a slope environment may also provide you with the much needed time aloft to develop you skills. ■

Tim enjoys the light lift and flies the model for over 35 minutes. Longest flight had previously been 7 minutes.

Composites & Model Gliders

Graphite Fibre Wing Joiners

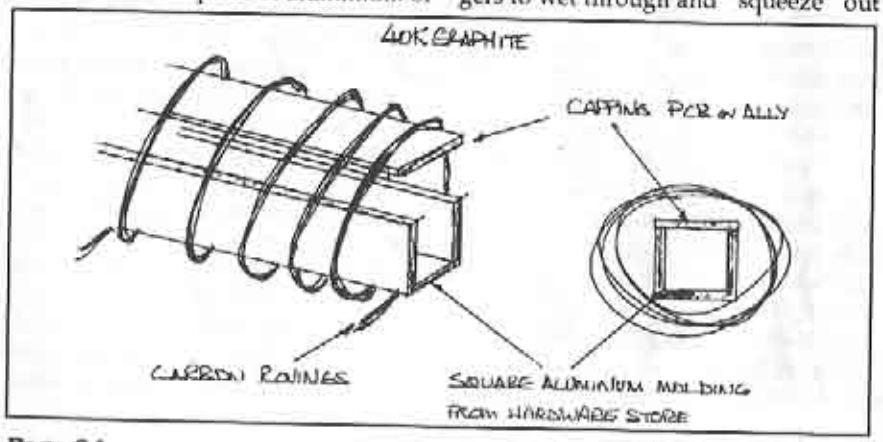
...by Graham Woods
"Merchistoun", Moat Lane, Priestwood, Bucks HP76 9BT, England

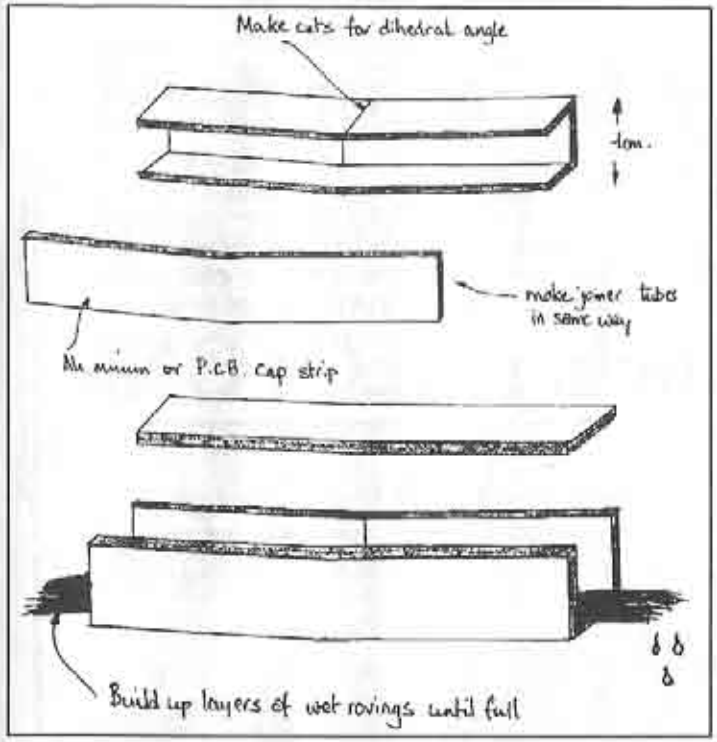
You can easily make your own graphite wing joiners by using low cost graphite rovings; the rods can either be straight or bent for dihedral, and any length you wish. You will need some rovings, some slow epoxy resin, some release wax and some U-shaped aluminium.

Cut your aluminium moulding over size and another piece of aluminium or glass PCB to fit over as a cap. If you want dihedral make a couple of saw cuts and bend the aluminium to the correct dihedral angle. Now wax the inside of the aluminium 'mold' with wax (not a silicone wax) or a proprietary release agent such as 'Freekote'.

Cut some manageable lengths of rovings, say a yard long, and find somewhere to hang them. Now mix up some epoxy resin and don a pair of nitrile rubber gloves.

Run each one through some mixed epoxy, and then pull the 'wet' rovings between your thumb and first two fingers to wet through and 'squeeze' out





the excess resin and hang them up. When you consider that you have enough lengths, cut pieces of the wet rovings oversize and lay them in the moulding until you have just over-filled it. Pop on the cap and put a couple of small G-clamps around to hold it in place. Alternatively, go find your heat gun and lay dry rovings in the molding and brush thru' with resin, playing on the gun at the same time. Hot resin mixed quickly loses its viscosity and wets the rovings easily. Fill up the mold in the same way and cap it.

For a cross section of $1cm^2$ you will need about 70 tows of 12k rovings.

You can either leave the resin to 'go-off' in its own time, or if you're in a hurry, put it in the oven and, if not, in the boiler room. When set, prise the graphite rod from the 'mould': in prising the rod out of the aluminium you will damage the ends of the rod but remember that you made them oversize in the first place.

Make the joiner tubes from the same aluminium material. Spirally the aluminum U-shape and cap with graphite rovings to hold it together and you should have a graphite joiner system for a couple of dollars. The resin may take up to a week to set really hard when you will have a graphite rod which will only require a small amount of wet and dry sanding to fit your tube.

You can make all sorts of pieces of molded graphite using this method, you just need to create the mould. ■

R/C Soaring Resources

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

Seminars & Workshops

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

Free instruction for beginners on construction and flight techniques. Sunday - Thursday. Bob Welch, 1247B Manet Drive, Sunnyvale, California 94087; (408) 749-1279

Fall & Winter 1 day seminars on composite construction techniques. Free with purchase of Weston Aerodesign plan set ($35.00) or kit. Frank Weston, 944 Placid Ct., Arnold, Maryland 21012; (301) 757-5199

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 $9.00, 1984 for $9.00, 1985 for $11.00, 1986 for $10.00, 1987 for $10.00, 1988 for $11.00, 1989 for $12.00. Third class postage included. For 1st class include additional $1.50 per issue. (U.S. funds) Walt Seaborg, 1517 Forest Glen Road, Oregon, WI. 53575

BBS

BBS: Slope SOAR, Southern California; (213) 866-0924, 8-N-1

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

Reference listings of *RCSD* articles & advertisers from January, 1984. Database files from a free 24 hour a day BBS. 8-N-1

Bear's Cave, (414) 727-1605, Neenah, Wisconsin, U.S.A., System Operator: Andrew Meyer

Reference listing is updated by Lee Murray. If unable to access BBS, disks may be obtained from Lee. Disks: $10 in IBM PC/PS-2 (Text or MS-Works Database), MacIntosh (Test File), Apple II (Appleworks 2.0) formats.

Lee Murray, 1300 Bay Ridge Road, Appleton, Wisconsin, 54915 U.S.A.; (414) 731-4848

Contacts & Special Interest Groups

California - California Slope Racers, Rich Beardsley (Director), 2401 Country Lane, Santa Maria, California 93455 U.S.A., (805) 934-3191

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

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

Eastern U.S.A. - Eastern Soaring League (Covers North Eastern U.S.A.), Frank Weston (Editor), 944 Placid Court, Arnold, Maryland 21012 U.S.A., (301) 757-5199

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

Maryland - Baltimore Area Soaring Society, Steve Pasierb (Contact), 21 Redare Court, Baltimore, Maryland 21234 U.S.A., (301) 661-6641

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282 Jodie Lane
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T.W.I.T.T.

(The Wing Is The Thing)

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

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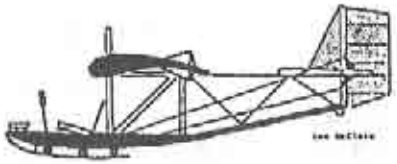


The Vintage Sailplane Association

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

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

Magic Lessons

...by Chuck Lohre, 3015 Beaver Ave., Cincinnati, OH 45213
513-961-1174 work; 513-731-3429 home

That day, last November, when I received R/C Soaring Digest and Model Aviation magazines and both had information about the Magic 138" unlimited soaring glider by Frank Weston, I knew this was exactly the hi-tech construction and performance sailplane I was looking for.

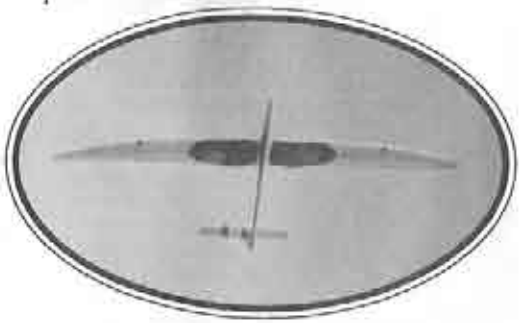
If I never built up a wing or used an iron on covering again it would be too soon. I decided to order the Spectra and epoxy-bagged version ($500 verses $300), because I didn't want to invest a great deal of time and money in the skills and equipment to bag my own. I'd see what I should expect first. The construction features really sold me — an all-Kevlar male molded fuselage, epoxy bonded Spectra directly over foam wings, inside the wing servos, T-tail and nose cone access. The performance specs, a reported 29:1, sounded great, too. This was the type of construction I wanted to learn and build my future models with. For a radio I chose the Airtronics Vision. It had all the bells and whistles, was by far the most popular at the NATS and, hopefully, was a radio I could go to my grave with.

Finally the big day arrived. I immediately worked every free hour I had to get the kit built for the May 4 and 5 sanctioned contest my club (the Cincinnati Soaring Society) had scheduled. Construction went well. Frank's instructions were great. Frank was readily available to answer any questions I had and bring me up to date on the evolution of my particular components. It's best to use a hot knife to cut the Spectra wing surfaces out. Just wire a No. 11 blade to your pencil soldering iron. The edge it makes is perfect. Saws or just a cool knife leave fuzz which is hard to sand and needs a lot of work to seal with CA.

I made the first hand launch test glides at 6:30 AM the Thursday before the contest. It just glided and glided. I was elated. I hadn't felt that high since learning to soar full scale and spending all afternoon up with the clouds. I give Frank the credit for the "off the board" flight. I followed the instructions precisely for alignment, balance, etc. That evening after work I launched the Magic again, but with my high start this time, and again it was awesome. I soon realized that I had a lot to learn about programming the radio and trimming this great plane.

I had been flying a Klingberg Wing and a Gentle Lady last season. I wasn't afraid of this size plane because I also have an 11' span ASW 17, Astro Flight, which prepared me for the fast flight, wide turns, high L/D and landing set up skills needed. My Klingberg Wing prepared me for aileron use and was a test bed for the Vision. Another club member had just finished a Legend and installed another brand of programmable radio. The hand glides went fine but on the first launch he lost all control. The plane's fuselage and tail feathers were the only things left. Bad filters the manufacturer said.

Another thing that helped was my meticulous building methods; I build a lot of models in my work. Measure twice — go sit down, read the instructions again — cut once. Careful alignment, balance and control installation and checks are a must when preparing this expensive aircraft.



On contest day the Magic flew well and it certainly achieved well above-average air times, but I still had to learn to land it. It just goes to show you that you can't buy trophies. After the contest, I flew a fun flight. I got up pretty good. The wind had picked up some and I was working some ridge lift off a tree line and then a thermal it triggered. Since I was getting down wind I started heading back. Now earlier the Magic had shown exceptional penetration and I'd won some bets regarding getting back to the landing site in a calm condition, but this was to be a Glider Guider's worst fear: SINK! I was in trouble, and without having the plane programed yet to penetrate, with a flip of a switch, I figured that the glide ratio was good enough to make it. The Magic finally made it over a notch in the tree line with a few feet to spare, but I stalled it and spun to the right, hitting a tree 30 feet up. The Magic dropped out of sight. I was amazed when I got up to it and saw that there were no visual breaks and minimal damage. My ego was hurt more, but I got a lift when I came over the hill with the plane in one piece and heard a big cheer. It only took a few minutes that evening to repair the damage.

The Magic is a superior plane and performs to the letter concerning all those trimming quirks that previously, with lower performance planes, I just couldn't tell exactly what was going on. It will take me awhile longer to get used to this plane and especially learn to fly the rudder and opposite aileron in thermals, etc.; you sure do in full scale. The outside wing always produces more drag because it is traveling faster and producing more lift. The plane will slip, fuselage will rotate away from the line of turn, as soon as you let up on the rudder. Also, because of that lift, the plane will continue to increase the angle of bank, thus requiring a slight amount of opposite aileron. By programming in about 5% of flaps with elevator you'll get just about 4° flaps, the right amount for slower flying speed while thermalling, and -3° for speed with a little down elevator.

June 29th and 30th I flew in sanctioned contests in Dayton, OH, put on by the DARTS Club. My launches were higher than any other even without zooming (there was a good headwind). The CG was right at the towhook ring position (40% as per plans), 15° of flaps and 10% up elevator for launch setting. I was far too nervous and not flying smoothly. Even flying full scale it takes me a half hour to settle down and fly smoothly. Again my landings were poor. Bob McGowan's piece in the "Soaring Column" in the July issue of *MA* was right: "Keep the nose down and don't take the flaps off quickly or the plane will stall." The hardest part is planning just the right amount of flaps to use. It seemed that I needed to avoid making a long straight in approach, depth perception is poor in that orientation and I keep landing short. I now come over on downwind at a height dependent on the wind, 60' to 120', establish the needed rate of descent with flaps if needed, and make a big 180° turn (into the wind if there is a crosswind) to the landing area. I try to gently adjust flaps and diameter as needed per the wind and descent to set up for a short final, within 150'. By applying more or a little less flaps I can get Magic to come in on the spot. Flying other planes with more drag you could just speed up and burn off energy, but you can't do that

with the Magic. Once again it was like full scale, flying a Schweizer 2-33 (L/D 23:1) with a Clark Y airfoil, a guppy fuselage and wing struts you could side slip or just approach fast. Flying a glass slipper Grob (L/D 32:1) you won't be able to land doing that. The plane is too slippery to side slip and there is very little increase in drag at increased speed. You have to approach at the lowest speed possible (1-1/2 times the stall plus 1/2 the wind is normal), and then the spoilers are effective. Flying the Magic is different with flaps. I flew a full scale Blanik once with flaps in a thermal, but not during landing. It wasn't the operator's procedure to use flaps on landing. Top and bottom dive brakes are used for landing control in the Blanik. The Magic's flaps act only as drag generators when flying fast, not slow — sort of a contradiction during landing.

On learning thermalling techniques, the Magic has made it a lot of fun. On a few occasions I've saved a flight from well below launch height; that's really the fun part in this sport. Full scale in a Schweizer 1-26 (L/D 23:1) I once saved from 600'. I remember the precision and concentration needed to precisely maintain the bank angle and speed exactly at 20° and 45 mph (stall is 28 mph level, 40 mph at 20°), all the while continually recentering the lift. I went back up to 3500'. A corn silo had triggered the thermal.

One day during practice with the Magic it was pretty windy due to the strong convection going on. I had gotten a couple of good flights but hadn't made my landings. I am a little shy about keeping the plane on a good heading for landing if the speed is a little hot; after all it is a lot of money and the NATS were only two weeks away. A full 90° of flaps has cured that. On the third launch I got into a very strong thermal and was going up fast when the plane got thrown out, flipped over on its side, and then went into a steep dive. When I pulled out with the elevator the right wing panel bent up 30° at the end of the 24" spruce spar. By applying flaps the wing maintained its shape for a gentle landing. Frank shipped me another set of wings Monday with a 42" spar. I had my work cut out for me before the NATS. On further thought about the incident I'm sure the elevator pull out bent the wing, and I should have used the flaps to slow the dive.

Upon getting back from the NATS, I didn't even ruffle the experts' tail feathers, I continued to adjust my Magic. The new

wings were 6 oz. heavier bringing the weight to 68 oz. but that didn't effect performance, just balance a little. While at the NATS I started to experiment with a lot of flaps while thermalling, about 20° to 30° with mixed down elevator per landing mode. It worked out pretty good, that was the round I maxed. I don't use the flap stick anymore, down 20° elevator seems a little too much to use while thermalling. Approaches were good but I landed a foot short twice. Troy Lawicki said I was flying too slow. I'm learning to adjust the plane to fly at presets, since actually judging the proper speed is very

difficult, but the Magic is flying great. It is very important never to stall if you're to get the best performance. At one practice session I got 7-1/2 min. at 7:30 PM, an unheard of time for me, before the Magic.

I started to set up the Magic as Frank had suggested except for the flaps, I only put in about 75°, (the recommended 90° seemed a little crazy to start off with). Since then I've put in the 90° flaps. That is the only way to stop the plane. With 75° of flaps, Magic still retains a lot of speed and doesn't produce enough drag. After flying it as much as I have these are the settings I've evolved to now with the 2A 2FER Template on the Vision. Balance right on the edge of zero stability. After being trimmed to fly at minimum sink, just above stall (porpoising), Magic will very slowly pull out or almost fly straight where you point it, out of a 30° dive. That is the setting to get right first. It may only take 1/8 an ounce nose weight difference. I use turkey shotgun shot which is 1/40th of an ounce each and just fits into the 3/16" hole into the forward compartment. I haven't used any ballast, yet. Ailerons 45° up 15° down, 30% differential. Rudder +/-30°. Flaps -3° up and down 90°. Launch at 15% flaps (1/2" down on the rear edge) with 10% up elevator. Elevator up of 20° down 10°, near full throw available stop to stop. Camber of 36% on flaps and aileron. 20% camber on down and up elevator. Flap to elevator ratio of 12% down. Aileron to flaps of 5%. Dual rates at 50%. Set launch and landing threshold at max control. Fly with dual rates off and rudder on zero mixing. On launch and landing ailerons and rudder will automatically go to max mixing. I put the flying mode switch on the left side.

This all seems confusing, but very easy to fly. When launching I set the left top switch toward me (sets flaps to 15%, up elevator to 10% and full rudder mixing with aileron), launch and at top of line switch to neutral center position (no rudder mixing) while applying a little up elevator; then ease off it and fly off the line. It's not a zoom, but I'll learn that later. Not owning a winch it is a little hard to know one that well. The best gentle zoom I've had only gained 50'-75'. The Magic is not an incredibly over built plane, but the low wing loading and tremendous L/D retention at speed is all I need. While flying into a turn, apply half rudder when starting to turn with half aileron, apply a 1/8" to 1/4" elevator then back off a quarter on the rudder and reverse aileron (-1/8" to -1/4") to hold bank while continuing to hold a 1/8" elevator. Let the plane fly and don't get tricked into changing settings while the plane flies its ellipse while drifting downwind. If you fly smoothly Magic will continually show you how to recenter the lift by lifting a wing, the same way it showed you where the lift was to start with. Hanger flying determined that this sensitivity is due to the fact that Magic is a very lightly loaded plane.

Now, if I could just read the difference between sink dropping a wing or lift raising a wing. The sink that might mean it would be best to fly through it to the thermal beyond instead of avoiding the area. Helmut Reichmann's book "Cross Country Soaring" (full scale), reported on Konovalov's 1970 studies on two type of thermals. Type A thermals are common with increased instability, have a number of cores, are larger in diameter and have stronger turbulence at their edges. Type B have smaller diameters, are more narrow, have little turbulence at their edges and are common when the air below 1000' is more stable. This is the best book written on soaring in my opinion.

The only thing I'd like to change about these flying settings is getting the radio to program to fly on dual rates with another position on the one switch: (1) launch, (2) thermalling at low altitude on

high rates, (3) thermalling high altitude on low rates, and (4) penetration flight. The way my present set up works, control throws are small: 1/2" to 1" throw on rudder, 1/4" to 1/2" on aileron and 1/8" to 1/4" on elevator as judged by the end of the control sticks. I'd like to learn to fly with dual rates, but right now trying to remember to put them on and off is a little too much. When setting up to land, after 5 clicks of flaps are put in, plane controls go to full rates with automatic rudder coupling and plugs in down with flaps. I haven't used crow yet (it wasn't recommended by Frank). The Magic really scoots across the sky with the mode switch thrown forward for -3° flaps and elevator to 5% down.

One other thing about setting up the Magic is getting it to track straight ahead. Lateral balance is very important; two No. 11 X-acto blades stuck in the wing tip from the outer aileron cutout did it for the first set of wings. I could tell the difference. On the second set a little more weight was needed, so I hollowed out the wing side of the aileron cutout and stuck in about 4" of solder. After the balance is right, trim the plane to fly straight in calm condition. I just vary the aileron trim to do it and then adjust the flaps and aileron centering one or two points at a time until the Magic is flying straight. Maybe you'll need to adjust the rear wing pin hole on the wing. I just glue a sliver of the next size up tubing to the original tubing and reinsert. Removing the original epoxied tube is easy if you heat it up with a piece of coat hanger wired to your pencil soldering iron, then backing out with a rat tail file inserted so it will tighten. The root match up gets off about 1/32 to 1/16" but hasn't been any worse than that. As carefully as you set the incidence while building, I can never figure exactly what the wings are really doing out along the 138" span, in the end it all sort of balanced out and the Magic flies straight in all modes. Elevator setting may have to be adjusted after tracking is finally set. Once done though, the Magic will read the slightest difference in air movement, but not as sensitive as my Klingberg Wing! Nobody needs to know that much about the surrounding air!

Originally, I put a three layer automotive stripping tape trip at 20% on the airfoil, although Frank said that the WA0002 didn't need it. I thought I had the FX60-100 which he said did. At a recent Dayton contest Eric Sanders was flying a Merlin (the 100" version) without a trip and the same foil. We saw it really fall off when stalling, very dangerous near the ground. I have never had my tripped Magic do that. Eric's balance was at around 55% though for some strange reason, which would make it unsafe to fly if it was full scale; if you got into a spin you couldn't get out. Since then I've removed the trip. I've learned to keep the speed up, but the Magic does have a tendency to drop a wing at stall now; I am flying with a max rearward CG. You shouldn't be flying that slow, anyway. One other thing, the Kevlar pull pull cables should almost be tight enough to make a sound. You'll know if they are loose when Magic won't pull up and rotate quickly on a winch launch.

The effort and expense were all worth it. Thermalling is a cinch but those all important landings are very difficult! They should get better with practice. With my Klingberg Wing I finally did well and was in first place after two rounds at a recent 2 Meter contest and I've been flying it for over a year. It doesn't have any lift control devices. I usually have planes for a long time, my Astro Flight ASW-17 is 20 years old, and I'm looking forward to really mastering the Magic. Now, I have to get over the stage where I know just enough about the Magic to be dangerous. Most of the time it takes the form of high risk landings. I'm just going to have to force myself to set up and miss it if I have to. Just last Wednesday I creased the boom in front of the fin because I dorked

it after dancing with our approach tree and stalling three times below 50'! I'm not going to land from that direction any more until that tree gets Chainsawunerectus.

I'd like to thank Frank Weston. The Magic really is one of the most advanced planes in the world. From my research only RnR offers similarly advanced design and construction techniques, but construction methods I could never expect to do myself. For example: female moulding of top and bottom wing skins then bonding with spars, etc. in place. I'd also like to thank Airtronics for a radio up to the task.

One CSS Club member said he wanted a Magic after I hand tossed it and nearly completed a 360° turn. He said his new high tech, high wing loaded plane wouldn't have made it 200'. Now, I'm looking forward to building Frank's 100" Merlin from scratch.

I hope these suggestions help others master these types of planes. I'd recommend taking a few full scale flights as well. It is a challenge, but you'll understand why these types of planes fly just as the full scale ones do. Now, I'm off to try some side slips with the Magic, at altitude of course. ■

On September 14th at the Bluegrass Soaring Society's Mid-American Championship, Chuck took 1st place Unlimited - Duration flying his Magic! ■

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 JADE Impulse

...from Jarel Aircraft Design and Engineering

Imagine a two meter class sailplane featuring a fuselage, canopy, tail skid, V-tail pedestal, wing fairing and wing tips all manufactured using a new thermoplastic alloy so strong, it carries an unconditional guarantee!

Add to that, other features like preshaped hardwood leading edges, a unique selfaligning, foolproof V-tail pedestal, a comprehensive set of instructions with nearly 70 illustrations and photographs, machine cut foam cores, all necessary wood and a complete hardware package.

Imagine also, that this sailplane was equally at home on a winch or a high-start; that it was capable of thermalling in the lightest lift or streaking across the severest slopes. This aircraft would accept all 05 electric motors including Astro flight's 05 series motors as well as most 7 cell battery pack configurations without modification!

What if this sailplane carried a list price of only $79.95?

What if this sailplane really did exist?

Introducing Impulse, JADE's new 2-meter dream-come-true! Designed with new expectations and a new set of rules, Impulse provokes an emotional response that is sure to unleash some pretty impulsive behavior!

Fully tested easy to read instructions help keep construction time in the 12-18 hour range. (Some ARFs take longer then that!) When you're finished, get ready for a flight envelope that has to be seen to be believed! Combining SD6060 & S3021 airfoils with washout on a 550 sq.in. wing offers a flight envelope so wide, it's like having several planes in one!

At an empty wing loading under 10 oz./sq. ft., Impulse soars as if it were a built up polyhedral floater, yet the same plane loaded beyond 14 oz. flies like it had afterburners! (An Impulse recently came in 4th in a west coast slope race along side "composite" ships costing 5 to 10 times as much!)

Greg Porter & IMPULSE

Aircraft expenses don't end with the airframe though, as most high-performance sailplanes require several mini servos. An Impulse can be flown with only three standard servos and any two channel radio!

If you're tired of the high-cost of high-performance, try a little impulsive behavior. Available at your nearest hobby shop or directly from JADE at: 12136 Braddock Dr. Culver City, California, 90230 or call (213) 390-1348.

In association with JADE, Bob Ratzlaff of Aerial Model Aircraft Products is now offering Impulse wings glass bagged in blue foam for only $85! He can be reached at (213) 965-9504. ■

Model 20 High-Start & Winch Retrieval System

...from VMC Flight

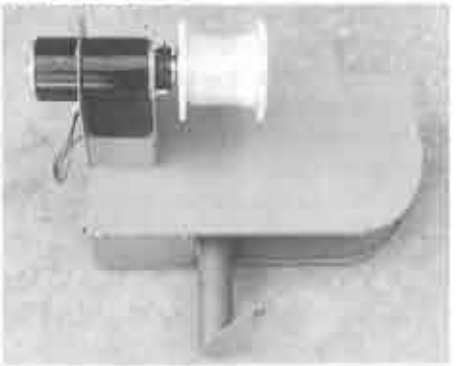
This is an update on the Model 20.

1. For those wondering about drag of the retrieval line and the untwister, of course there exists some minimal amounts of added drag. The question is how much and what is the net effect on the launch. It must be considered that the parachute is no longer carried aloft, which is a reduction in drag. Plus the fact that the retrieval line trails behind the aircraft much like smoke is left behind a powered aircraft, hence the "frontal drag" of the line is minimal. Other than some drag from the untwister, some minimal amount of drag imparted on the line as it leaves the retriever, and when the line is arced downward by headwind at the retriever itself, little additional net drag is affecting the glider. With a winch launch, drag is hard to measure, as an extra tap of the winch switch seems to cancel any drag effect. During a demonstration of our retriever at Morgan Hill, most pilots were getting into controlled air space with their zooms off of the RETRIEVED winch and if they were getting added drag, they didn't say so and it sure wasn't apparent. Let's face it. Other than the Mark Triebs of the sport, with their pedal-to-the-metal launches, we all have some reserve left in that winch motor.

With a High Start system the drag could be measured in a few feet less altitude at launch, but after wearing a trail in the hot sun chasing that danged chute, who cares?

2. Some questions arose regarding construction material and weight of the retriever. The case is constructed of sheet aluminum and carry weight is approximately 20 pounds. We us a U-1 deep cycle battery and it gives us "all day" performance, (all day meaning "all 5 of us are seeing spots before our eyes and it's wine time"). The U-1 battery is 5" X 7" and 6" high and very light weight compared to some of the submarine batteries we have seen at the field. With the retriever in one hand and the little U-1 in the other, even us old geezers can make it non-stop to the flying site. The winch guys need only to hook up to the submarine battery. The U-1 is commonly used in powered handicap scooters and should be available at any battery supply.

Any questions can be addressed to us by calling our tech line at (408) 973-3333 week days from 7 AM to 5 PM PDT. Ask for Ernie. VMC Flight, 18971 Fernbrook Ct., Saratoga, CA 95070. To order toll free: (800) 225-0364. ■



GRAUPNER MC

...from GLIDERS

Brian Scott at GLIDERS, the Sailplane and Electric flight specialists of Nottingham, has recently announced the company's intention to market the GRAUPNER MC range of micro processor controlled Radio equipment.

This is a new departure for GLIDERS who until now have dealt only directly with the public on a retail and mail order basis from their Nottingham premises.

"This move completes the range of "High Order" computerized radio equipment and support available in the U.K." commented Brian.

"The customer now has the total choice from U.K. suppliers without recourse to the problems of importation and the tenuous links that involves for the ordinary man in the street. Particularly as the three contenders in this market are all German companies with the resultant language problems."

"We will be supplying English language equipment and manuals translated into English to ensure the end user gets the maximum from his equipment."

An agreement has been reached directly with Graupner to stock the MC-18 and MC-16 equipment and accessories at Nottingham.

"From the outset our plan is to deal wherever possible with the retailer thereby ensuring continuity of valued local supply for the end user."

GLIDERS intend to carry ample stocks of equipment and accessories and provide a technical backup and assistance service to retailers and users throughout the country.

The MC range represent a family of closely integrated systems and peripheral devices which have at their heart a micro processor to deal with routine management of data before transmission to the model.

As with so many modelling trends, GRAUPNER were first among the contenders to supply this type of equipment, introducing the MC-18 in its initial form in their 1987 catalog.

The system is therefore the most thoroughly field tested of its type available and numbers many existing and potential World Champions amongst its list of satisfied users. A number of whom are British.

Yet, because of the architecture of the electronics and software, and GRAUPNER'S committed development program the systems are still as far in front as they were in 1987.

"This combination of track record and continued excellence together with the list of whos-who currently using the sets must make the system a first stop on any potential buyer's shopping list" adds Brian Scott who has good reason to have vested interest in such matters being a committed F3B pilot.

But its not just an ability to deal with complex flight options that makes these set so valuable to the average user.

You have to use such a set to comprehend the shear luxury and simplicity they bring in ironing out the odd building error or mismatch in control surface movement.

This together with the facility to store and permit retrieval of such settings at will, restores the lost pleasure of a Sunday afternoon flight session following a rushed week at work when model building or repair work took a back seat as usual.

As a by-product of the micro processor control, switches and analogue controls can be added to the set at will. Allocating their use on a model by model basis.

"The switch is where you want it when you want it - not where the designer stuck it!"

A single set of add-on hardware is common throughout the range. Added to this the software modules contain all the flight characteristics of F3A, F3B, F3C, and F3E (F5) type modules in one package. Gone are the days of plugable modules for each mode with their attendant faulty connections and risk of damage.

"You can always move from a Helicopter to Aerobatic then Glider aircraft safely and almost as quickly as you can say it."

For the expert customer the ULTRA-Soft module and PROFI-Trim facilities may be specific whilst the Sunday afternoon user loses none of the basic benefits inherent in the set whilst avoiding these complexities.

The sets can store up to 30 models for instant retrieval along with all trim settings. Each model may have up to 4 in-flight modes such as Launch, Speed, Distance, and Soaring whilst gliding for example.

Within these modes different pilot preset trims may be selected and moved to via switches in a smoothly delayed fashion programmable over 0.6-30 seconds. To simplify and speed the set-up of a new model up to 18 "Skeletal Models" are provided as starting points on which to base your new creation.

These radios represent the upper end of expenditure for the modeller, but if you keep your transmitter for 10 years (and most people do!) then it costs no more than your morning newspaper per day.

"What price pleasure, satisfaction and security?"

For more information, contact Brian Scott, GLIDERS, 81 Victoria Road, Netherfield, Nottingham NG4 2NN, England; Tel: 0602-870243, FAX 0602-605992. ■

Model Parameter Program

...from Tom Stults

We are pleased to announce that we now have available a program that will render your calculator obsolete when designing any new model. The program, MPP, will perform all the calculations on a monoplane, biplane, tailless aircraft or glider. All operations are from easy to understand and use menus. The program will calculate the area and cg of any wing planform or airfoil, and area relationships such as stab/wing. Fuse, nose and tail moments are calculated as well as the Tail and Fin volume coefficient. Wing loading and power loading are determined along with maximum speed, maximum lift and landing speed. These are calculated differently, of course, for different types of aircraft; for instance, the power calculations are bypassed for gliders. Power is determined by prop size, pitch and rpm and the engine may be fuel or electric.

Some useful options are the wholesale increase or decrease of all dimensions to change the size of the model and the ability to input a monoplane and change it easily to a biplane with similar flying characteristics. You may save and retrieve the parameters, as entered, of any model that is available for measuring to use as reference or for building. You may also print out a report (hard copy) of the parameters as entered and all the calculations. The program will even design a set of floats for your favorite bird.

Included with the Model Parameter Program is another program called WEP (Weight Estimation Program). This program will help you estimate the weight of an as yet unbuilt model that you are designing or considering building.

You can obtain both programs, Model Parameter Program (MPP) and Weight Estimation Program (WEP), for $19.00 at this time. Please include $2.50 for postage and handling. Please send a check or money order to Tom Stults, 2504 Del Rio, Yukon, OK 73099. ■

EZ-LAM Epoxy Finishing Resin

...from Aerospace Composite Products

EZ-LAM, the only epoxy laminating resin specially formulated for Model Aircraft use, is now available in a 12 ounce package. This new size is ideal for trying out laminating and fiberglassing techniques, without investing in large quantities of resin. Available in either a 30 minute or 60 minute "pot life" version, the 12 ounce EZ-LAM kit retails for $12.00.

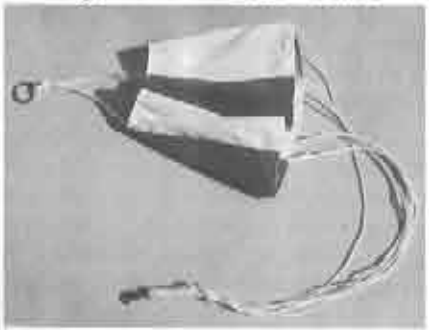
30 and 60 minute EZ-LAM Epoxies are also available in 1-1/2 Gallon kits ($84.00); 1-1/2 quart kits ($34.00); and 1-1/2 pint kits ($21.00).

EZ-LAM Epoxies are available from your hobby dealer or direct from Aerospace Composite Products. Dealer inquiries are invited.

To make working with EZ-LAM Epoxy truly convenient, Aerospace Composite Products now has available calibrated dispenser pumps. These laboratory quality hand pumps are pre-set to dispense 1 ounce of resin per stroke, and 1/2 ounce of hardener per stroke...the exact mixing ratio for EZ-LAM Epoxy. No more calculating, weighing, and fussing with getting the correct proportions.... just pump out equal numbers of pump strokes. The dispenser pumps are available for fit pint, quart, and gallon cans.

EZ-LAM Dispenser Pumps retail for $6.00 per pair and are available from your hobby dealer or direct from Aerospace Composite Products. Dealer inquiries are invited. Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714; (714) 250-1107, FAX (714) 250-0307. ■

Signal Air Hi-Start Chute



Signal Air Winch Parachute

Graphite Filler

...from Composite Structures Technology

High stress joints and fillets can be reinforced for maximum strength with Composite Structures Technology's very light, high strength Graphite Filler. Mixed with your favorite epoxy, the graphite/epoxy compound can be used to reinforce engine mounts and fire walls or shaped into high strength fillets. Once cured, it sands easily to the final contour desired. The graphite filaments interlock to form a complex matrix for maximum strength. CST's Graphite Filler can also be used to mold light weight parts. Graphite Filler is extremely light while providing maximum strength.

Composites Structures Technology offers a full line of epoxy fillers for every modeling need. High strength Graphite Filler is available through your local hobby dealer. Direct orders can be placed by calling 1-800-338-1CST or send $3 for a complete catalog to: CST, Dept. M91, P.O. Box 4615, Lancaster, CA 93539. ■

Winch Chute, Hi-Start Chute & Launch /Retrieval Harness

...from Signal Air

The photos are samples of my wife's 'wares' (winch chute, hi-start chute and launch/retrieval harness). The hi-start chute is the one used on NorthEast Sailplane Products "Pinnacle Hi-Start". The winch chute and harness have been used by the USA F3B team this past Spring.

All three designs have been true "workhorses" for the R/C sailplane gang here in northwest Florida. Although the harness flag can become a bit weathered, I have experienced no failures with any of the three designs.

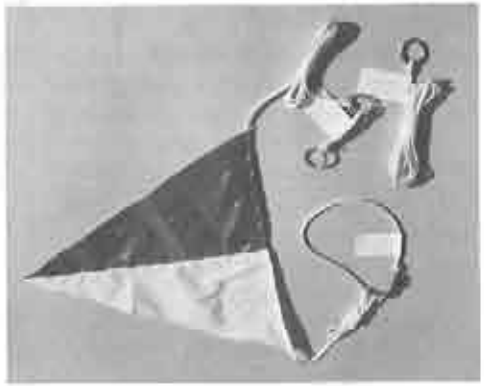
We're a definite 'cottage industry' as my wife and I are both counseling psychologist, with she loving to dabble in sewing/arts and crafts, and I in...you guessed it: R/C sailplanes.

The whole shebang started out when I became dissatisfied with over-the-counter/mail order/non existent devices to launch our 'toys of the thermals'. We tried several designs and have presently decided through trial and error on these.

Hi-Start Parachute: $14.95, Winch Parachute: $19.95, Launch/Retrieval Harness: $16.95, S&H: $5.00 (from 1 to 5 units - any combination), rings are $5.00 per 1/2 dozen (S&H included).

Available from Signal Air, Robert Lawson, 4580 Sailboat Lane, Pensacola, FL 32514; (904) 476-1226 (home). ■

Signal Air Launch/Retrieval Harness



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For Sale - Business

SAILPLANE DESIGNER'S + DRAG REDUCTION & STRUCTURES HANDBOOKS, $7.95 each. Size/locate stable components, many low ReyNmbr airfoils via breaking Eppler's code, define speed/glide slope, design wing structure, drag reduction techniques. Eric Lister, 2214 Regina Dr., Clarksburg, MD 20871.

VACUUM SWITCHES. A good, high quality, low differential, adjustable vacuum switch for professional-type results when bagging Glass, Balsa, Obechi, Carbon Fibre, etc...$30.00. **ONE-WAY VALVE** for use in the vacuum bagging system between the Reservoir Tank and the Pump, a must for a good sealed system...$3.50. Add $3.50 to cover S&H. Send SASE for list of other R/C related speciality items. Make checks payable to: Tom Overton, 1302 Arleen Ave., Sunnyvale, CA 94087; (408) 736-1568.

MODEL R/C DESIGN PROGRAM — takes the math out of design; analyze mono, bipe, tailless or glider — calc areas cg HP and more, inc dec model size, conv mono to bipe SASE for details. Tom Stults, 2504 Del Rio, Yukon, OK 73099.

3-VIEWS scanned to CAD! Re-design/modify a current or favorite plan into your next contest winner! Catalog of CAD services and products $3 (includes sample diskette). Collins Scientific, Inc., 6957 NW Expwy, Suite 311, Oklahoma City, OK 73132.

For Sale - Personal

Airtronics SAGITTA 900...$70.00; Pierce Aero GEMINI MTS...$55.00; Pierce Aero PARAGON...$55.00; Bob Gerbin's BGXL 118", polyhedral, Clark Y, flaps...$55.00; BODST HLG (partial kit)...$25.00; 3 M Gnome (partial kit)...$50.00; LJMP CHEE-TAH...$120.00; Buzz Waltz CONQUISTADOR...$45.00. Tom Gressman, W330 N5570 Linden Circle E, Nashotah, WI 53058; (414) 367-2419.

MAGIC, Weston-built, FX60-100 airfoil, new RTF, complete with 6 Airtronics servos mounted in wings and fuse ...$950.00; without servos and wiring...$795.00. Bruce Townson, 41 Oak Manor Lane, Pittsford, NY 14534; (716) 338-6336 work, (716) 586-0337 home.

4M DG 202, ready to fly, includes retract...$325.00; Soarcraft LIBELLE, fuselage flown, new wings...$80.00; FUTABA 5 CH PCM...$145.00. Mark Foster, 826 Oneonta Dr., South Pasadena, CA 91030; (213) 257-4573.

Frank Weston MAGIC, beefed-up wings & fuse., carbon fiber, spectra & glass, finished & flying...$675.00; Multiplex FIESTA, excellent, finished & flying ...$300.00. Call Ray at (714) 859-2039.

FALCON 880 kit (white foam, 1/16 balsa), MCV Falcon video, Aerospace Composite EZ Vac with extra bagging tube and 1 1/2 pts EZ Lam epoxy. Above items sold together...$300.00 + shipping; Multiplex FLAMINGO Contest, ail, rudd, elc, spoilers — servos mounted in wings (no bell cranks), all servos included. A fast plane that also thermals very well ...$400.00. Call Craig (510) 471-7706.

1/4 scale FOKA 4, all glass with orange gelcoat, RG-15 airfoil, ready to fly, excellent condition...$1200.00 obo. Bill (619) 931-1438.

SYNERGY III, orange and white with 4 JR servos, excellent condition...$650.00. Bill (619) 931-1438.

MLLER KING 85, with 120 inch span wood wings, HQ 2.0/9 airfoil, and one-meter long carbon spar. The King is ready to fly, and if you buy with servos they are already installed in the wings (4 X metal-geared Becker S400s) and fuselage (2 X metal geared Becker S600s). Servos in wings hook up automatically. A new King costs over $700 these days. This would be a great starter for someone interested in F3B. Check out my prices: $450.00 — King with no servos OR $650.00 — King with all six metal-geared Becker servos READY TO FLY. Contact Don Edberg for more info (714) 552-1812 eve and weekends.

Wanted

Sailplane winch drum, plans, or complete unit. Ed Athey, 1002 Stewart Ct., Azle, TX 76020.

PULSAR & PANTERA, complete and ready to fly, radio eq. not required. Curt Nehring, WK (714) 972-7811, HM (714) 592-2105.

ROKE ASK-18 either finished or unfinished. Robin Lehman, 63 E. 82nd St., New York City, NY 10028; (212) 879-1634.

"Jane's World Sailplanes" by Andrew Coates, Flying Book Ziff - Davis Publishing, LOC C#78-58507, ISBN 0-87165-021-5. Rick Palmer P.O. Box 1513, Springerville, AZ 85938; (602) 333-2386.

Ace Micropro 8000 User Review

...by Bruce Abell, Cessnock NSW, Australia

I bought my first Ace set about 12 years (?) ago and it was their "Pulse Commander" unit. I had a ton of fun with it (still have it, too!), and then bought their "Digital Commander" kit, assembled it and used it (converted to 29 mhz) for a few years until they brought out the "Silver 7" series.

By this time, I was becoming slightly more proficient and decided that the "Silver 7", with its facility to interchange mixing boards, was what I needed to advance to aileron and flap equipped gliders, so I bought the conversion kit and built it up.

Then the "Micropro 8000" came along!! Well, I reckoned that for an outlay of only U.S. $165.00, the upgrade kit was a must, and so off went my order to Ace.

Now, at 62 years of age, I'm not computer orientated, so this was a very big step for me but I have not regretted it for one minute. The actual assembly was really quite easy, as Ace supply a very well laid out instruction manual that is easy to follow if read carefully. I have found this with ALL their electronic kits and the only problems I have ever had have been due to my own failings, either in following the instructions or bad soldering due to not-so-good eyesight.

Now, the kit comprises a new case, pre-assembled Encoder Board and sundry switches, wiring, etc. You utilize the gimbals, trim switches (more on this later), R.F. deck and antenna from your old Tx.

The only complaint I had was that the instructions did not clearly indicate which side of the Encoder Board to insert the wiring from, but this is a relatively minor point as these holes are electronically connected to both sides of the board. However, for piece of mind, I recommend fitting the wiring so that all soldering is done on the side of the Encoder Board that has the circuit lands on it.

Now, as expected, Old All-Thumbs got into trouble! Due to less than satisfactory eyesight (even with Bi-Focal Glasses), I had several short-circuits, caused by one or two strands of the hook-up wire not going through the hole in the Board and shorting across to the adjacent land.

Now, Ace do cover this in their general instruction sections, so I can only plead poor eyesight and missing this when I pre-trimmed the ends of the wires, so do be very careful here. If you can mount a magnifying glass on a stand and do your soldering under this, then this is definitely the way to go.

So, I've reached the stage where I'm ready to start programming and straight away, I'm in trouble again!!! This time I found that I would get so far into the programming and then it would all go haywire and I'd have to start again. I thought that I might have wired up some of the pots incorrectly, so I went back and rewired the ones that seemed to be giving me the trouble, but all to no avail. As a last resort (or so I thought!), I rang Ace's technical support number. By this stage, you're thinking, "Why didn't he just do that in the first place?" But, you see, telephone calls to America from Australia are not cheap!

Well, the bloke on the Ace end of the line was extremely helpful but, as I couldn't afford to pay the cost of a call long enough for him to talk me through the programme, he could only give me advice based on the symptoms I described. He was spot-on!! It turned out that I had an intermittent fault INTERNALLY in the aileron pot and it eventually tossed it in completely, allowing me to diagnose the fault. It seems that, due to a life of hard work, one of the connectors had broken away internally from one end of the resistance, allowing the pot to function one way but not the other.

By this time, frustration was running rampant! The end result was that I shipped the Tx off to Ace ($30 airmail postage!!!!) to review the faulty pot and calibrate the set and this they did, giving a full report for only $40 (and another $30 airmail postage!!!!). However, the Tx is now functioning perfectly and all that remains is for me to understand fully what the unit is capable of and set up my models accordingly.

Two early discoveries are the fantastic facility to trim the model in flight with the "Auto-Trim" feature (without altering the manual trims) and then, after the flight being able to read off the EXACT amount of alteration to be made and then programme that into the Tx. The other great feature I like is the "Throttle Preset". I use this with my power models (mostly Old Timers — they're just self-launching gliders!) to stop the motor by just pressing the button, but it is also very useful when connected to the flaps (or spoilers) and allows full control of the landing approach at the press of a button! I NEED this!

As you have no doubt gathered, I'm very impressed with my "Micropro 8000" and will be designing future gliders with its options in mind once I become fully conversant with the unit.

I and a couple of mates are now contemplating upgrading some of our old sets that are NOT Ace units and we feel this to be a very practical means of recycling some of our old sets that are a bit limited at present. The only possible problem could be that these sets have mechanical trims instead of electronic ones, but we feel that the only problem here is that they would lack the facility to adjust the amount of trim movement and might prove ineffectual if exponential rates are used. However, this would be a small price to pay for a very inexpensive top-of-the-line transmitter.

My recommendation? GO FO IT! ■

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