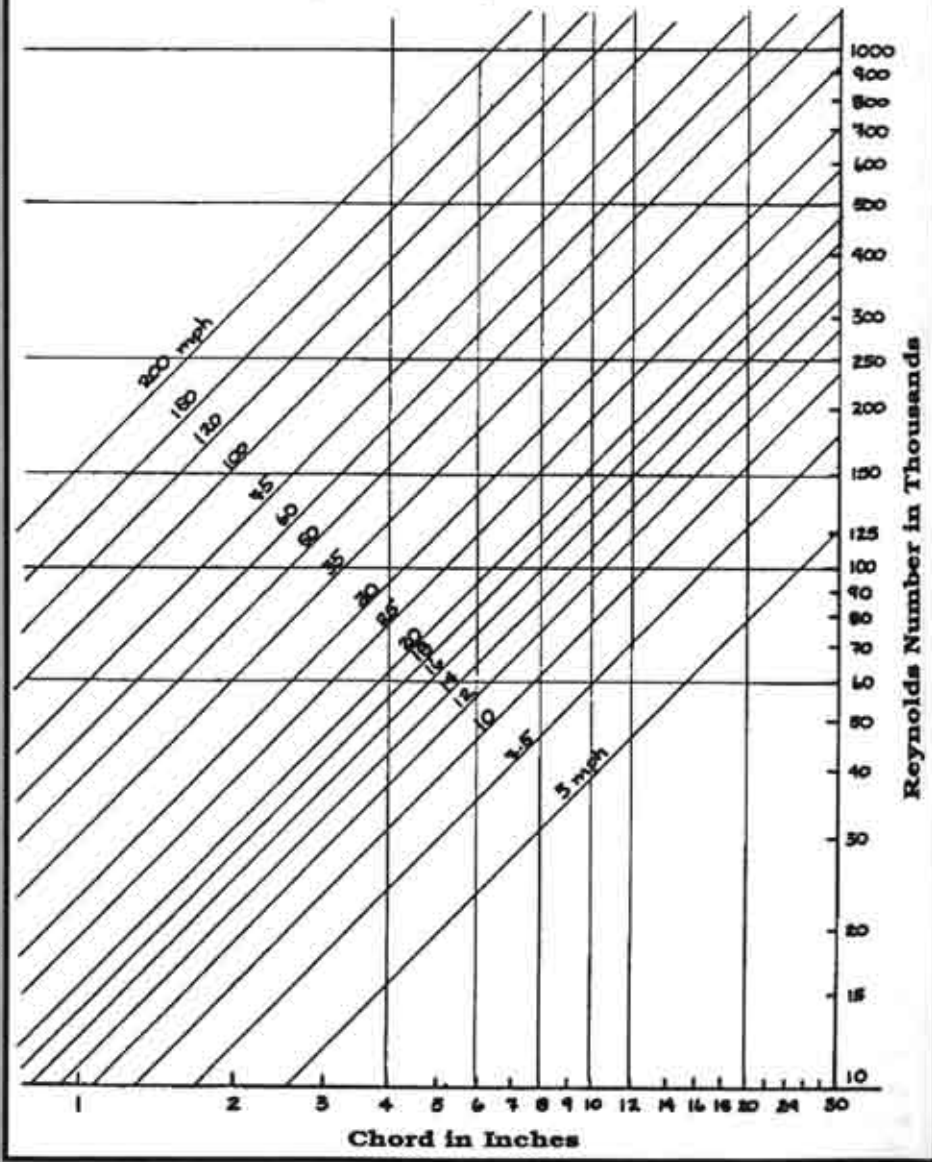
CHORD vs. SPEED vs. REYNOLDS NUMBER

Here's a useful graph developed by B^2 Kuhlman and Alan Halleck. Knowing two pieces of data will give you the third. For example, if the tip chord of your Scheumann planform sailplane is four inches and it's traveling at 20 mph the Reynolds number (Re) is about 65,000. On the other hand, its 12 inch root chord at that speed has a Re of nearly 200,000. How easy is it to have a Re of 500,000? Try a nine inch chord at 75 mph. Or consider that cute RC-HLG next time its five inch chord floats by you at 5 mph and a Re of 20, 000. Finally, remember the average velocity of a sailplane in an F3B speed run is 100 mph; even with a four inch chord that's a Re of over 300,000! Sort of makes you want to look at polars all over again, doesn't it?



R/C Soaring DIGEST

May, 1991
Vol. 8, No. 5

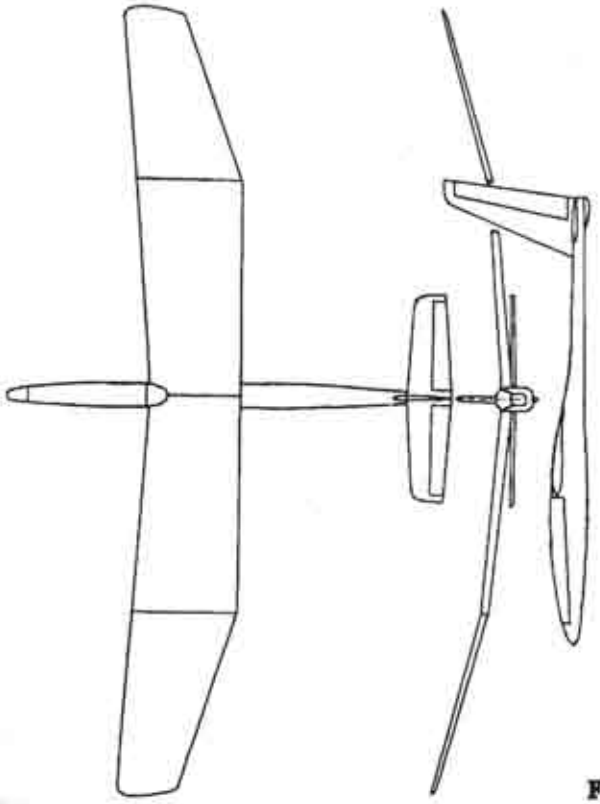
* * Special Bonus Issue * *
Contains 16 Extra Pages

DRAGONFLY

by Bruce Abell

Specifications

Span:	**2 Metre**
Chords:	**Root 9"**
	Mid 10.5"
	Tip 6"
Sections:	**Root BA 25R 12%**
	Mid BA 25M 10%
	Tip BA 25T 8%
Wing Area:	**718 sq. in.**
Wing Loading:	**6 1/4 oz./sq. ft.**



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- Feature Columnists & Technical Editors — Martin Simons, Bill & Bunny Kuhlman (B^2), Gordon Jones, Wil Byers

The Soaring Site

We hope to have the survey sheets, which are still arriving daily, summarized by next month. In the meanwhile, we have started incorporating some of your great suggestions. This month, we've added a new column called "R/C Soaring Resources" and given you another 16 BONUS pages. "Jerry's Workbench" is on the subject of composites and where to obtain them. Check out the back cover, too. If you wish, you may reproduce and enlarge this chart for ready reference.

We are in receipt of draft rules for a new FAI event, class F3I for Aero-Tow Gliders, from Terry Edmonds, CIAM Soaring Representative. Terry says, "This event was approved last year with provisional status. However, until now, there hasn't been an English translation of the rules. You will notice some pencilled in changes. These are things I have recommended to the Soaring Sub-committee. Somehow I have become an English language consultant for the CIAM Soaring Sub-committee. To the best of my knowledge, the rules have not been available for distribution in the U.S.A. before. Please state that the rules are still in draft form and that the final version could be a little different. The French claim they have been flying this event for several years with good results."

Since only a small group of you indicate interest, we won't print the rules in *RCSD*. A copy of this 8 page document can be obtained by sending us a Legal-Size-Self-Addressed-Envelope for the U.S.A. If outside U.S.A., please just send a self-addressed envelope.

Jerry & Judy

R/C Soaring Digest
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(415) 689-0766
FAX (415) 798-6436

Jer's Workbench

Composite Material

Going over some of the early returned survey forms, I see that many of you scratch build and that there is a need for information on composite building, composite building material and where to locate them. So, Gordon Jones and I will try to tell you a little bit about the most common ones used in model building. Both of us have written articles on the subject of composites from a slightly different perspective. The articles are combined in this column, for easy reference, with Gordon's input in quotes and indented. Should you find some duplication, it is intentional. The subject of composites is extremely complex.

> Composites should be stored carefully and used based on the manufacturer's instructions. Since I work with resins and fiberglass almost every day, I have installed a vent in my garage/workshop, and I DO NOT work in the house with the resins and such. Also, I purchase plastic surgical gloves at a local medical supply and frequently use a small nose mask so as not to breathe in my latest pile of sawdust scraps, foam cuttings, etc.

So, for those items listed below, we will try to tell you where, in our opinion, they're best used. In the months to come and future columns, I will try to go into greater detail. First, I'd like to provide you with some information on reference material that may be of interest.

Handbooks on Design

For those of you who **really** want to design and build your own models, or modify any existing models that you have in order to obtain that little bit of extra performance, I would like to suggest two handbooks by Eric Lister: *Sailplane Designer's Handbook* (49 pages) and *Drag Reduction and Structures Handbook* (56 pages). I have had these 2 handbooks for many years and have referred to them on occasion. Not sure if the books were still available or out of print, I tracked Eric to Maryland. He says that they are still available, but that he has been out of touch with the hobby for a few years. (Eric is an aeronautical engineer and consultant and, at one time, was very active in the R/C hobby.) By the way, if you want nice glossy books for your bookshelf, these are not for you. (Although legible, one was written in 1974 and was done on what appears to be a typewriter using cut & paste methods.) However, they contain technical detail for designing your own sailplane. While some of the information is quite technical, much of it is not.

The Madison Area Radio Control Society (M.A.R.C.S.)

I have just received my copy of the *M.A.R.C.S. 1989 National Sailplane Symposium* proceedings on "The Paths of Future Flight". For those of you who are unfamiliar with the National Sailplane Symposium, it is a 2 day conference that has been held in Madison, Wisconsin for several years, now. Many noted modelers talk and share their ideas and knowledge on the subject of soaring and the talks, photos, slides, questions and comments are synthesized each year and distributed. The 1989 proceedings are spiral bound, 8 1/2 X 11 with about 188 pages by my count. Although I couldn't attend, I see that the speakers were Walt Good (*The Militky Cup Electric Event*), Larry Jolly (*Designing to Win*), Walter Panknin (*Flying Rainbows*), Michael Selig/John Donovan/David Fraser (*Princeton Airfoil Tests*), Bob Steele (*Whither Soaring*), Tim Renaud (*Future Directions for Radios*), Terry Edmonds (*Impressions of the F3B World Championships*), Ed Eloranta (*Sailplane Meteorology*), and the speaker at the banquet was Bob Champine (*Reflections from a Pilot's Career*). Al Scidmore was the Proceedings Editor and Bill Vogelsang was the Symposium Chairman who ran the show. 1989 and back issues to 1983 are available, should you be interested. (For ordering information, please see the end of this column.)

What is a composite?

According to Webster, a composite is "something put together, made up of various parts or elements, a compound."

> "The technology of today's aircraft designs both in our hobby and the home built aircraft arena has increased ten-fold over the past several years. It was once thought that high tech was a simple fiberglass fuselage and balsa covered foam wings. This has changed dramatically during the past few years as we have begun using space-age materials in more varied applications. Today we think nothing of adding Kevlar and carbon fiber to strengthen both fuselages and wings. The advent of a practical vacuum bagging system has brought on the expanded use of fiberglass covered wings, and has opened the door for even more exotic wing designs. What are some of these materials, and how do I use them are the questions most asked by the modeler today."

The most common composite building material used in model building, today:

- Wood — balsa, spruce and plywood
- Resins — polyester and epoxy
- Fabrics — fiberglass, graphite, kevlar and spectra
- Fillers — microfibers, microballoons and silica
- Foam — white and blue

Almost every kit contains some of these composites such as balsa wood fuselage sides with plywood doublers including balsa wood and plywood formers. The wing, in this example, is constructed with ribs, leading and trailing edges made of balsa wood, spruce spars and plywood dihedral braces.

It is possible to upgrade this type of kit by laminating carbon fiber to the spruce spars which adds strength, and fiberglass the nose and bottom of the fuselage to prevent damage when landing in the rough. Not to take away anything from the designer, it is to be recognized that different fliers in different conditions have different needs.

So, looking at the list, there is a place and or a need for almost everything, but there are other factors to look at or consider such as strength, weight and, of course, cost.

Resins

There are two rules that must be followed:

Rule 1: Read and follow the manufactures directions, "DO NOT ALTER." The manufacture said to mix this many parts of "A" to that many parts of "B." Do it. Otherwise it may never cure.

Rule 2: DO NOT try and work with any resin in a cold shop with a high humidity. Work in 65 degree temperature or higher. Why? Again, it may never cure or, if it does cure, it will be a long time doing so. Rule one again says to thoroughly stir and mix!

> "An essential part of composite construction is the resin used to adhere the glass cloth, Kevlar and carbon fiber. Just as fiberglass products are extremely varied, resin systems also differ greatly in their working properties. There are two basic types of resins available; polyester resin and epoxy resin. Each type has its own applications and is superior to the other in certain respects."

Polyester resin comes in two types. The "A" type is for a surface coat and the "B" type is used for multiple laminates with a catalyst as the curing agent.

"A" type resin has a small amount of wax in it and comes to the surface as it cures (This resin is hygroscopic and draws moisture from the air.), but it is sandable.

> "There are two types of polyester resin; type "A" contains a small amount of wax in it, which comes to the surface and forms a barrier against moisture. This permits the resin to cure completely and the surface is hard and easily sanded. This is used as a finish coat in multiple layer lay-ups, or as the only resin used in a one coat application. Most fiberglass fuselages that had been laid up with polyester resin use type "A"."

"B" type or laminating resin has no wax. After it has cured, it will still be tacky to the touch and cannot be sanded. Ideally, if done properly, it is used for laminating multiple layers of fiberglass cloth in fuselage construction.

> "Type "B" polyester resin does not have the wax content. As a result the surface stays a little tacky, as the surface cure is being inhibited by moisture. This is a general purpose bond type of resin used as the lower coat(s) in multi-laminates. Type "B" is not a good resin for model uses."

The catalyst curing agent can be varied a little bit but don't get too carried away as it will cure in the pot before it can be used. It's best to make up a test patch to get to know the resin before starting any large project. Remember, a low temperature and high humidity will slow the cure time.

Working with Polyester resin is quite easy. If applying a single layer of fiberglass cloth over wood, use "A type or surface resin", but if working with multiple layers of fiberglass cloth, start by using "B type or laminating resin" and then change back to "A type or surface resin" for the last layer of fiberglass cloth.

> "The biggest drawback to using polyester resin is that it attacks foam and therefore cannot be used in wing structures. In addition, it is more flexible than Epoxy resin and requires numerous coats to be effective in models. Another problem with polyester resin is that is it of a higher viscosity than epoxy resin which results in a higher weight for the structure."

Something to remember, if the fiberglass fuselage is made of polyester resin, the servo rails, formers and wing rods should be installed using polyester resin. Polyester resin has a very hard surface and epoxy resin will not bond to it. The epoxy resin may look like it has bonded, but it will break loose in time.

> "Read the instructions carefully when using polyester resin! Be sure that you mix the resin according to the directions or you will end up with something that will never dry. Adding more hardener will not work with polyester resin to speed the cure time. It will only make the situation worse. And if you mix a bad batch, stop and make up another batch according to the instructions; do not try to "make do"."

Epoxy resin is 2-part: epoxy resin and its hardener. Epoxy resin and its hardener comes in many types with the cure time anywhere from 5 minutes to 24 hours, or more. There are no rules on what epoxy resin to use, so use what is best for you. If you are only working with small bits and plan to hold them together with your fingers, 5 minute epoxy will do, but for larger bits that you are clamping together where more working time is required, I use 30 - 60 minute epoxy. For those big projects like an epoxy resin fiberglass fuselage or epoxy resin fiberglass wings, it is best to go with the longer cure time epoxy resin, as additional working time is required. Remember, keep the temperature up to 65 degrees or higher in the work area.

> "Epoxy resin has a lower viscosity than polyester resin and does not attack foam making it the primary choice of modelers today. It is available in many viscosities and cure times which provides numerous options for the builder. This resin is used in home-built aircraft applications a great deal and this has provided some pluses for the model builder. Initially there were some problems with sensitivity to some types of epoxy, just as there have been problems with the fast cure epoxy glue we use. The manufacturers have now produced newer epoxies (both resin and glues) that do not cause a chemical reaction."
>
> "The application you are planning will determine the pot life of the epoxy you use. These range from about 40 minutes to 2 hours in length. The cure time of the resin also varies and strict attention should be paid to the instructions concerning cure times. In most cases, if you find an epoxy resin that works well in one application it will work well in most others."

One thing about epoxy resin is that it is stronger than polyester resin. But, it also costs about twice as much.

> "There are more epoxy resins available which is a good news - bad news story. Most are excellent for our applications; but there are some that do not fulfil our requirements. If you are going to use an epoxy resin check with another modeler or the manufacturer prior to purchase to ensure that you are getting one that will fill your needs. Some epoxy resins will not work well on foam wings because they are somewhat brittle, but provide excellent fuselage adhesion, and just the reverse is true in other cases."

Fabric

> "The most basic structural material in building a composite aircraft is fiberglass cloth. Glass cloth is available commercially in hundreds of different weights, weaves, strengths, and working properties. Very few of these, however, are suitable for the requirements of high strength and light weight. Even fewer are suitable for the hand lay-up techniques employed in our hobby."

Fiberglass, Kevlar, Graphite and Spectra are all man made composite materials. They come in many different forms, stiffness, strengths and weights. To cover this subject I would have to write a book, but I'm only going to cover what would be of interest in model building.

Fiberglass cloth comes in three forms: mat, uni-directional and bi-directional (woven). The weights rang from 1/2 - 20 oz. per square yard.

Mat is made up of numerous, random running strains of glass filaments. (Looks like the air filter in a furnace.) The mat is used for bulk built-up in molding and repairs like filling holes.

Uni-directional fiberglass could be used in spar making, but I haven't found any real need to use it in model making.

> "Uni-directional cloth has 95% of the glass fibers woven parallel to the selvage, giving exceptional strength in that direction and very little at right angles to it. Uni-directional cloth is used in areas where the primary loads are in one direction, such as the bottom layer of wing skins or fuselages."

Bi-directional or woven cloth is what most of us use in model building. The weights used in model building will be from 1/2 - 7 1/2 oz. per square yard. 1/2 - 1 oz. per square yard is ideal for laying over wood because of its strength and

finish. 2 - 7 1/2 oz. per square yard is used for lay-up in fuselage or wing construction. I can't tell you what weights and how many layers to use as this is a variable and will depend on what you will be making. Some bit of engineering and experimenting on your part will have to be done.

> "Bi-directional cloth has half of the fibers woven parallel to the selvage (the woven) edge of the cloth and the other half at right angles to the selvage, giving the cloth the same strength in both directions. Bi-directional cloth is used primarily for the needed sheer and torsional stiffness over an area. "

Bi-directional fiberglass cloth also comes in two types: E - glass and S - glass. E - glass is 30% stronger and 15% stiffer than S - glass. The E - glass is more expensive than the S - glass.

> "Multiple layers of glass cloth are laminated together to form the fuselage structure in a mold or over foam to form a wing skin. Each layer of cloth is called a "ply". The number of plys is dependent on the application, weight of the cloth used and type of cloth to attain maximum strength with as light a weight as possible."
>
> "Another fiberglass option is uni-directional fiberglass tape. It comes in rolls that can be used as a spar cap for foam wings or as additional structural support in fuselage lay-ups. Standard fiberglass tape is used to join and reinforce fuselage seams. While not as strong as the uni-directional it does provide excellent strength in this application."

Kevlar and Graphite

Moving into the space age of model building brings us to the use of kevlar and graphite which is sometimes called carbon fiber. Kevlar and graphite are about 4 times stronger than S - glass.

One of kevlar's first uses was in the construction of automobile tires and sailboat sails. As tough as kevlar is, it is very easy to work with if it can be cut. A special pair of scissors is required. Do not use your wife's good sewing scissors, or else! One thing about kevlar is that it needs to be laminated between two layers of fiberglass. If you sand a kevlar surface and go through the resin and sand into the kevlar, it will become fuzzy and more sanding only makes more fuzz. The fuzz comes from cutting into the threads of the kevlar fabric and in doing so destroys the integrity of the kevlar. Kavlar is best used in a fuselage lay-up.

> "Another material that has been used for a number of years in aerospace applications is Kevlar. Kevlar is an organic fiber which is yellow in color and soft to the touch. It is extremely strong and tough and about the lightest structural fabric on the market today. Kevlar is highly resistant to impact, but is difficult to work with for hand lay-up applications. In addition, when sanded as an outer surface it produces small fuzz making filling and painting very difficult. Kevlar is available in both bi-directional and uni-directional cloths. It is used to strengthen fuselages, and has been used in strengthening glass wings."

Graphite is an alternate in the construction and replacement of many steel parts in high performance race cars and race boats. It's a weight saver and is as strong as steel.

Graphite is stiffer than kevlar and would make a really strong fuselage but, because of its electrical property, it would block the signal to a receiver's antenna if it is run down inside the fuselage. A small amount of graphite used in the reinforcement of stress points is OK, but its best use would be in the construction of lighter-weight wing joiner, spars and wing skins.

> "A material that has been used an an alternative to fiberglass and Kevlar in some applications is graphite. Graphite has been used by modelers for some time in construction primarily in booms and wing joiner tubes. Graphite is only mils thick with good strength; but has one drawback - it is very brittle and has a tendency to shatter. Uni-directional graphite can be used to reinforce structures with good results."
>
> "Carbon fiber has found many uses from race car body components to wing rods. Carbon fiber filaments are finer than a human hair, but extremely strong. It is available in many different forms that provides the user with a variety of applications. Carbon fiber mat is available in many thicknesses or weights that can be used to strengthen fuselages, over spars in balsa construction and over trailing edges and spars in foam construction. It is wet out like fiberglass cloth for most applications, but in thick strips it can be applied to spruce spars with cynoacralate adhesives adding torsional strength to the wing structure."
>
> "Carbon fiber rods can be used for wing rods providing a light weight joiner that has tremendous strength. With small diameter carbon fiber rods, pushrods, using guides, can be fashioned. It is also available in tubes that can be used as a combination spar and joiner tube. In small quantities it can be used to fashion small parts in molds for bellcranks or other hardware items. Carbon fiber "tow" in the right thickness can even be used as a replacement for spars in some foam wing applications saving weight and adding tremendous strength."

Spectra

Newest thing on the market today is spectra. Pound per pound it is 10 times stronger than steel and 35% stronger than kevlar. Today's applications include its use in airborne radomes, bullet proof garments, boat hauls and sporting equipment.

Like kevlar, spectra needs to be layed-up in a composite between two layers of fiberglass because, if it's sanded, it too will become fuzzy and will have lost its integrity. Even with its super strength, it is easy to lay up, but very difficult to cut. Special scissors or a hot knife are required. The only weight fabric on today's market suited for model building, that I have been able to find, is 2.8 oz. per square yard.

Additives and Fillers

There are too many additives and fillers to list, but a couple of examples would be aluminum powder to protect against ultraviolet light, and hydrated alumina mixed with resin as a fire retardant. But, the ones most used by modelers are microfibers, which are used to thicken resin and as a gap filler. It bonds to wood very well. Microballoons mixed with resin make a putty and form fillets that are easy to sand. Silica is used to control the viscosity of resin. This will help to prevent resin run-off when working on a vertical or near vertical surface.

Foam

The most common foams used in model building are the white (polystyrene) and the blue (styrofoam). The difference is the weight. White foam is one pound per cubic foot and the blue is two pounds per cubic foot. The blue is more dense, much stronger and more expensive.

A great many of modelers today are using foam in wing construction by laminating wood or fiberglass skins on to a foam core. This makes a very strong and straight wing. Some model builders who build one-of-a-kind, not wanting to make a mold, will use a foam base or foam plug to construct a fuselage.

Summary

I hope that this bit of information will help answer some of the questions you have on composite construction. With a little imagination and using the above composite building materials, almost anything can be constructed. If you have any special projects or techniques that you have worked on and would like to share with the modeling community please write and send pictures if you can. We'll continue with the subject of composites in future issues of *RCSD*.

We see by the surveys that many of you are new to the hobby and many don't belong to clubs, which means that you probably don't have an opportunity to observe another's techniques. So, this month, we have added a new column called "R/C Soaring Resources", which we will continue to expand on as we obtain additional information. So far, there is one year-round instruction program in San Jose, California and we're hoping to find more.

Where to find composite building materials

"If you want to try out some of these materials talk to a local flyer who has used them and can give you some help, or call one of the manufacturers for advice. In addition, there are some articles, books, and videos that cover most applications. Julian Tamez (Channel 1 Productions) has some videos that go through step-by-step instruction on fuselages and wings. Another good video on wings is the one produced by Composite Aircraft Engineering, the Sucker Kit folks. Jerry Slates had an article in the October issue of *RCSD* on making hardware parts from resin and carbon fiber. There is information out there on just about any application you want to try. BUT, be sure to read the instruction of the product you are using prior to using it."

Look in the yellow pages of your local telephone book under Plastic for resin, fiberglass and foam. Or, contact the following and get their catalog:

Aerospace Composite Products
P.O.Box 16621
Irvine, CA. 92714
(714) 250-1107

Aircraft Spruce & Specialty Co.
P.O.Box 424
Fullerton, CA. 92632
(714) 870-7551
(800) 824-1930 (except CA. & AK.)

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Humble, TX. 77338
(713) 540-3944

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P.O. Box 4615
Lancaster, CA. 93539
(805) 723-3783

Fiber-Glast Developments Corp.
1944 Neva Drive
Dayton, OH. 45414
(800) 821-3283
(513) 274-1159 (Ohio only)

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100 Patterson Ave.
P.O. Box X908
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Mustoe, VA. 24468
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(301) 974-0968

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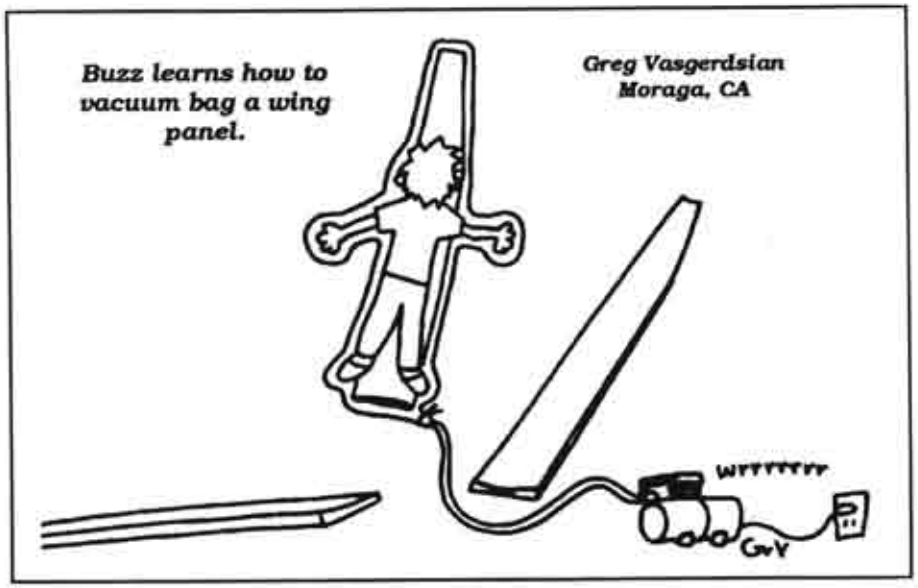
1989 for $12.00
Third class postage included. For 1st class include additional $1.50 per issue.
Walt Seaborg
1517 Forest Glen Road
Oregon, WI. 53575

Sailplane Designer's Handbook
Drag Reduction and Structures Handbook
$7.95 each or two for $14.98 (Includes S&H U.S. funds. Outside U.S.A., please write to obtain additional postal costs.)
Eric Lister
2214 Regina Drive
Clarksburg, Maryland 20871



Some Tips from Gordon

To add strength to the servo cavity in a sheeted foam wing add a square of carbon fiber matt over the location of the servo cavity on the foam prior to sheeting the wing. Just lay the carbon fiber on the wing and "wet" it out as you would fiberglass cloth. It makes the bottom of the servo cavity stronger and you won't have any flex in that area.

Looking for a simple rack to store your airplanes that doesn't cost you an arm and a leg but is simple to put up and looks good too. Try the shelf rack materials from the local building supply store. The wall strips come in assorted lengths and so do the shelf brackets. The 12" brackets will hold the normal wing and fuselage on the same "shelf" so that you have an airplane on a shelf. You can even get fancy and put some pipe insulation around the shelf brackets to protect the covering material.

On The Wing

...by B^2

This month we describe a computer program to help design swept 'wings, and the result of Alan Halleck's use of the program – his RAZER1 slope racer!

Our trip to the 1989 MARCS Symposium was a wonderful experience, and we wrote about Walter Panknin's presentation on flying wings, "Flying Rainbows", in the September 1990 issue of *RCSD*. As we mentioned in that report, Walter gave out a packet of materials to those interested in designing their own flying wings. Included were the formulae for determining wing twist based on required C_1 and a stability factor.

Using Walter's formulae as a basis, we developed a short computer program for our antiquated Apple II Plus. Written to compute needed wing twist, it ran very rapidly and gave twist values comparable to several known successful designs.

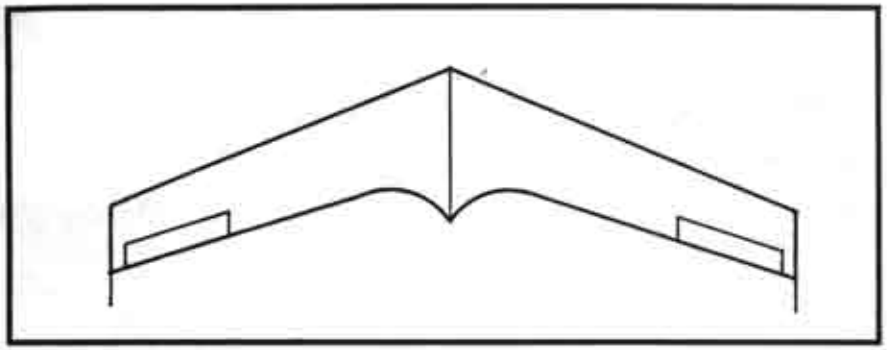
Alan Halleck, of Portland, Oregon, is a fellow "wing nut" and computer freak with whom we converse on a regular basis. Knowing Alan would be interested, we sent down a hard copy of this small program for him to enter into his IBM compatible. Since there are no graphics involved and the commands used are parallel for both versions of BASIC he was able to enter it with no problem, and Alan immediately set to work designing a flying wing using a couple of airfoils designed by Martin Hepperle.

An October '90 get together with Alan during which we spent several hours at his computer produced a much more sophisticated BASIC program. The program now prompts the user for airframe information such as span, chords and airfoils, sweep, projected weight, and other information. The printout shows the wing area, location of the neutral point, CG location based on a series of stability factors, wing loading, and of course the twist required for a given coefficient of lift. It's easy to modify individual pieces of data to see the effect as all values remain constant from one run to another unless changed when prompted. All airfoil data required by the program is stored on disk, and placing airfoil data on disk is a simple task performed by a very small additional program.

The result of Alan's design work is a bat tailed 20° sweep flying wing of 77" span. Winglets provide some vertical area, but elevons are the only control surfaces. Total washout is a minimal 1 1/2 degrees. The 'wing is of foam core construction with fiberglass and Kevlar providing the strength, and the entire structure is vacuum bagged. We've included a small sketch of the resulting planform. Alan located the CG according to the computer program and found it to be extremely accurate. Removal of weight to shift the CG rearward was met with a decrease in performance. This is proof again the program does deliver accurate information.

We had the opportunity of witnessing the RAZER1 in action at Goodnoe Hills on the Columbia River. During a high speed landing the 'wing flipped into the air and hit the rock surface of the hill inverted but survived without a scratch — it's one strong airplane! The RAZER1 is capable of some great aerobatics. It does good axial rolls and can fly inverted for extended periods. The turning radius is very small.

The proof of the RAZER1 design came at the November '90 slope race held by Alan's local club, the Portland Area Sailplane Society (PASS). In winds of 40 knots and above the RAZER1 performed admirably, taking second place in all heats and placing fifth overall out of 16 entries. Alan admits to not being well practiced for the event, and he missed a pylon on the last lap of the last race; otherwise his placing would have been higher.



New design, first race, pretty good performance, right? Well, there's more. The wing loading of the RAZER1 is about 10.7 oz. per sq. ft., yet it was competing against conventional tailed sailplanes loaded at 16 to 24 oz. per sq. ft. The rotor on the hilltop was vicious and ate several airplanes, but the RAZER1's single "hard landing" barely dented the nose.

Alan has drawn up plans for the RAZER1 and has made them available to our plan service, B^2 Streamlines (P.O. Box 976, Olalla WA 98359-0976). These are not full sized, but since the 'wing is of foam core construction they really need not be. Airfoil cross sections are printed out full size so that templates can be easily made, and construction details are on the plans, as is a list of sources for the various materials required. Cost of the plans mailed in an envelope is just $5.00; add $3.00 if you wish them rolled into a tube for mailing.

We will provide a printed listing of the main computer program and the small program for placing airfoil data on disk for $2.00, postage paid. Send your request to us at P.O. Box 975, Olalla WA 98359-0975. Please mention whether you want the Applesoft or IBM version.

We and Alan wish to thank Walter Panknin for presenting his formulae to the modeling public at the '89 MARCS Symposium, as well as for so enthusiastically supporting the release of our computer program to readers of *RCSD*. The complete text of Walter's presentation at the '89 Symposium will hopefully be available as you read this. Contact Al Scidmore, 5013 Dorset Drive, Madison WI 53711 for further information regarding Symposium Proceedings. (For ordering, the information is included in "Jer's Workbench" & in the "R/C Soaring Reference" column.)

Bill & Bunny
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Dragonfly

...by Bruce Abell

G'day! The Armidale Sailplane Expo. (Australia) is over and what a great weekend it was — as usual! 35 nominated to fly and 32 actually flew.

I should have taken a photo or two, but with 4 Newcastle flyers and 3 from Cessnock all helping each other, it was pretty hectic! We flew 7 rounds over two days, and the scores show that the top flyers didn't lose more than one round apiece. There were over 30 winches (Some shared a winch and others had spare back-up units.) lined across the field and this is normal for glider competitions, here. After the model comes off the line, someone (usually the timekeeper) winches the drogue down to the turnaround pulley to prevent any line crosses. Another team member, who is waiting at the turnaround, then brings the line back to the winch ready for a relaunch if the pilot decides to abort. We fly the comp. pretty much the same as the thermal task in F3B except that we fly an 8 minute flight in 11 minutes with scores in each heat normalized to 1000 points. The system works very well and is quite popular.

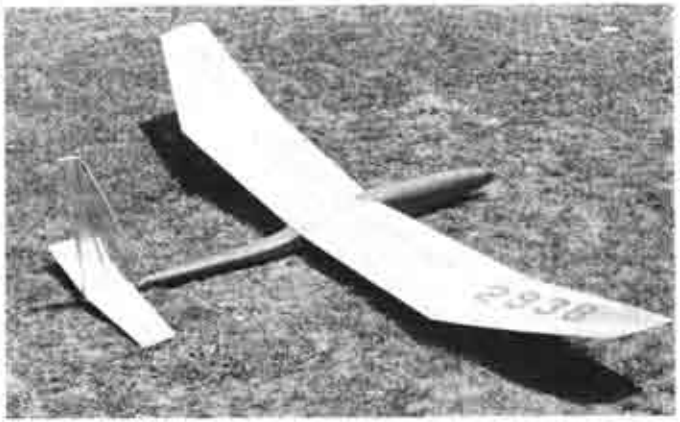
The Open Class winner was Evan Bengston and the Bruce Mitchell Award was presented to Peter Pine, who is the main driving force of the Armidale Club and who has represented Australia at F3E World Competitions twice — a very popular choice! (Congratulations from *RCSD*, too.)

One of our club's Juniors, Brett Willis, took out the Best Junior award and came in

Phil Crandon's beautiful scale Schweitzer at Armidale Sailplane Expo. Photo by Peter Pine, provided by Bruce Abell.

a very creditable 12th over-all. He flew a stretched (3 metre) "GNOME" that I drew up for him and he calls it the "TROLL". Unfortunately, he has now started an apprenticeship and has discovered girls, so we'll probably lose him for a few years! Kids NEVER get their priorities right!!!

Yours truly didn't do too well, as I flew my new design and only trimmed it out a couple of days before the comp. and wasn't too familiar with its handling characteristics. As is my usual form, I trimmed it to almost neutral stability to get maximum visual "signals" from it in flight and this makes for over-sensitivity



DRAGONFLY

Winch line-up at 1991 Armidale Sailplane Expo. Bruce Lehman photo. Provided via Peter Pine & Bruce Abell.

of the elevator in a thermal turn. This takes some getting used to and I wasn't mastering it too well until the last couple of rounds, one of which I scored 7 minute 59 seconds and a spot landing bonus. It was enough to get me 3rd in the 2 metre section, though.

I've been trying for over 30 years to find a design that would have good penetration in winch conditions without having a great slug of lead in it and I think I've finally started to achieve that dream! The first day at Armidale had winds of 10 to 15 knots and I found that my model could penetrate upwind quite well with the wing loading of 6 1/4 oz./sq. ft. Even John Haren commented that I "must be doing something right" to achieve such good penetration. I feel that the forward sweep, combined with the sections mentioned (See RCSD for Dec. 1987 & May 1988) plus the textured (polyester chiffon & dope) upper surface are all contributing factors. Also, the wider chord at the polyhedral break is probably contributing by making this area more efficient due to the higher Reynolds Number. It's all fairly complex aerodynamically, but it's working!

The name was suggested to me by a couple of the flyers at the Armidale Sailplane Expo. due mainly to the unusual visual effect of the reflecting metallic thread in the covering (see enclosed sample) and the wing shape also sug-

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An overall of the winch that clearly shows the foot pedal, the solenoid actuating arm and the solenoid, itself. Club winch made by Bruce Abell. Photo by Bruce..

Casio Altimeter Watch Temperature Sensitivity

...by Lee Murray

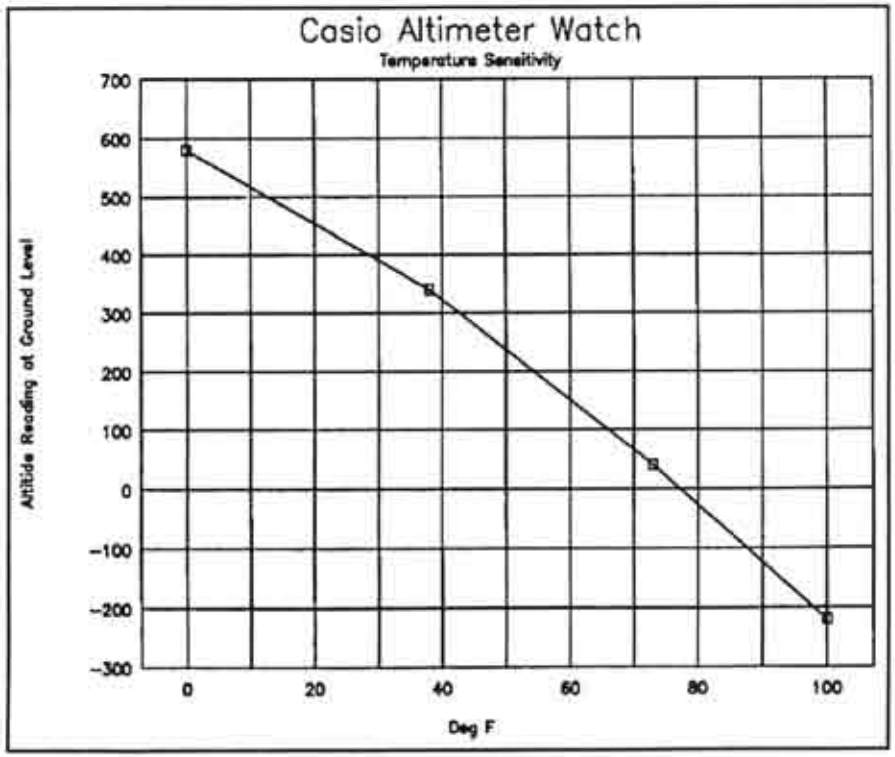
The Casio Altimeter Watch was the subject of three reports in RCSD *in 1990 (#3, pg 17 by Jim Gray - Model 510; #5, pg 7 by Wil Byers – Model 510; #8, pg 6 by myself – Model 376).*

The last two reports indicated that there was a sensitivity to temperature but little quantitative data was given. I am now providing data and a graph showing how the model 376 watch zero altitude adjustment changes as a function of temperature. It would be interesting and useful if someone would test the Model 510, and watch to see if that model has the same sensitivity. In dealing with the temperature sensitivity, Rick Palmer is using bubble packaging for insulation. I'm using foam rubber.

In my earlier article I had indicated that the calibration of the watch was relatively accurate and had provided a graph of data obtained with vacuum chamber comparisons (simulated altitude) vs an aircraft altimeter. The temperature sensitivity of the calibration was tested by using environmental chambers at 38, 73, 80 and 100 degrees F. The zero problem did not show up because the watch altimeter was reset at the beginning of each test.

Casio Altimeter Watch Temperature Sensitivity Test

Temp. Deg. F	Time	Reading
0	8:24 AM	580
38	11:55 AM	340
73	1:00PM	40
100	2:00 PM	-220



I have had some letters and comments which indicated that the resetting of the altitude memory was easier than I first believed and had reported in my article. The procedure is to enter the adjust mode, press the increase (Split-Reset) and decrease (Start-Stop) button simultaneously. Then, return to normal function by pressing the adjust button. There was also a question about how to remove the watch band. The band is very tightly mounted to the watch body. However, using a very small jewelers screwdriver, the watch band spring-loaded pin can be compressed from the bottom side of the watch. Getting the band back on is a little more difficult than removing it, but that is what I have done.

I took the watch with me on several trips involving air travel. It is interesting to note how the more modern aircraft control cabin pressure is better than the older aircraft. A trip up the Weston Peachtree Plaza Hotel (Atlanta) elevator (5th floor to 72 floor) showed 600 feet in altitude gain. I suspect this reading is accurate since the height per floor computes to 9.0 ft/floor. The building seems much higher than a good launch height, but perhaps not.

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Soaring with Electric Sailplanes Late in the Season

...by Ray Reiffer

Here in Michigan, I find that the soaring conditions in November in my area are not generally good. But, I like to fly a lot...3-5 times a week if I think the weather is good. Sometimes, if it's just a beautiful day but the conditions aren't quite right, I like to experiment.

I have had many satisfying soaring flights this fall in the late afternoons after work, and I have discovered a type of cloud formation that practically guarantees soaring results with ceilings beyond my ability to see the ship! Yet, the sky, for all practicable purposes, was devoid of activity, as none of the usual signs were present or, at least, not observed.

I'll call these patterns the snail shell formations. Actually, the fact that the air is not moving (save for a light breeze) is the condition that allows the snail shell pattern to develop. Should a wind come up, the formation and lift will disappear in a matter of a minute or two. I have found these patterns early in the morning and late in the afternoon, when conditions are calm and the sky is hazed over or turning white. This type of sky allows the observations to be made.

After soaring to altitude late one afternoon, I found there were soaring birds up there, which looked like pepper specks high in the sky. I had never seen so many in one place. Since hawks do not stay together in thermals for long, I knew they probably weren't hawks. At any rate, I observed the tiny dots streaking back and forth and just having fun. Buzzards and swans, which do soar in large flocks, do not play as hawks do. So, one can only guess as to what they were.

I finally noticed that the area above the birds looked like a fat-legged spiral much like a snail's shell. Once noticed, although faint, I could make out the spiral. I had not noticed it earlier when I scanned my immediate soaring range before launching. The spiral shape became more ghostly as I watched, and it soon faded to an outer ring with a bulls eye of fog in the center. My plane had climbed to the point where I was just able to see the wing across, and it continued to climb. For a 100" sailplane to be that tiny, these

spirals must be up a fair ways, to say the least.

I always get nervous at that altitude. My electric sailplane has no spoilers, so I maneuvered it away from the area until I could not observe the formation any longer. By the time I got the ship down to within easy sight, the formation had disappeared and the lift was gone.

Just recently, I found another sign of a spiral and, again, it was a calm, late afternoon near 6:00 P.M. on November 12th. This was a fragmented spiral. There were no other clouds, anywhere; the sky had a milky-colored hue. I glided on over to the area and got 27 minutes out of it, which included 3-4 loops and just plain goofin' off. As it was 40°, I had had enough after a 40 minute flight.

How was I able to reach the lift? If I had launched with a winch, I don't think I could have reached the formation because of the dead sky. I couldn't have gotten enough altitude. Since a 3 minute motor run has put me up higher than a winch, this is where the electric sailplane comes in. Additionally, there is often lift up high, that is not found at the lower altitudes, where the delicate green air has more time to organize.

My system will run strong for 6-8 minutes. So, in estimating that it will only take three minutes to get to the spiral, I know that there is enough reserve, if need be, to try and locate the good air a second time, if necessary. Although standard search methods will usually find it, sometimes it is too weak to work. With the motor running any good air should show itself, and you can start soaring. If the air doesn't provide enough lift, restart the motor and go for more altitude or better air. With any luck, you'll go to the top.

My electric sailplane is a standard configuration with a cheap $13.00 motor and 7X4 folding prop which runs via 7 1200 Mah batteries. The wing loading is 11.5 on a thin 10% foil flat bottom. This is my third ship, and the performance is very impressive for a no bucks outfit. My electric sailplane has had several hours of air time that would otherwise not have happened. It has provided me with an opportunity to experiment with various questions I've had concerning lift at odd hours and times.

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BARCS (The British Association of Radio Control Soarers)

Jack Sile, the editor of SOARER, *has provided us with some background information on BARCS.*

What is BARCS?

BARCS (The British Association of Radio Control Soarers) was founded in 1972 to organize and represent the interests of everyone involved in radio controlled thermal soaring. In 1976, slope soaring was added. More recently, electric power launched soarers have become popular. This new aspect of silent flight joins many others that have come to be a regular part of the BARCS scene over many years — ranging from slope pylon racing and cross country soaring to scale flying of both gliders and unpowered versions of civil and military aircraft.

In 1984, BARCS was awarded the FAI Diplome d'Honneur by the Royal Aero Club in recognition of its achievements in furthering radio controlled soaring.

At the heart of BARCS, you will still find an unrivalled national and international programme of radio controlled thermal soaring. Well-organized and friendly competitions are held every weekend throughout the summer flying season up and down the country. Members are kept in touch by *SOARER* — BARCS internationally respected newsletter which carries full coverage of competitive activities and technical developments in soaring.

The BARCS Programme

Here is a selection of what BARCS can offer to its members:

A personal achievement programme in thermal and slope soaring has been devised for members who prefer to progress outside the competitive field. Bronze, silver, gold, diamond and double diamond awards are made on successful completion of graded tasks which may be carried out on your own field or slope.

Summer and winter postal contests are organized each year, again performed on your own flying field.

A regional league championship each year is based on results achieved in open club competitions held under BARCS rules. Continuous growth in the number and variety of competitions available to members throughout the flying season is a major goal of the Association.

BARCS open class thermal duration rules are recognized by the FAI as the international competition class F3J and a growing programme of international events is based on this format.

The development of unconventional models is promoted through class awards such as the one for tailless models in League competitions.

Soaring innovations that clubs can take up in their own competition programmes are promoted through the formulation of appropriate sets of rules for classes such as 100S, hand-launch and cross country.

A major international event to BARCS rules, known as Interglide, together with the national BARCS championship, Radioglide, provide opportunities for leading pilots to test their skills in world-class company.

A biennial technical symposium, BARCSTEC, regularly receives high quality papers from leading soaring personalities to be presented to members at its meeting and subsequently published.

The Annual General Meeting is organized as a major event for members to combine business with pleasure, meet each other and sample the latest technology on offer from trading stands at its Midlands venue.

A regional and national slope Cross Country League is held each year, based on open competitions organized at club level. Clubs are encouraged to run a wide variety of event formats within a co-ordinated national programme.

The annual John Whitaker Trophy is awarded for the best cross country flight to his rules. This is just one of a special range of awards available for both solo and competition achievement in addition to the regular endowment of permanent competition trophies.

Finally, the Association believes in continuous innovation, both technically and in the form of new competition opportunities for the many disciplines within radio controlled soaring. New members are therefore within their own interest area, whatever it may be and however it may develop over the years.

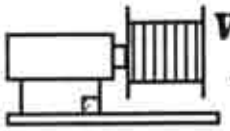
SOARER

SOARER is published quarterly. The newsletter carries advertising but is independent of any commercial interest. Its role is to inform the membership and provide an effective channel of communication on everything from recent technical developments to competition news and the calendar of events.

It is our aim to present the best material available in the United Kingdom with as much original content as possible — certainly much more and at a higher technical level than is available in bookstand magazines which include soaring as only a small part of their general coverage of radio controlled flying.

* * *

The November issue of *SOARER* has 64 pages (with cover, 68) and is similiar in size to *RCSD*. SOARER is available for £ 10.00 (ten pounds sterling) for a year's membership and 5 issues by international money order to Alan Cooper (Membership Secretary): "Hillcrest", Top Road, Hardwick Wood, Wingerworth, Chesterfield, Derbyshire S42 6RQ, England.



Winch Line ...by Gordon Jones

A look at PC-SOAR

PC-Soar is an analysis program designed to allow the user to test model sailplane designs on PC compatible computers (IBM PC, XT, AT, PS-2). The information gained from the computer allows the designer to test individual design ideas against known models with varying airfoils and design parameters. The ability of PC-Soar to compare model designs and compute model performance by observation of tabular or graphics displays provides the modeler the means to design with a great degree of success prior to construction.

PC-Soar provides two forms of evaluation: the airfoil evaluation, and the whole sailplane evaluation. Both methods provide tabular and graphics data to show the designer the performance range of airfoils and models.

The program and libraries come on three disks with an in-depth information packet that explains the installation, operation, and modification of the program. Included in these instructions is a section titled "Getting Started and Learning to Use PC-Soar". This section takes the user through the installation process with explanations of the conventions used throughout the program. It further walks the new user through some of the procedures to work the program and raise the comfort level of the user.

An on-line description is also available in the HELP section of the QPOLARS menu which adds further information for the user. Other instructions appear at the top or bottom of each screen while running PC-Soar.

Before you install PC-Soar there are a couple of pre-installation items that must be accomplished. You must have DOS set with GRAPHICS.COM to run graphics if you are going to print the various graphs or data screens for reference. In addition, you must decide whether you will install PC-Soar on a hard drive or whether you will use floppy disks. Reading and understanding the supplied instructions is also a must for proper installation and set-up.

PC-Soar users please note that DOS release 4.0 has some copy problems that will not allow you to copy the program to the hard disk. This is not the case with DOS 4.1 and is probably one of the reasons that MicroSoft came out with release 4.1 so quickly. In addition, Lee Murray is working on some upgrades to PC-Soar including screen changes and corrections. Work on these changes is coming along well and should be available soon.

Version 3.2 is the culmination of a great deal of work with many new or enhanced features from previous versions. New features include:

- Floppy and hard drives are supported appropriately
- CGA, EGA, VGA, and Hercules graphics cards are supported
- Color graphics more clearly identify overlaid plots
- Faster operation and easier option selection
- Compare models and compute performance simultaneously
- Cursor use virtually eliminates typing
- Path settings allow more flexible use with disks and drives
- DOS commands can be executed without leaving the program
- On-line helps are provided

To gain a comparative view of these new features and enhancements I sat down with an earlier version of PC-Soar and completely went through the program. The differences are like night and day! The new version is a lot more user friendly while providing a better base through the separation of data so as not to confuse the user. For those with the earlier version I strongly suggest an upgrade.

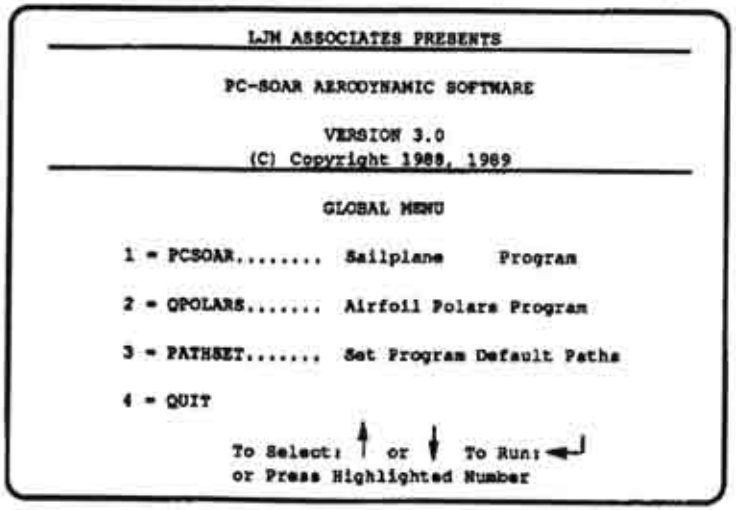
PC-Soar is divided into two entities: the program and libraries containing the sailplane and airfoil libraries. The program takes care of the administrative functions (screens and such) and the manipulation of data for the use of the library files. The library files (SP for sailplane and AF for airfoil) contain the actual data used or modified by the user for the analysis process. The AF library has several sub-directories that contain different types of airfoil data used with the models in the sailplane directory. These sub-directories include:

- \TH Theoretical polar data
- \PWT Princeton wind tunnel data by Selig/Donovan/Fraser
- \PWT2 Additional Princeton data
- \HRN High Reynolds numbers for large wing chord models
- \OWT Other wind tunnel data (Althaus)

Operation of PC-Soar is based on a menu driven system providing the user the various menus with multiple selections to accomplish the desired operation. The Global Menu contains four options that depict the two basic evaluation paths, the program path setup and a program exit. To select the desired option use the arrow keys or the number of the desired option to select that option. Press ENTER to select and display the option desired. The Global Menu is depicted below.

Working with an airfoil or sailplane is accomplished by bringing the selected airfoil/sailplane to the desktop. This convention is used throughout both evaluation paths. In the case of a comparison of sailplanes you will have to bring all of the airplanes for the comparison to the desktop, but this can be accomplished in one step with little effort. The program conventions are very straightforward and while at first they will seem a little time consuming after working with them they will make perfect sense.

The QPOLARS menu provides the user a look at the airfoil of interest in a tabular data format and a graphic representation of that data. With the create option, an airfoil can be added to the airfoil data file, providing you have the data required for entry. Most of that data for the Princeton airfoils is found in Soartech 8. Another option is to modify an existing



airfoil by using other figures for the tabular data.

SELECT - This option allows the user to select and view the airfoil data. It provides the tabular data relating to the airfoil in an easy to read format. From this option, a secondary menu allows you to view the data in graphic form or print the data.

CREATE - This option provides the means for the user to get into real trouble by creating his own airfoil. You can enter data from another source or modify an existing airfoil by copying it to a new file and making the appropriate changes. Once again, you can view your data and print it for reference.

HELP - This facility is the general help facility for the program and is worth reading for the program overview and conventions used throughout the program prior to starting. It provides tips that will speed up your interaction with the program and give you some good ideas on how to set it up best for your uses.

EXIT - Exit returns the user to the Global Menu.

The Main Menu is where the real fun begins! With this portion of the program the user can build and compare sailplanes, and look at the parameters and performance of his individual design. The comparisons can be run with known sailplanes in the database or against those that the user builds. It is all in what you want to accomplish.

ADD - This option is where you put one or more sailplanes on the desktop to compare or modify them. Remember, you have to move the sailplane to the desktop to perform any evaluation function.

CREATE - With this option you can input all the parameters of your design to use for the performance evaluation to see just how good your ideas are. Remember to SAVE your design with the SAVE option if things look good.

COMPUTE - The Compute option will be the most used by the individual designer as he attempts to find the optimum performance range for the design. This option shows the parameters in tabular and graphic form to provide the best representation of the input data. One neat little item in this option is that the CG range is computed so you don't have to figure it out yourself.

COMPARE - With this option the designer can compare his design against those in the database. There is a wide range of sailplanes in the database so finding one of similar parameters is not a problem. And if you really have a particular comparison in mind you can create that design along with your own for the evaluation.

SAVE - This function allows you to save the sailplane that you have modified or created with one of the other options. Remember, if you don't save it and leave PC-Soar it will be lost. It is just like working in a word processing program and not saving your text when you are done.

EXECUTE - The Execute option provides a window to DOS so that you can leave the program and perform a DOS function (like finding where you put a particular file). You can then return to the program without going through all the initial entrance steps.

EXIT - Exit returns the user to the Global Menu.

PC-Soar is a great tool for anyone wanting to design their own sailplane or for those who want to modify an existing sailplane with a new wing. We all love to tinker with designs or we get into discussions of "what If". This program solves the problem very nicely with a minimum of effort. It allows the user the flexibility to do things his way and see the results of his efforts. It allows for change in the parameters to satisfy individual requirements and tastes. All in all this version of PC-Soar is a must for the serious (or not so serious) designer.

PC-Soar has come a long way over the past couple of years and is an excellent tool for the modeler, whatever his interest range. This program provides the answers to a great many questions and with the tabular and graphic displays provides the best way of viewing information on a sailplane.

One note is in order: the representations of any computer program are just that, a representation. The actual sailplane may fly differently when built and in the air due to individual flying style and building accuracy. I know that the Quabeck airfoil proves out great on computer, but I don't care for them in the air. And the same is true for other flyers with other airfoils and designs. Select something that you are comfortable with and then improve it from there with a newer airfoil or what ever. And there is PC-Soar to help out with those modifications.

A Closing Note

Chuck Anderson has begun a total rebuild of his Airfoil Plot and Design programs. In working with the early version of the Plot program and basic menu structure it is a lot faster and user friendly. Also planned in the next release are some enhancements to allow the user more flexibility.

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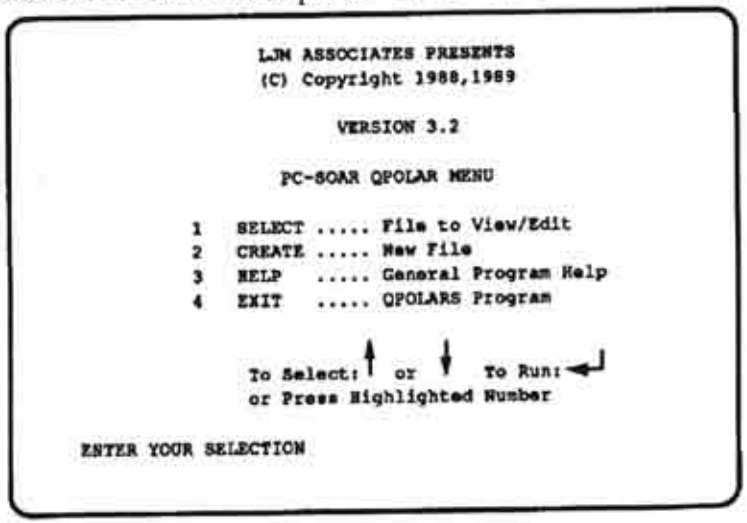


Understanding Thermal Soaring Sailplanes

Part 4 of 4 Parts
Continued

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

...by Martin Simons

Smooth and textured finishes

Some modellers believe that the type of covering material used on the wing makes a considerable difference to the performance and handling of the sailplane. The effect is thought to be similar to that of a turbulator, creating fine grained turbulence in the boundary layer, but unlike the 'trip strip', the entire wing surface is involved.

At Princeton a SD 7032 profile was tested with a plain balsa skin, which was then covered with plastic film to give the usual glossy surface, and re-tested. The outcome in performance polar terms probably requires no further comment (Figure 42). The smooth film skin shows a marginal advantage, particularly noticeable near stalling speed.

A point made by some pilots is that even though a textured finish may have no noticeable effect on the polar curve of the sailplane, or even make it a little worse, it can render the model easier to manage in the air. This is not supported by the curves of Figure 42, which actually indicate a higher stalling speed for the balsa skinned wing, but it may be correct in some cases. If a profile develops laminar separation bubbles, the bubbles tend to change size, sometimes contracting to the so-called 'short bubble' form and sometimes lengthening to extend over a third or even more of the wing chord. Such bubble separations shift to different locations on the wing at different angles of attack. This alters the pressure distribution on the wing and must have some effect on control and stability. If the slightly 'grainy' finish of a fabric covered wing acts as an ever-present turbulator, there will be a drag penalty and the polar curve will be worse. But if no separation bubbles form, improved stability and smoothness of response to control are quite likely. In such a case it may well be preferable to sacrifice some performance for the sake of better handling. A pilot who finds the sailplane easy to manage is likely to do better with it than with a theoretically superior model which requires frequent corrective actions or which stalls suddenly when a separation bubble 'bursts' at a high angle of attack. There is little doubt that apparently identical sailplanes covered with different material, do behave differently in the air. Once again, experience and experimentation are the best way to proceed.

It may also be the case that the very inaccuracies of some model wings, for instance the use of multiple spars with film or fabric covering sagging between them, has desirable effects in avoiding separation bubbles. The wind tunnel results on the 'wavy clay' version of Eppler 374, mentioned in Part 3, suggest that quite large irregularities of form can sometimes actually improve the performance of a model wing. The Eppler 374 profile was also tested by Dieter Althaus at Stuttgart, with various different finishes and structures. At the lower Reynolds numbers the least accurate type of construction showed up best.[1]

What seems to be true for one profile may not be so for another. Although any such generalisation is rather dangerous, it is probably fair to say that a reasonably accurate, smooth and polished wing will give best results at high speeds, without turbulators. Turbulators, textured coverings, and even rather wobbly construction, may have some beneficial effects with some wing profiles. This should not be used as a general excuse for inaccuracy. A bad profile may be 'repaired' by using turbulators or rough surface finishes, but there is not really much doubt that a modern profile will give better results, if it is accurately made and finished.

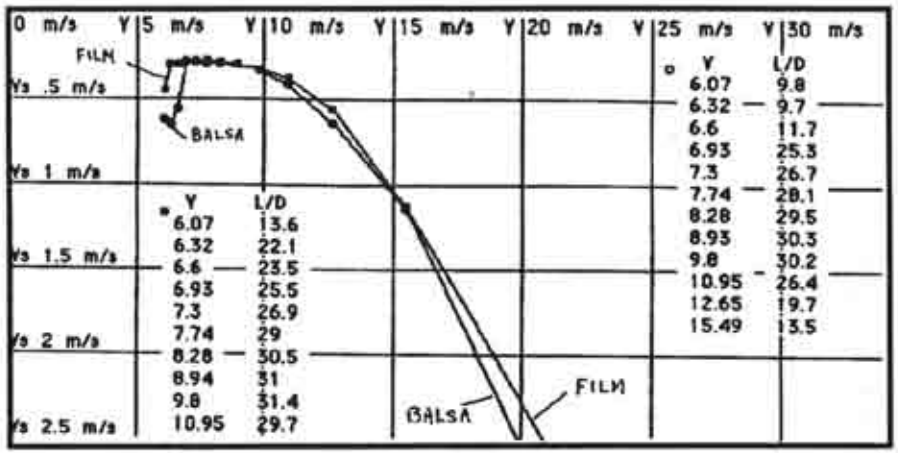


Figure 42 **Performance Polar for Wing**

	SD 7032 A Balsa Skin		SD 7032 B Film Skin	
Velocity Metres/Sec	Sink M/Sec	L/D Ratio	Sink M/Sec	L/D Ratio
21.92	3.139	6.98	2.768	7.92
15.50	1.145	13.54	1.126	13.76
12.65	0.642	19.72	0.556	22.74
10.96	0.414	26.47	0.368	29.77
9.80	0.324	30.25	0.311	31.48 MAX
8.95	0.295	30.37 MAX	0.288	31.08
8.28	0.281	29.51	0.271	30.52
7.75	0.275	28.17	0.267	29.04
7.31	0.273 MIN	26.73	0.271	26.92
6.93	0.274	25.31	0.271 MIN	25.53
6.61	0.562	11.76	0.280	23.56
6.33	0.649	9.75	0.286	22.16
6.08	0.619	9.83	0.445	13.65

Parasitic drag

As shown before (Figure 9, Part 2, *RCSD* April, 1990), parasitic drag is relatively unimportant at low speeds but increases rapidly as the airspeed rises. In a thermal there is only slight advantage in having very low parasitic drag but in searching for the thermal it makes a lot of difference. The chief aim of reducing parasitic drag is therefore to improve the high speed part of the polar.

To bring this into perspective, use has been made of the **Sailplane Design** (Version 3) computer program devised and marketed by David Fraser.[2] This program makes approximate allowances for tail and fuselage drag and uses the Princeton wind tunnel test results for the wing profile drag. A good many factors enter into calculations of parasitic drag which no program so far has been able to

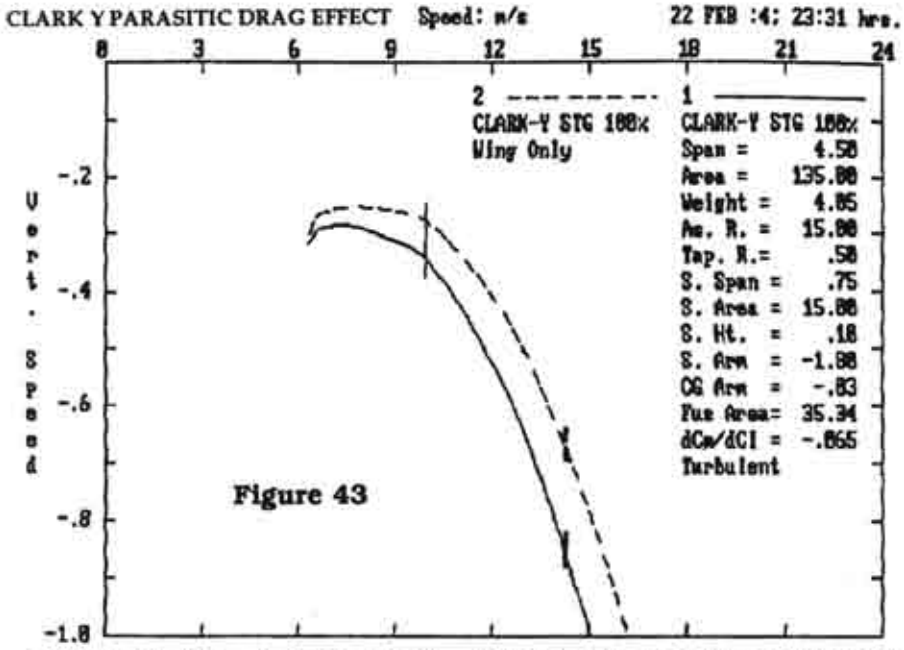


Figure 43

accommodate fully. In what follows, therefore, the various figures and charts should be taken as approximate, rather than exact. The methods of calculation differ slightly from the author's 'wing-only' program which has been used hitherto. Slightly different absolute performance figures appear.

To begin with something familiar, the upper curve on Figure 43 shows the performance of a Clark Y profile wing, of 4.5 m span and 1.35 sq metres area, according to the Fraser program. The lower curve results when an ordinary tail unit and fuselage are added to this wing.

The main relevant dimensions are shown in the table of figures on the right hand side of the diagram. The horizontal stabiliser area here is 10% of the total 1.5 sq metres, i.e., 0.15 sq m, or 11.1% of the 1.35 sq m wing area. Stabiliser span is assumed to be .75 m. and it is mounted 10 cm above the estimated position of the wing wake. The program assumes the vertical stabiliser is half the horizontal stabiliser in area. The fuselage skin area is approximated at 35.35 sq dm, the tail moment arm is 1.8 metres, the centre of gravity of the model is 3 cm aft of the wing aerodynamic centre. The last figure in the table is the stability factor, which is discussed below. The boundary layer flow over fuselage and tail is assumed to be turbulent rather than laminar.

At every point the vertical distance between the two polar curves represents the drag penalty associated with the tail unit and fuselage. The figures produced by the program show that at minimum sink trim, 89% of the total drag comes from the wing. (This is found by adding the vortex-induced drag and the profile drag of the wing.) At best L/D, the wing drag is still 82%. and at a flight speed of 15 m/s (33 mph) 78% of the total. Turning this round the other way, at low speeds about 11% of the drag is caused by tail and fuselage, at higher speeds this rises to more than 22%.

These figures apply only to one particular sailplane configuration and method of calculation but they are fairly typical. Comparable calculations with different dimensions show roughly

similar proportions. The effect of any single alteration will in practice probably be undetectable but careful attention to all possible details should produce a worthwhile improvement in total drag.

Flying wings?

We cannot, unfortunately, reduce parasitic drag to zero. The idea of the 'all wing' layout is almost as old as aviation itself. Diagrams such as Figure 43 tempt enthusiasts into supposing that a sailplane with no fuselage or tail would show savings of total drag between 10 and 30%. Unfortunately, to make a reasonably controllable aircraft without a tail, the wing itself has to be completely redesigned, usually with a reflexed profile and some sweepback, both of which reduce efficiency. It also proves practically impossible to do without vertical fins and rudders and these sometimes have to be excessively large, to provide stability in yaw. Even with the benefits of up-to-date design methods, some modern tailless full-sized sailplanes have still proved extremely difficult to fly and even dangerous. So-called 'flying wing' aircraft can be made safe and controllable but the outcome is a considerable increase in both vortex and profile drag, offsetting or more than offsetting the gains hoped for, while some parasitic drag from the enlarged vertical stabilisers remains after all.

Tail drag

A large proportion of the parasitic drag of an orthodox design, is caused by the tail unit. Normally the tail comprises a horizontal stabiliser, which incorporates the elevator control, with a vertical surface, usually a fin with a hinged rudder. (If a V tail is used, the total area of the two surfaces is about equal to the total area of the vertical and horizontal members of an ordinary tail.)

Tail surfaces are small wings and all remarks about wings can be transferred, with necessary changes of emphasis, to tail surfaces.

Tail drag, like wing drag, is a combination of vortex drag and profile drag.

[1] See D. Althaus, Profilpolaren für den Modellflug, Vol 2, published by Neckar Verlag, Stuttgart 1985.

[2] Sailplane Design is obtainable from David B. Fraser, 1335 Slayton Drive, Maple Glen, PA 19002, USA

Martin Simons
13 Loch Street
Stepney
South Australia 5069

The 1991 Southwest Regional Sailplane Championships

were held on January 19th in Casa Grande, Arizona. The photos were provided by Chuck Wehofer (Secretary/Newsletter Editor) of The Central Arizona Soaring League (C.A.S.L.).

...continued on page 30

Ridge Writer

...by Wil Byers

ASW-20 L owned by Bill Liscomb with all glass, molded wings, stab & rudder.

Speed!

Many slope enthusiasts are drawn to the need for speed and the attentions it gathers.

This is probably true because speed provides the kinetic energy a model needs to perform maneuvers, to make the model more responsive, and provides for penetration into the wind; which is survivability, in a slope soaring environment. However, even though "speed is life" it can also be death! Death, because a model traveling at 120 mph is going to arrive at the ground a great deal sooner than one travelling 30 mph. That provided of course both models started at the same height. Also, numerous aerodynamic forces are a function of velocity squared (V^2); i.e., $K=1/2(mv^2)$. Thus, forces will build rapidly as the model builds in speed. Therefore, a large stick movement at 30 mph might be fun, but at 120 mph it could be disastrous. And, a slope ship traveling across the sky at 120 mph requires a great deal of attention, to follow its movements, and keep it in sight. More than one good slope pilot has lost sight of their model during a high speed maneuver or misinterpreted what attitude the ship was in, thereby **CRASHED.** For this reason, it is desirable that you consider the speed range of your new model and purchase according to your needs. Don't buy simply for the sake of speed, alone.

Next, airfoils do make a difference. This is especially true of a slope soaring model. Once you have defined the many parameters of your particular flying needs and made your choice of a model, it is suggested you check the airfoil being used on it. Airfoils make a difference for a number of reasons. Reasons such as, "Do you want to do precision aerobatics? Fly races? Do cross country on the slope? Fly in light lift conditions? Penetrate heavy winds? Etc., etc.?" As would be imagined, placing two different airfoils on the same model will result in two entirely different handling models. This simple fact is just the point. If one wants to get the most enjoyment out of slope flying, pick the proper airfoil for that kind of flying. In other words, if one wants to do precision aerobatics, it is necessary to use a symmetrical or very nearly symmetrical airfoil. However, if it is necessary to zoom down the straits of a race course, the model will require an airfoil that has a good L/D with a low, wide drag bucket. In this area of decision making it would be advisable to purchase a book discussing airfoil theory or providing the needed data. There are many good books in this area and I suggest you ask an experienced individual for guidance in choosing one. (I will make some suggestions in future columns.)

Bill Liscomb's FOKA on the bluff at Torrey Pines.

Next, one should consider whether the radio gear you own will fit within the limited space of the new model. As you are well aware, radio equipment has changed immensely in the last few years. What we dreamed of for servo size in the past is now reality. Receivers have also shrunk in size, thereby allowing them to be installed in the smallest of fuselages.

A group of flyers at Torrey Pines that like to fly 1/4 scale high performance L/D dedicated models.

Batteries, unfortunately, still remain about the same size and, unexplainably, are still required in most models. Now, you must decide how well that equipment will fit in the fuselage, wings and, even in certain applications, in the fin or elevator. It is not uncommon to hear about a modeler who must buy a new flight pack or entire radio because their old system didn't fit into the model they just purchased. And, it is really quite common these days to hear a fellow modeler say he must buy new servos to fit into the wings of a model glider. So, equipment size is a definite consideration when studying a new design.

Besides size, one should also recognize the amount of torque that will be required to drive the control surfaces of this new ship. This means, the servos output force needs to be equal to or greater than the force that will develop by the control surfaces, of the model, in any flight regime. Any flight regime, is a very important point to make, because the model may be very controllable at low speed, with a low power servo. However, once the model starts to gain in speed, what was once a controllable flying surface may require more power than the servo has. When this condition exists, the servo may become stalled, thus drawing more electrical current, not moving the flying surface, and resulting in a model that is out of control. Worse, the control surface may build up so much force that it strips the servos gears. That would mean that even if the model were to, fortunately, slow down, it would still be uncontrollable and probably crash.

It is wise, therefore, to study all the design parameters of a model. Then, analyze whether or not your radio gear will function satisfactorily. If you are in doubt or have questions about you equipment performance, you might consider calling or writing the manufacturer. Manufacturers will be glad to provide you with any technical data they have. They may even have some modifications or updates to your equipment that will extend its performance.

Before spending all your hard earned dollars, a simple but pertinent question to ask yourself is, "Do my flying skills really match my choice of model?" If they do, great! However, if they don't, it is probably unwise to purchase that design without either building or flying assistance. The idea of taxing one's skills

with a very responsive model or difficult project, and assuming that it will help develop better skills, is not entirely well founded. That having been said, it is most likely true that, to improve your skills, one must have a model that requires a greater degree of that skill than the model they currently own. On the other hand, if one attempts to fly a model that is too responsive for them, the result could be less than satisfactory. Or, if a building project is too difficult for your building skill it could remain unfinished and you become disillusioned.

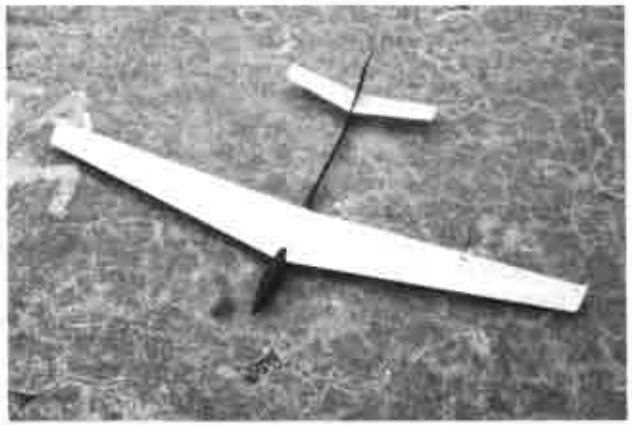
All too often a pilot will feel confident that his skill matches that of a new model, when it doesn't. They may have made an unexpected change in performance which was not readily apparent. They might have progressed from a polyhedral ship to a glass, aileron ship, with no dihedral. They would be most apt to find the model quite controllable while flying slow. But, let the model's attitude be modified by a gust, and its airspeed is likely to increase. Then, the responsiveness of control inputs will become exaggerated by an increase in the velocity of air passing by the control surfaces. This could result in the model moving at a high rate of speed and in a direction hard for the pilot to interpret. Quite possibly, with rapidly increasing pilot skill and a great deal of luck, the model may be saved. Unfortunately, many times the pilot's skill erodes due to an increase in their panic level and, of course, luck is an uncertain quantity. So, the new model kisses mother earth solidly on the lips of disaster.

If you still want to buy a "Hot Rod" slope ship, be advised you might want to seek help. It should be noted that a high performance slope ship is a whole bunch of fun to fly! Fun because they are just that, high performance. They will sense even the smallest of control input and will do exactly what they are told to do and, sometimes, even more. And, models of this type can travel well in excess of 100 mph. Therefore, the humble approach, where an inexperience pilot seeks the proficiency of one who is, is highly recommended. It will pay for itself in dollars and enjoyment one hundred times over.

John Benson's SNARK

Wally Roettinger's Pod & Boomer. C.F. over balsa with glass cloth, bagged wings & pitcherons.

Finally, how does one decide whether



John Benson's small sloper. Note the ship ailerons and full flying elevator. C.F. fuse. with glass cloth, solid balsa wings, 50 " span at 15 oz.

to scratch build or buy a kit. That is the question! This is going to be entirely up to you. Not much can be offered to you generically in this area. An extraordinary amount of fun, relaxation, and pride are in both endeavors. It will be your task to decide if your personality is the kind that is compatible with starting from nothing and arriving at a finished product, if you choose building from scratch. Or, whether your personality is the kind that likes the anticipation of waiting for a new kit to arrive on the doorstep. Also, determine if your enjoyment comes from looking through the parts of a new kit, or from getting a gallon of your favorite epoxy resin. One must, too, decide things like whether they want to build this new creation without a set of instructions. Because, building a model from scratch will require the special ability to think through the process, without the aid of instructions. These are just a few of the pertinent questions that will help you decide if you should scratch or kit build you next slope soarer.

The anticipation of that first flight and, somewhat less, all the other flights to follow, is probably what attracts many of us to a new building project. Whatever quality it is that brings us to a new project, we should most certainly pick the right model for our particular needs. Thus, we will most likely find additional satisfaction in it. Also, we may be more likely to encourage other people to participate in it with us.

Slope Scene

A letter arrived this month from John Benson. John informs me that he, and a group of flyers from Newport, RI, enjoy slope soaring very much. He goes on to tell us how his slopes are not very big but they produce some good lift because of "the laminar air that flows over them from the open ocean." John adds, "In the summer we're lucky enough to have a whopping, one hundred footer that faces directly into the prevailing southerly winds." He also makes a very accurate observation about lift generation. He says, "Unlike large slopes, where the lift is nearly straight up, smaller hills produce flatter lift and restricted lift corridors." This is the same as saying that the lift has a greater horizontal component to it.

Additionally, John tells us that their models have evolved into models with slim fuselages and incorporate thin airfoil sections. He says they like the pitcheron designs such as that designed by Ken Stuhr and indicates they have designed adaptations for their particular needs. Also, they are strengthening these models for survivability with carbon fiber tow and West systems epoxy. Lastly, John guarantees us "honest injun" a five

foot levee can be sloped in the right conditions.

John's address is 29 Tames Street, Newport, RI 02480; Ph# 401-846-0566. I am sure he would enjoy hearing from anyone interest in joining him for some slope flying.

Another fellow sloper wrote to inform us there is a club whose roots are in slope soaring. That person is Bill Liscomb of Carlsbad, CA. Bill is a long time slope soaring buff and is now the acting president of the Torrey Pines Gulls. The club is a very active one and, as many of you are probably already aware, they organized and hosted the Torrey Pines Scale Fun Fly in 1990. Their membership is currently about 190. Interestingly, the club is now 30 years old. It is currently the oldest sailplane model club in the U. S. This means slope soaring has been a part of R/C soaring for a long time.

As would be expected one of their primary flying sites is Torrey Pines bluff. Further, Bill tells me they have some very good thermal soaring sites. But, when the wind is blowing on a weekend day, they usually have about a dozen or more soaring pilots out to fly slope. If you are interested in joining in the fun I'm sure you would be a welcome addition. Bill Liscomb can be reached for further information at: 7034 Fern Place, Carlsbad, CA 92009; (619) 931-1438.

Hoping for Wind, Wil Byers
RT. 4 Box 9544
W. Richland, WA 99352
(509) 627-5224 (7:00 PM - 10:00 PM weekdays, after 9:00 AM weekends)

Southwest Regional

The photo on page 25 shows Saturday's winners (E. Holder, J. Mangino, I. Douglas, S. George, J. McCarthy). The group photo is, of course, of the fliers. The Grand Champions were J. Mangino (1ST), S. George (2nd), and I. Douglas (3rd). Congratulations to all.

The following extract was from their newsletter which accompanied the photos.

"One thing that was a surprise to me was the number of people who did not know what a Triathlon was all about. This is one where the scoring is set up to make you think while you are flying. For a 10 minute max you can get 600 points plus a possible 200 precision points for landing on an even minute plus 200 landing points. It becomes really interesting when you have to evaluate continuously whether to go for a max time or land, but on an even minute. A 9 minute flight is definitely a killer. Also, the trade off between landing points and precision points can make it really ticklish when you are on approach but going over time. Ed Holder won the day on Saturday with nearly perfect flights and awesome landings. The contest was a huge success because of all the people that were there and they were from all over the southwest region: California, Nevada, Arizona, Colorado and New Mexico." Vern Poehls, President & CD

Diary of a ... Slope Soarer

by Bob Welwood

Wednesday.

It's two in the afternoon and I can't concentrate on my work. Another look out the window. Judging from the wind speed and direction of that flag, flying conditions are perfect right now. Too bad, I think. After all, I just finished installing the radio and balancing the new plane last night. No time to get to the slope after work tonight. Hmmmm, I wonder if there's maybe an urgent business appointment I've forgotten about?... I'll dash home, grab the plane, and get to the ridge while this breeze is still pumping lift! No, no can do. Besides, the nicads are not charged. I'll have to wait for the weekend. Weather forecast is looking good so far. Better get back to work now...

Friday.

Weekend has arrived and even the weather is still promising... must get home promptly, get the grass cut, car washed, and grocery shopping done tonight. Don't forget to charge the nicads... load up the plane, call the flyin' buds to meet at our regular place. Jeez, I'm sure my new glider is going to fly great... the hair on the back of my neck stands up just thinking about it.

Finally, all weekend chores are completed. Alarm's set, car's even gassed up. The guys will be impressed by the paint job and trick SD airfoil. Not too bad, I think, even for an old hacker like me.

Saturday.

Rats! Everything is all set except... No Wind. High pressure snuck in overnight. But excellent conditions during the week were, after all, a bad omen. Not much else left to do but volunteer my services for an afternoon of shopping centre prowling, and maybe dinner out tonight. I sure hope things improve tomorrow...

Sunday.

Life is wonderful. Morning conditions are clear with a 15 mile blow from the South. Just so happens that's right for the big-lift slope an hour from home. Thank you. Thank you. Only enough time for a quick cup of coffee and then get busy loading up the plane ... One last check to make sure everything's here - radio, tools and glue, wing bolts, check, check.. check! Time to go.

Traffic is light. As I reach the highway, I semi-consciously run through the assembly and launch steps for the new

ship. First... I'll head her out about 25 yards then swing to the right and follow the ridge along for oh, say about 60 or so... then a nice gentle left aileron bank, a jab of up elevator into the wind and she'll cruise back across the slope so I can check out those lines as she slips by. Yessiree, everything's going well and it flies just as I expected. All those hours in the shop have paid off...

Whoa, better stop dreaming now and watch the speedometer. Why is it taking so long to get there?

At last... here I am.

At the Slope.

No one else has arrived yet. No time to waste, get that new airplane together. Who knows how long this wind will blow? Final inspection - everything looks good, check control throws.. up, down, left, right, yup everything's alright. Range check, OK.

Nothing left to do now except fly it. Walk over to the edge and hold her into the wind. Feel that air blast in the ears, a sure sign of good lift. She seems to want to fly. Wiggle the sticks one more time. Servos buzz. Take a deep breath ... Cowabungaaa - and out she goes. Get your hands back on the sticks fast!

To my relief, she tacks straight out and begins to rise, as if being pulled by an invisible wire. Ok, Ok, lets follow the plan now .. gentle right turn and I feel my thumb nudge the stick while watching for a response. Exactly on cue, the right wing drops and the nose swings over. Nice. She's now sinking slightly and starting to pick up speed. Just what I need, I reassure myself.. plenty of airspeed for the next turn. Time to bring her back now, and instinctively my thumb eases the aileron stick in the opposite direction.

So far, no surprises ... she's flying obediently although a little more quickly and sensitive than I'd imagined. A subdued moan tells me that there's plenty of airspeed as the glider slices by only 10 feet from where I'm standing. Now need to get a little more altitude to play with, so I ease back on the elevator trim a touch. Sure enough, excess velocity is traded off for altitude. A moment for maybe a little self-congratulation. Just where are those other guys, the lift is great this morning. Oh yes, it's early yet.

A few more passes, gaining more height with each one. Nerves have settled down now, its time for some adventure. I make a major mental note... "Should put in at least a half hour flight before attempting to land." That way, in case I screw things up....

I bump the elevator trim ahead a couple of notches, push the stick slightly forward for good measure and, on command, she's flyin' pretty slick again. Here goes a pylon turn... one, two, and I bang in left aileron with back stick. Wow, she rotated around the wing great! I'm delighted. Level out, bleed off the speed and settle the nerves once again. Make another mental note "The elevator is responsive, maybe bordering on touchy". Try to fly smoothly.

Next thing to do is check out the stall characteristics. I mean, under controlled conditions. Head her straight out into the wind and pull back on the stick... up, up and suddenly a wing drops and she's racing for the ground. Don't panic yet, but I'm super-aware of the up-elevator now being applied. She responds and I smile slightly. I make yet another mental note... "This plane seems to accelerate very rapidly in a dive." But don't they all? So much for the stall test, and I pull an inside loop almost without thinking. Yea, I've seen better too, but give me some time.

I'm starting to feel like I've got this little puppy mastered now, so it's only natural that the maniac, who is inside all of us, begins to surface. He starts asking me outrageous questions.... "Why not see how far those wings will bend? What about a high speed inverted pass? Or maybe do a reversal right into an outside loop, followed by a roll. Top Gun stuff. All the good fliers do this, you know."

Fortunately, Mr. Conservative steps in once again to remind me that this is a new airplane, the product of many shop hours, and there's plenty of time to get crazy. Stick to the plan. Anyway, it's now time to start thinking about landing this thing.

All at once, my mind plays back in slow motion, every fouled-up landing I've made on this slope. And there were many. Hurry up and turn that VCR off....

Lets see, if memory serves...the good book on Slope Soaring suggests a series of passes, closer and closer to where you'd like to land until - voila, it sets down exactly where and how you wanted. Piece of cake! That sounded so simple when I read it. Gee, that wire fence behind me somehow seems bigger and closer than I remembered.

Maybe just five minutes more flying before I land it. Sure. Plenty of time yet. Why did I drink that coffee this morning?

Reluctantly, I draw another deep breath, grip the box a little tighter, and start the landing approach. There's maybe a million things to remember all at once... keep up the airspeed, get the nose into the wind, keep the wings level, watch it, watch it, stay away from that fence and the rock pile. What the—?! Why did it do that? Yikes! Time to panic... a painful wingtip-nose-wingtip-tail maneuver... almost like I always practice it that way... as the glider crunches in. Awwww Sheeeez, another lousy landing!

A quick look around. Good, no one saw that. What went wrong? Seems to confirm my hypothesis that a certain number of aircraft must be sacrificed in order to master slope landing technique. I wonder just how close I really am to that magic number.

I walk over to survey the damage. The closer I get, the worse it looks. That perfectly aligned stab and rudder are busted up pretty bad. Wing is not serious, nose is punched in, paint is rashed, radio still works. Hey, I've had worse. So who cares about the Concours paint job, this is a SLOPE airplane!

All of a sudden, the repair plan kicks in... a little epoxy and masking tape here, realign the tail the next night, a little of this and a little fibreglass there, hey this'll be fixed by Wednesday.

I get the wreckage loaded up and start heading back home. Better think of a good line to offer the wife when she sees this mess... perhaps without using my Homer Simpson impression this time.

I'm driving home while replaying the flight in my mental VCR, and naturally, there goes that darn landing tape again. Never mind the landing, didn't it track good? And those pylon turns were sooo nice....

Monday, Tuesday.

Repair plan being executed to schedule. Hey, this airplane really looks like a sloper now. No more perfect glassy paint job to distract me while bombing around the ridge! Time to check the weather forecast for this weekend...

Bob Welwood
14615 21 Street
Edmonton, Alberta
Canada T5Y 1V8

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 at 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

SOARTECH 8 Airfoils at Low Speeds, 398 pages, testing model sailplane airfoils in a wind tunnel at Princeton University, U.S.A. Contains documentation of the facility and quality of the data, and results of the tests on over 60 wind tunnel models. By Michael Selig, John Donovan, David Fraser. Published and available through Herk Stokely, 1504 North Horseshoe Circle, Virginia Beach, Virginia, 23451 U.S.A. (Could one of you drop us a line on the costs, Herk? Are SOARTECH 1 - 7 available?)

BBS

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 - Would someone drop us a line, please?

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

Europe, Asia, Pacific Rim - Love to hear from you.

This is our first cut at identifying the special interest groups that exist, today. We receive letters asking questions that we can't answer such as, "I've just moved to the East Coast. Can you direct me to local flying sites?" or "What clubs are in my area?" or "I'm new to the hobby. Who can I talk to?" or "I'm just passing through the area. Are there any contests scheduled?" That's what this list is all about. If you find yourself or special interest group missing, please let us know.

Definitions

ARF Almost Ready to Fly
R-T-F Ready to Fly
SMTS Sportsman Multi-Task Soaring Event

Several of you asked what these terms meant. We'll try to put some of the more common ones in the following issues. If the list becomes too large, we'll provide it separate from each monthly issue. Your questions on the FAI will take awhile.

...by Curt Nehring
500 S. Main #650
South Tower
Orange, CA 92668

F3B/USA

The Newsletter for the **Multi-Task Soaring Enthusiast**

Subscriptions: $12 / Year / Six Issues

Write: F3B/USA
Byron Blakeslee
3134 Winnebago Drive
Sedalia, CO 80135
(303) 688-9572

You are invited to join the
NATIONAL SOARING SOCIETY

- OFFICIAL AMA SOARING "SPECIAL INTEREST GROUP"
- YEARLY NSS "SOAR-IN" TOURNAMENTS
- NATION WIDE "EXCELLENCE AWARDS PROGRAM"
- EXCELLENT BI-MONTHLY NEWSLETTER
- NSS FULLY SUPPORTS THE F3B SOARING TEAM & LSF SOARING PROGRAM
- NSS IS INVOLVED IN THE ORGANIZATION AND OVERSEEING OF THE SOARING PORTION OF AMA NATS (INCLUDING AWARDS BANQUET)
- YEARLY DUES ARE $12 (SPECIAL FAMILY RATES)
- NSS OFFICERS ARE FROM ALL 11 DISTRICTS

For Information, Contact:
NSS Secretary/Treasurer
Robert Massmann
282 Jodie Lane
Wilmington, OH 45177

LSF

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

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

League of Silent Flight
P.O. Box 517 • Winfield, Illinois 60190

F3H INTERNATIONAL

Newsletter on Cross Country (X/C) Flying

Myles Moran, 10428 Oso Ave., Chatsworth, California 91311 U.S.A.; (818) 882-4687

(The first newsletter on X/C Flying, "worldwide (?)", arrived recently. It contains 4 8 1/2 X 11 pages. Myles hopes to publish the newsletter 3 - 4 times a year. He is looking for interested parties to contact him.)

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

Schedule of Special Events

Date	Event	Location	Contact
May 18	2 Meter & Unlimited	Biddeford, ME	K. Baker (207) 865-3079
May 18	Duration 2M & Open	San Antonio, TX	Tom Meeks (512) 590-3139
May 18	Hand Launch	Mollala River State Park, OR	T. Erickson (503) 246-1501
May 18-19	Standard & Unlimited	Asheville, NC	J. Vennerholm (704) 765-4213
May 18-19	Cross Country	Burlington, NC	D. Barry (919) 229-5234
May 18-19	X-Country	Calif. Valley, CA	M. Hadley (805) 972-5147
May 19	Hand Launch	Dallas, TX	Gordon Jones (214) 840-8116
May 19	Unlimited Thermal	Ellicot, CO	B. Welsh (719) 495-3572
May 24-26	Slope Race Mid Columbia Cup	Richland, WA	Wil Byers (509) 627-5224
May 24-26	2 Meter & Unlimited - Rabble Rally	Ocala, FL	T. Beckman (305) 252-0014
May 25-26	Thermal	Nunica, MI	Cal Posthuma (616) 677-5718
May 25-27	RadioGlide '91 International F3J	Oxford England	Graham Foster (USA - Call RCSD)
May 25-26	2 Meter & Unlimited	Spokane, WA	B. Weirauch (509) 489-2944
June 1-2	International Slope Race	Davenport, CA	Rich Beardsley (805) 934-3191
June 1-2	MI Soaring League #1 - LSF Regional	Fort Wayne, IN	Bob Steele (219) 485-1145
June 1-2	X-Country Classic - Sugarloaf	Dickerson, MD	Steve Sober (301) 949-9007
June 2	Hand Launch 8TH Annual	Riverside, CA (Call after 6:00)	Ian Douglas (714) 621-2522
June 8	Thermal	Maple City, MI	Troy Lawicki (616) 276-9696
June 8-9	Unlimited	Little Rock, AR	R. Cartwright (501) 568-2905
June 8-9	1991 AMA National Ralley (Wright Patterson Air Force Base)	Dayton, OH	
June 8-9	Western Soaring Championships (209) 878-3462 Day 878-3078 Eve	Farmington, CA	A. Stonner
June 8-9	Invitational X-Country Great Race XV	Oswego, IL	Lee Sheets (708) 748-8934
June 9	Summer Sailplane Classic	Tustin, MI	Mike Stump (616) 775-7445
June 9	Triathalon	Dallas, TX	Gordon Jones (214) 840-8116

June 15	Duration 2M & Open	San Antonio, TX	Tom Meeks (512) 590-3139
June 15-16	SlopeGlide '91 F3F, Scale, X/C	Rivington Pike England	Tom Speakman (USA - Call RCSD)
June 16	Hand Launch	Dallas, TX	Gordon Jones (214) 840-8116
June 22-23	NSS Soar-In 2 Meter & Unlimited	Madison, WI	A. Scidmore (608) 271-5500
June 22-23	2 Meter & Unlimited	Gainesville, FL	E. Wilding (904) 375-0918
June 23	2 Meter Unlimited	Novato, CA	M. Clancy (415) 897-2914
June 29	MASS Nationals Soaring Warm-Up	Memphis, TN	Tony DiGirolamo (901) 756-5528
June 29	Thermal	Dayton, OH	Ken Allen (513) 236-6849
June 30	Open Man-on-Man	Dayton, OH	Jerry Shape (513) 843-5085
July 6-7	Unlimited Thermal	Seattle, WA	W. Volhard (206) 774-8840
July 13	Slope Race	L.A. Area, CA	Rich Beardsley (805) 934-3191
July 13-21	AMA NATS	Vincennes, IN	Gil Gauger
July 14	Handlaunch	Dallas, TX	Gordon Jones (214) 840-8116
July 14	10 Minute Precision	Houston, TX	Julian Tamez (703) 540-3944
July 20	ARE Brown Memorial	San Antonio, TX	Tom Meeks (512) 590-3139
July 27-28	Western MI Sailplane Championships	Nunica, MI	Cal Posthuma (616) 677-5718
July 28	Hand Launch Man-on-Man	Dayton, OH	Ken Allen (513) 236-6849
Aug. 3-4	Dual Soar-In	Grand Ledge, MI	Larry Storie (517) 626-2290
Aug. 10	Thermal Festival	Maple City, MI	Jim Johnston
Aug. 10	Slope Race	Davenport, CA	Rich Beardsley (805) 934-3191
Aug. 10-11	Unlimited Thermal	Seattle, WA	S. Pugh (206) 874-2429
Aug. 10-11	2 Meter & Unlimited	Lakeland, FL	F. Strommer (813) 938-6520
Aug. 11	Multi-Task	Dallas, TX	Gordon Jones (214) 840-8116
Aug. 17	Canyon Lake Thermal	Austin, TX	Tom Meeks (512) 590-3139
Aug. 17-18	OHIO Cup Man-on-Man	Dayton, OH	K. Davidson (513) 864-1774
Aug. 18	Canyon Lake Slope	Austin, TX	Tom Meeks (512) 590-3139

Toledo Model Show

...by Mike Stump

The 37th annual WEAK SIGNALS model show was held at the Toledo Sports Arena April 5-7.

This show deals with all types of model aircraft, cars, and boats with most major manufacturers and distributors and some retailers represented. Toledo also is a showcase for many cottage industries and small manufacturers associated with the hobby industry.

The Toledo show this year had just a few new kits to offer. The real excitement came in some new building and construction systems which allow most of us to take easy advantage of new materials and construction techniques while removing some of the mystery that surrounds them. the following is a description of many of the offerings I was able to gather information about although it certainly is just a rough outline of what is becoming available.

Dynaflite B.O.T. (top) and Electric APOGEE (available in the fall).

Dave Corven of Acme Aircraft shows 3 meter INFINITY.

J&M GLASSCRAFT A4 mini-sloper and SONGBIRD 100" with Dynaflite planes in background.

ACME AIRCRAFT

Dave Corven brought this business to Toledo for the first time introducing 2 kits. The INFINITY is a 3 meter span multi-task sailplane with a 960 sq. inch wing. The INFINITY can be built with a conventional or T-tailed fuselage weighing 75-85 ounces complete. The RENEGADE is a 2 meter

Kyosho SOARUS

(L - R) LSF President Bob Steele, Bob's wife, and NSS Sec./Tres. Bob Massman at combined LSF - NSS booth.

Hobby Lobby booth with ET 2000 and VHV on display. Elektro-Jr. and Chip kits also on display.

version of the INFINITY. I wasn't able to pick up a three view or printed info. on the RENEGADE, so have no detail on finished weight or wing area. Both kits are available with either fiberglass or kevlar fuselage. ACME also offers a variety of fuselages in your favorite European shape; large diameter carbon fiber, aluminum, titanium, and steel wing rod sets; arrowshaft hinge kits; T-tail pivots and elevator bellcranks; epoxy, sheeting materials, cloth and a variety of parts and services. Contact Dave at ACME AIRCRAFT INC. 61501 N. Ridge Tr., Romeo, Mi. 48605; 313-656-1879.

AIRTRONICS

I had a chance to talk with both Jack Albrecht and Tim Renaud on separate occasions about the INFINITY Radio Systems. As you've probably read elsewhere, the 600 will be a slimmed down budget version of the VISION. From my conversations and the information I was able to pick up, the 600 will only offer 1 flap output on the receiver and only 2 flight mode presets (launch & thermal). The 600 is a great value for the features offered. The radio is in production right now and should be available by June. The 1000 should be available by late fall, so don't count on the new ultra-super

radio until then. Lots of features with a hefty price tag, to boot. The VISION stays solidly in the line as the flagship sailplane radio with all the features we will ever need and some their competitors still don't have.

The LEGEND was the only sailplane on display and is now readily available through most outlets. Also, at the AIRTRONICS booth was information on some new high-torque servos that are now available (The PRO-SERIES). Originally intended for RC cars these servos should be able to handle any heavy duty load. All 3 servos come in standard size cases. The 94151 weighs 1.9 oz. and has 75 in/oz. of torque, 94152 weighs 2.4 oz. with 105 in/oz., and the 94161 weighs 2.5 oz. with 135 oz/in. Lots of power in a standard package.

Bob Sealy (Quality Fiberglass) with new PULSE 2 meter.

AEROSPACE COMPOSITE PRODUCTS

Owned by George and Barbara Sparr, Aerospace Composite Products offers a complete line of modern building materials: a wide variety of glass, kevlar, and graphite fabrics in a variety of weights. All types of laminated materials for bulkheads, trays, etc. All of their pre-preg CF laminates are now water cut for very precise widths and the smoothest edges I've ever seen on a CF sheet. Also available from ACP is EZ LAM Epoxy, The KEV-CORD for push-pull control systems, and a no fray CF tape carried in a tissue that dissolves when wetted with resin.

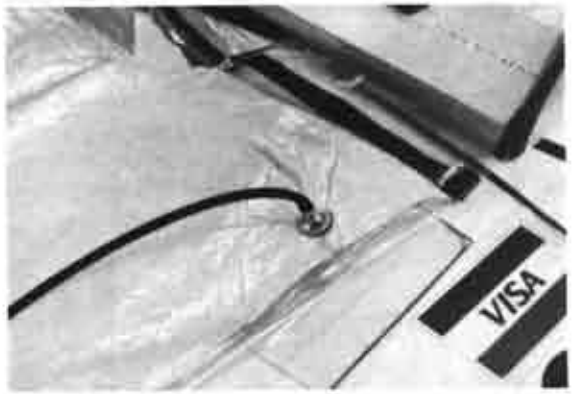
Bob Sealy with DIXIE H.L.. LASER in background.

Two special items of interest were on display at the ACP booth. The EZ VAC kit uses a small continuous duty pump that is set to pull 7 in. HG. This pump is accompanied by everything needed to complete your own vacuum system. A unique part of this system is the EZ VALVE which is installed through the bag eliminating the need to seal a tube at the bag's end seal. This valve can be purchased separately and should become a part of every bagging system. At under $80.00 shipping included, this is a very affordable system. Contact ACP at P.O. Box 16621, Irvine Ca. 92714; 714-250-1107.

Another item was shown in the ACP booth by Roger Chastain. The Tekoa "FEATHER CUT" hot wire foam cutter drew a large group at every one of Roger's cutting demos. This foam cutter is a hands-off hot wire cutter that can be set up on most any flat surface. It uses a calibrated swing arm so, by setting the pull-wires (these also double as power leads to the cutting wire) to the same percentage of taper on a tapered panel, a clean cut is made entering the leading edge and exiting the trailing edge evenly. I know of several people including designers and kit manufacturers that were impressed enough to invest in the FEATHER CUT. According to the manufacturer, this unit has been selected (endorsed?) by the 1991 U.S.A. F3B Team. For more information on the FEATHER CUT, contact Tekoa, The Center of Design, 3219 Canyon Lake Dr., Hollywood, Ca. 90068; 213-469-5584. Watch for a review of this unit and the EZ VAC in a future issue.

COMPOSITE STRUCTURES TECHNOLOGY

Matt and Gail Gewain brought their complete bag of tricks to Toledo. These folks (by my memory) have been dealing with Rohacell for as long as any company in this business. They offer Rohacell in 3 different densities and in a variety of sizes. Also, from CST, comes a complete line of glass, kevlar, and CF fabrics. A variety of epoxy is available featuring the West System, mold release and various laminating accessories.



Aerospace Composite Products EZ Valve installed in bag for use.

Composite Aircraft Engineering Sucker Kit. Simple, reliable vacuum kit.

CST also offers a complete line of vacuum bagging systems and accessories. The Mighty Mini-Vac (see IMS review *RCSD*, March '91) is a perfect starter kit. CST also offers the Professional Vacuum Bagging System with an industrial grade pump complete with regulator, gauge, and relief valve. This industrial grade unit can pull up to 24 in. HG so a regulating system is recommended when using white foam.

Of interest to view at the CST booth were 2 cores, one laminated with glass, the other with unidirectional CF cloth. Both samples were smooth and very ding resistant. Also on hand was a spar section built around Rohacell with CF caps and

wrapped with glass cloth which was easily as tough as any reinforced wood spar I've seen and much lighter. Contact CST at P.O. Box 4615, Lancaster, Ca. 93539; 805-723-3783.

COMPOSITE AIRCRAFT ENGINEERING

Noel Rossow of CAE offers a practical, easy to use, low priced vacuum bagging kit with the Sucker Kit. The Sucker Kit uses a hand operated vacuum pump and clamps to maintain the vacuum within the system. Although not quite as convenient as the low cost electric system, this is the lowest priced vacuum kit on the market. The CAE line includes 2 weights of glass fabric, arrow shaft hinge kits, white birch and African mahogany veneer sheeting, CF tow, and a variety of bagging accessories. Also offered is a video tape showing the step-by-step vacuum bagging process. Contact Noel at Composite Aircraft Engineering and Supply, P.O. Box 866, Lapeer, Mi. 48446; 313-664-3330.

Gail Gewain writes another order for their mini-vac vacuum kit. In foreground is cut-away of CF covered wing section laying on sample of uni-directional CF cloth. Mini-Vac kit in background.

DYNAFLITE

At this year's show the Dynaflite booth featured a blend of all kinds of aircraft. Featured sailplanes were the Bird of Time and an aileron/electric version of the Apogee Sailplane which was introduced last year. This electric Apogee was very sharp and will be available to the public in the fall. Dynaflite, of course, carries an extensive line of kits from gliders, electrics, and light weight power designs that could probably serve as PSS sailplanes.

Roger Chastain (R) demonstrates "Feather Cut" hot wire foam cutter for Warren Tihart. Power supply (right foreground) will be available in June or July.

HOBBY LOBBY

Over the past couple years we've all watched Hobby Lobby become a major source of electric goodies from overseas. This trend continues as they had their ET 2000 and UHU on display as well as the Chip and Elektro-Jr kits on hand. The Hobby Lobby booth was full of great electric accessories. The widest variety of

View of swing arm and linkage of "Feather Cut". Weights on bow arms are adjustable for top and bottom cuts.

Dave Ellis prototype unlimited DUCK was 3rd in static display. Standard DUCK of Pat Sullivan placed 2nd. First time in the history of the Toledo show that one design family has dominated any class of static competition. (Troy Lawicki's 2 meter DUCK won Sailplane Static contest.)

Pat Flynn's ASTRO MAGGIE. Latest version with Eppler 374 will be Pat's XC Race plane for '91.

folding props, motors, and associated items was on hand to view and purchase. This booth stayed crowded through the whole show which made it difficult to dissect everything they had available to the electric flier.

GREAT PLANES/TOP FLITE

Now part of the same large distribution network, Great Planes and Top Flite had separate booths located near each other in the arena. Great Planes moves into 91 continuing to offer the SPIRIT as their only glider kit and the electric version called the SPECTRA. Both models fly well and are extremely easy to build for the entry level to intermediate flier. Also in the Great Planes booth was the SOARUS electric glider. This Kyosho ARF is built to compete with the UHU and looks as if it could do well in the hands of an

intermediate or better pilot.

In the Top Flite booth most of the attention seemed to be geared toward Monokote. 5 new pearl colors are being introduced as well as Cub Yellow. In a conversation with some of the Top Flite personnel on hand there is a rumor of a teal covering on the way, as well. The new pearl colors are white, blue, red, wine, and yellow. With the teal and pearls in the line, if you've been waiting to make a fashion statement with your latest creation, you can do it now with Monokote.

QUALITY FIBERGLASS

Bob Sealy has been supplying kits and accessories to the soaring community for enough time to become fairly well known throughout the country. Bob brought 2 new kits to Toledo this year. The new 2 meter kit is called the PULSE. As the name suggests, this is a smaller version of Bob's standard class PULSAR. The Pulse features an epoxy/glass fuselage, S-3021 foam core balsa sheeted wing which can be built with ailerons or in a polyhedral version. You can choose from flaps or spoilers for glide path control. The fuselage has a slip off nose cone and is 45 inches long. Flying weight is 42-45 oz. for a 9-10 oz. per sq. ft. wing loading.

The other new kit on display was the DIXIE HL. This hand launch glider uses an all wood fuselage with a T-tail. It has a foam core wing sheeted with 1/32" balsa. The main panel airfoil is the SD-7032 with the tip panel airfoil the SD 7037. Projected flying weight for the DIXIE HL is 15-16 oz. for a 6 oz. per sq. ft. wing loading. Another new kit in the Quality Fiberglass stable is the Catalina XC. This 148 inch wing span XC plane can be ordered with your choice of S-3021, SD-6060, or SD-7032 airfoils. The minimum flying weight is 7 1/2 lbs. for thermal work and the Catalina can be ballasted up to 11 lbs. Slope planes from Quality Fiberglass include the ME 163 KOMET and the JAVELIN flying wing. Bob also makes at least a dozen different fuselage styles available as well as foam cores for wings and stabs. Contact Bob Sealy at Quality Fiberglass, 1941 N. Dixie Ave., Cookeville, Tenn. 38501; 615-526-4770. Watch for a review of the Dixie, soon.

ROBBE

The Robbe booth was dominated this year by helicopters. The one sailplane on display, however, was an impressive model. The SAPHIR has a 2.8 meter wingspan and comes with pre-sheeted Siros wings and a Plura fuselage. With no less than 20 glider kits in the Robbe line, this import company certainly has something for almost any glider pilot. Some great, large (3-4 meter span), scale subjects are available, as well as flying wings and entry level kits and ARFs. A look through the Robbe catalog also shows a very complete selection of electrics and accessories. Other points of interest are the top line radios that Robbe/Futaba have available for the European market.

SIG

At the sig booth the RISER 100 and NINJA slope plane were both on display. The NINJA seems to be gaining popularity as a sport slope plane all over the country. Both the RISER and the RISER 100 are popular entry level type kits at a good price point that offer excellent all around performance. Also in the Sig booth was a sailplane with ailerons, a V-tail, and what I would guess to be about a 60 inch wing span. It has no name as yet but may be available as a kit this fall. Our picture of this particular plane wasn't up to publication quality so you'll have to take my word that it looked fun.

LSF & NSS

The LSF/NSS booth was manned over the weekend by LSF President Bob Steele and NSS Sec./Treas. Bob Massman and their families. A lot of Midwest contest information was exchanged. A petition to AMA to allow the flying of a Sportsman Multi-Task Soaring event was there to be signed. It generated a good number of signatures that will accompany the letters of support for this move that have been sent to or forwarded to AMA. It looks as if the NSS, as an organization, may be headed back on the road to recovery as the voice of RC Soaring enthusiasts. It was officially announced at Toledo that Sportsman Multi-Task Soaring and Cross Country will be flown as provisional events in Vincennes. Registration will be through the contest directors for these events and not through AMA. More information will be available in future issues.

• • •

The WEAK SIGNALS announced that this is the last year this show would be held at the Toledo Sports Arena. The '92 show will be held across the Maumee River in the SeaGate Center in the first weekend of April.

Mike Stump
607 Washington
Cadillac, MI 49601

NEW PRODUCTS

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

Ni-Cad Voltage Monitor & Ni-Cad Cycler & Discharge Modules

...from Martin Stern, a Distributor for Astrodata

ESV on-board PEAK ESV, ESV on-board AVERAGING ESV, Flight Box ESV, Cycler, and Special Orders. For more information and a more in-depth description, contact Martin Stern, 1235 Wildwood Ave., #116, Sunnyvale, CA 94089-2709; (408) 730-2182.

Multi-Colored T-Shirts & Sweat Shirts

...from Jennings Products

Jennings Products is pleased to introduce 13 new shirts designed especially for the model aviation enthusiast. Our shirts are heavy duty brand names. The designs are well executed in a wide variety of scenes. Most scenes have five or more colors and are completely washable. Each shirt is constructed of 50% cotton and 50% polyester for comfortable wear and easy care. Retail prices are $12.50 for T-shirts and $22.50 for sweat shirts (Includes S&H). Available in white with multi-colored scenes. Sizes M, L and XL. Jennings Products is a small company operated by an active modeler. For more information, contact Jim Jennings, Jennings Products, P.O. Box 1121, Hendersonville, Tennessee 37075; (615) 824-0475, (615) 824-5150 (FAX).

106 - Glider

107 - Electric

"FEATHER CUT" Hot-Wire - Foam Wingmachine

...from Tekoa: The Center for Design

The "FEATHER CUT" Wingmachine is a precision machine designed to cut perfect foam wings, stabs and fins every time. It features a single hot wire to eliminate surface ripple and trailing edge "burn-out" which is common in the "two-wire" systems already on the market.

Flyers are turning to balsa sheeted or composite bagged foam wings in increasing numbers to replace the inefficient stick and rib wings found in most model kits. However, the success of an aerodynamically correct foam wing lies in the accuracy of the core.

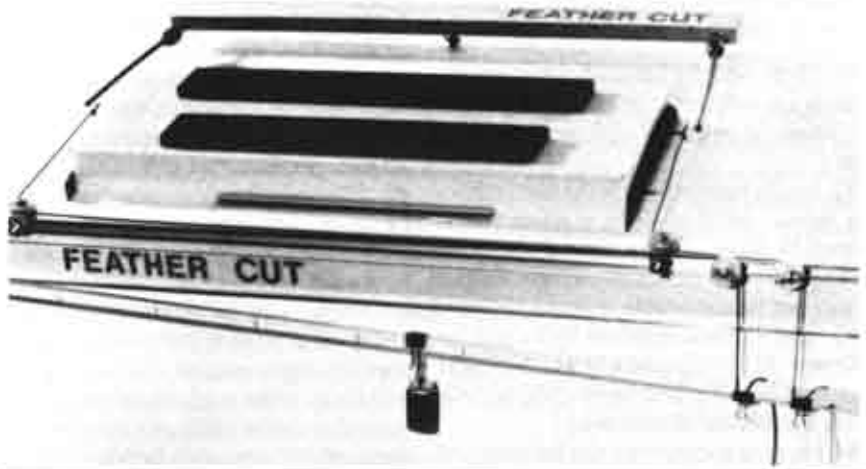
Tekoa's "FEATHER CUT" Wingmachine takes the mystery, worry and waste out of the process of cutting both straight and taper wings with proprietary down-weights and a three-point-tracking system. Components are anodized, plated and designed for heavy use.

The "FEATHER CUT" Wingmachine comes with complete instructions. It attaches to the front of a work bench or dining table with a couple of pieces of masking tape for easy installation and clean-up.

"FEATHER CUT" has been selected by the 1991 U.S.A. F3B Team. The "FEATHER CUT" was used to create the precision foam cores used in the planes flown by Senior Champion, Blayne Chastain, who won three national titles at the 1990 Academy of Model Aeronautics National Championships.

The "FEATHER CUT" Wingmachine can now be ordered directly from the manufacturer or through select distributors and dealers for $139.95. For more information, contact Roger Chastain, Tekoa, 3219 Canyon Lake Drive, Hollywood, California 90068; (213) 469-5584.

"FEATHER CUT"
Hot-Wire - Foam Wingmachine



Proposed Rules for Sportsman Multi-Task Soaring for 1991 AMA National Championship

...by Mike Stump

#1. 75 oz. weight limit, no other restrictions on sailplane. (A different weight limit could be considered, perhaps 80-85 oz.)
#2. No changes in weight (ballast) within a round. All 3 tasks in a given round must be flown at the same weight. (This suggestion has drawn mixed reviews and may not be acceptable to some.)
#3. The TD and distance tasks will be flown MAN-ON-MAN with flight groups of 4-7 pilots depending on matrix. Retrievers will be used.
#4. No re-launches with the exception of winch malfunction.
#5. Prep Time and Working Time will not be used.
#6. Distance: The pilot has 7 minutes after release from tow to complete the task. The task is the most laps possible in 4 minutes beginning with entry into the course. The task ends 7 minutes after release from tow even if the plane has been on course less than 4 minutes. This allows as much as 3 minutes to look for lift and gain altitude before course entry.
#7. Distance Scoring: Maximum laps flown in each flight group = 1000 pts. with other flight group scores based on % of winners laps.
#8. Speed will be flown as one large group as in 1990. It will be scored however by flight groups and each group will fly in order. each flight group winner will receive 1000 pts. A minimum score of 500 pts. will be awarded for course completion with most scores awarded for % of winners time. (winners time divided by other times)
#9. Duration – Task is 7-8 minutes (CD's option). This should not be as automatic as 6 minutes especially if you are flying ballasted. 1000 pts. to flight group winner based on flight time with other flight group scores based on percentage of winners flight time. Landing points will be added to the task score. The AMA L-4 or L-6 landing will be used.
These rules may not be perfect for everybody, but they seem to be a good blend of multi-task and the American system of contest operation. The intent of these rules is to eliminate the slow and cruel pace of F3B. Note also that the phrase F3B has been eliminated from the name of the event. These rules are not meant to be tampered with or amended by the F3B committee. They are for soaring SPORTSMEN interested in multi-task competition, as a reminder to the multi-task gurus that have tried to lead us to a wing loading limit. The Sportsman Multi-task soaring event is not for you to step down to, but for others to use as a springboard to higher levels of multi-task Soaring.

XC & SMT will be flown as provisional events this year. Registration will be at the event or through the event director, not with the regular NATS entry sheet. I'll get info. on dates and CDs as soon as those decisions are made.

Mike Stump
607 Washington St.
Cadillac, MI 49601

California Slope Racers

...by Rich Beardsley, CSR Director

The 1991 season started off by testing the resolve of our brand new club.

Mother Nature, who plays a very major role in the success of any slope race, did not cooperate for the season opener. It was very evident from the weather pattern preceding the Saturday race date, that we would have questionable conditions for the race. Sadly, after twenty-three members showed up at the Los Banos Reservoir site, we discovered that the wind was 180' from the direction required for lift at the normally-flown ridge.

As is common among those of us with the need for speed, we would not give up without trying every possible slope within sight. So, Rich Spicer, Rich Tiltman, Steve Lewis, John Pappas, and I set out in search of a slope to fly the race from. We tried every location that we could possibly drive to. I tossed my racer into the southeast wind a number of times without finding a slope with sufficient lift to hold a race. We drove back to the group of waiting racers with the bad news. Rich Spicer and Rich Tiltman, of RnR Products, said they would try the one slope that we hadn't tried. Rich Spicer gave his NOVA a toss. Ten minutes later, after a display of superb flying skill, he was able to bring the NOVA to a safe landing. He had been at least 300 ft. below the top of the ridge!

After one more aborted attempt on the south side of the lake, we concluded that there was no chance to race at Los Banos. We all packed up our planes and decided that we would try one more spot on the south side of San Luis Reservoir on the way home. After gathering at a small slope on Hwy. 152, we were met with almost zero wind conditions. It was then that we came to the realization that we would have to set a rain date for the race to be flown in the near future. (At this time the date has not been set.)

I would really like to thank the CSR members that came to the race, even in the face of questionable weather. It seems that the need for speed and competition is a most powerful motivating force. Although we are off to a rocky start, we will prevail! The Division I/Division II idea has yet to be proven, since we were unable to race, but the feedback from those who showed up to race was positive. Our next race is scheduled for the week-end of June 1 & 2. It's the BIG ONE, The INTERNATIONAL SLOPE RACE, the reason that California Slope Racers exists! There has been a change of location, and we will keep the race at its traditional location near Davenport. This was decided by a vote of the membership.

Pre-registration will be important as we expect at least 50 pilots to attend. I already have two entries from England, so please get your entries in as soon as possible! Send a check for $25.00, with the following info. on your racer:

(1) Area in square feet. This includes the area of the horizontal tail (shadow area in the case of V-Tails).

(2) Your primary frequency and an alternate.

We will be assigning racing numbers to be applied to the top and bottom of the right wing and the vertical stab. This should aid in aircraft identification by the corner workers. We will not issue numbers 1 thru 10 as they will be given to the top ten points-earners of the 1991 season. We hope to have numbers issued to all pilots by the third or fourth race. The pilots attending the Los Banos "race" had the first choice of numbers:

B. Armstrong	96	J. Lytle	76
R. Beardsley	77	J. Pappas	44
J. Brehm	28	B. Ratzlaff	42
J. Dvorak	26	K. Smith	23
W. Highfield	17	R. Spicer	11
B. Hull	40	R. Tiltman	88
B. Kovack	91	S. Tooher	54
H. Kramer	48	P. Vince	52
S. Lewis	69	Scott Woodward	33
B. Lytle	15	Steve Woodward	34

I will continue to issue numbers on a first come first served basis by phone, mail, or at the races. Send me your first, second, and third number choices.

See you at the start gate!

California Slope Racers
C/O Richard Beardsley
2401 Country Lane
Santa Maria, CA 93455
(805) 934-3191

Cross-Country

!!News Flash!!

May 18th and 19th will see a Cross Country event in California Valley near Soda Lake. Rich says to take Hwy. 5 to Hwy. 58, and head west on Hwy 58 to Simmier. Follow the signs to Soda Lake & you can't miss it. You'll know because of the size of the planes. There will be a BBQ & Cash Raffle. On a map, Soda Lake looks to be half-way between Bakersfield and San Luis Obispo in Northern California. For more information, contact Rich Beardsley.

On the Subject of Knots

A Letter From Canada

Dear Friends at *R/C Soaring Digest*,

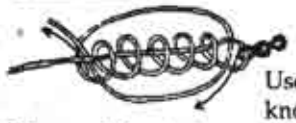
In the January, 1991 issue, page 17, Peter Stevens from England (no relation) shows the "blood knot" and says it may be used for either line breaks or attaching the line to rings or winch drum. Well, I agree with the latter, but not for line breaks where line to line needs to be joined. If the knot shown by Peter Stevens is used, then the connecting ends are in "shear" which is not good practice. Secondly, this is not a full blood knot — only half of one — and is better described as a "jam knot". For mid-line connections, a "barrel knot" is best (as shown in the diagram). This works well for both mono and braided lines and should be wet when pulled up tight. It is my experience that most clubs do use this knot for their line breaks, so what I am saying is really nothing new. However, for the benefit of those who may be new to soaring, whether by hi-start or winch, this information may be useful.

(signed) A.B. (Steve) Stevens, Chairman for Soaring, Pacific Zone, MAAC, Canada

Barrel Knot

Lap ends to be joined and twist one around the other 3 or 4 times and bring the end back through the strands. Repeat at opposite end. Pull up slowly and tighten.

Jam Knot



Bring end thru 1st
Then last loop — 5 times around. Pull up good and tight.

Use the jam knot to tie on all lures, hooks and swivels with a wire loop eye.

Classified Advertising

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RCSD has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs.

For Sale

KITS - New in box - Dodgson Designs SABER, wings & stabs are pre-sheeted by NSP...$425.00; Dodgson Designs LOVESONG with Competition Products full length cores & full-size building saddles...$190.00; Robbe ASW 24...$275; Asher Carmichael, 106 Pineview Circle, Daphne, AL 36526; (205) 626-9141 home, (205) 433-3686 wk.

HOBBIE HAWK, complete, new in box, ARF...Mike Bamberg, (800) 388-2022 OR.

Wanted

GRAND ESPRIT, Airtronics; John M. Gallagher, 1846 E. State St., Rockford, IL 61104; (815) 398-6811.

Plans & Publications

Plan Service, B2 Streamlines, P.O. Box 976, Olalla, WA 98359-0976. Send $1.00 for complete catalog. Refundable on first order.

Wanted: Engineering Employment

Knowing that a good portion of the RC soaring community is composed of engineers, I thought I'd see if one of you could help me find a job. I will be receiving my BSMAE from the University of Missouri - Columbia in May with a 3.6 GPA. My areas of study have been Machine Design, Manufacturing Methods and, of course, Composite Materials and Aerodynamics. If anyone knows of any possible positions, please let me know. Reward: A free E-Z Retriever for any info. leading to employment. Jim Harger, 1911 Wolcott Dr., Columbia, MO; (314) 443-6708.