R/C Soaring DIGEST

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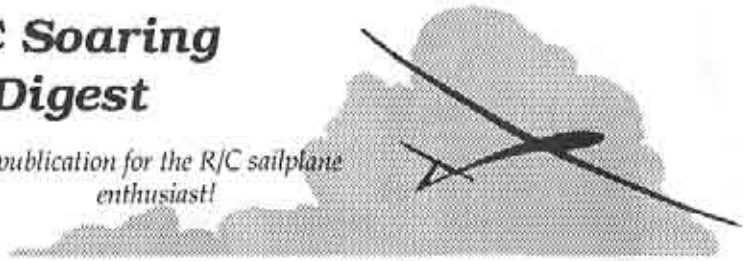
"Aza Raskin Launches an Anabat at Milagra Ridge"
Pacifica, California

Anabat Review on Page 32

R/C Soaring Digest

A publication for the R/C sailplane enthusiast!



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

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The Soaring Site

Happy Birthday BARCS

BARCS (British Association of RC Soarers) is celebrating their 21st year. Quite an achievement, indeed! Happy Birthday!

Looking for Gary Anderson?

Gary Anderson (American Sailplane Designs - Milo) dropped us a note to let us know that he is in Washington and "for those who might want to know", his address is 875 Maple Dr., Goldendale, WA 98620; (509) 773-5257. Gary also says that he has made it to LSF Level V and is now located about 60 miles west of Eagle Butte.

New Zealand Soaring Society

We recently received the October/November 1992 New Zealand Soaring Society newsletter and found that a new team has recently taken over the publishing responsibility from Colin Stace: Peter Presant (Editor), Glen Spackman (Financial Controller), Paul & Judith Havill (Records & Production). Shortly after the newsletter arrived, we received a note from Glen who said that they wanted to include more computer-based graphics in the newsletter and are now running a 386 DX 40 IBM. He asked if we would print the following in *RCSD*:

Wanted: Computer graphics or icons with R/C soaring themes for use in New Zealand Soaring Society newsletter. Our software includes WP5.1, MS Publisher and Windows 3.1. We can convert graphics formats. If you can assist, please write to: Glen Spackman, 22 Lynda Avenue, Wellington 6004, New Zealand.

So, if any of you can help them out, please contact Glen. We wish them success in this new responsibility that Colin has worked so hard on for so many years!

2 - Meter DG100

We have received a couple of inquiries about how to obtain the 2 - meter DG-100

as shown in Rick Palmer's article on page 24 of the November issue of *RCSD*. We recommended that they check the local hobby shops; however, we have since dug back through our records and found some information that Rick had sent regarding the DG 100. It is available from Etone Models, 146 Ansley Road, Stockingford, Nuneaton, Warwickshire CV10 8NU England. Additionally, Rick Palmer can be reached at (602) 333-2386 in Arizona if you wish to obtain more information and, if you're in his area, he is always looking for folks to fly with.

F3B/USA

George Spitzer has taken over the responsibility of the F3B/USA newsletter from Byron Blakeslee. George's address is: F3B/USA, 87 1/2 North Catalina Avenue, Pasadena, CA 91106; (818) 796-5024. Best wishes in your new endeavor, George!

1993 NATS

The 1993 NATS will not be in Lubbock, Texas. We received a call from Mike Stump and it seems that the NATS will, once again, be held in Vincennes, Indiana...

CST Is Moving

We received a note from Gail Gewain, Composite Structures Technology, to say that they are moving Christmas week but, as of yet, have no firm address. Their 800 number (800-338-1278) will go with them and we'll give you the new address as soon as we get it.

Aileron Differential

The following was received from Jef Raskin of Pacifica, California:

"Re: Jentsch's otherwise fine piece on Aileron Differential (*RCSD*, July 1992, page 54). The author says, "On a glider, in particular, the upward movement should be greater than the downward movement, typically by at least a factor of two."

The problem is simply this: when you are flying inverted, such differential works against you. The article should have been amended to read: "On gliders not intended for outside and inverted maneuvers, Bunky, the upward..."

Aero-Towing 92

Many of you have asked for information on the subject of aero-towing over the last couple of years. Well, aero-towing takes place in the Long Island (New York) area by folks such as Robin Lehman, and John Clarke with Robin's help has prepared a 30 minute tape on the subject. A picture is worth a thousand words and they will walk you through such things as the different types of tow hooks, releases, and even what size the tow plane should be. How do you launch a simple rudder elevator type glider all the way up to a 50 pound, 1/2 scale glider? Well, seeing is believing. To my knowledge, John Clarke has not officially released the tape, as yet but, for those of you that are interested in this type of flying, he can be contacted at 911 Covert Avenue, N.H.P., NY 11040.

Answers to Questions

In the November issue of *RCSD*, page 2, Ron Richardson asked a question and we have received the following response from Jef Raskin:

"With respect to Ron H. Richardson's request for something on the theory that there is an optimal wing loading for a given airfoil and/or planform, I regret to say that there is no such thing. Wing loading is simply the weight of an aircraft divided by the lifting area. It has no relationship on its own, to the airfoil or planform (the shape of the wing as seen from above, independent of size). The phrase which begins, "I think that wing loading promotes a cruising airspeed..." may indicate a bit of confusion as to what wing loading is. I would suggest that Ron study Martin Simons' fine and readable book "Model Aircraft Aerodynamics" and then reapproach the problem."

Ron, in this issue of *RCSD*, Martin Simons has gone more in-depth on this subject. Please see his column, "Understanding Sailplanes" in this issue. You will also find at the end of his column the information on how to obtain some of his books. Thank-you for asking the question, as we're sure that many of the other readers have the same question, as well.

More Answers to Questions

We received the following from Michael Selig, Urbana, Illinois:

"Daniel Hatfield in the November 1992 issue of *RCSD* asked some interesting questions related to tailplane design. I have some thoughts and comments. I am sending this to you in case other readers might be interested. I am also sending Daniel a letter with the same information.

"Daniel asks is there an advantage to using a nonsymmetrical stabilizer airfoil. For a conventional glider, there is a download on the stabilizer in normal flight. This download is required to zero the pitching moment about the center of gravity. It may be verified that the stabilizer on a conventional glider produces a download by trying to fly without the stabilizer. The glider will immediately pitch downward. The stabilizer download counteracts this moment and gives rise to what is called trim drag. For best performance (usually at the expense of handling), the center of gravity is moved as far aft as possible so that the stabilizer load is nearly zero, and the trim drag is a minimum. In this case, the stabilizer operates at a nearly zero lift coefficient in cruise flight. A moderate amount of negative C_l (negative stabilizer lift-up elevator) is needed for thermal flight, and occasionally a little positive C_l is needed for high-speed cruise flight. Thus, a slightly negative-cambered airfoil would be an improvement over the symmetrical airfoil.

"It was asked how thin should the stabilizers be? I have never seen a good analysis of stabilizer sizing. The control authority depends on the airfoil $C_{l,max}$ and the area of the stabilizer. If the stabilizer airfoil is made thinner, the $C_{l,max}$ will decrease, so the stabilizer area must increase to keep the same control authority. As a result of increasing the stabilizer size, the profile drag has increased, but the induced drag decreased. It is a tradeoff. Without doing a detailed parametric sweep study, it is not possible to determine the optimum size. But keep in mind that in a mathematical sense the optimum is flat and points nearby are nearly just as good as the actual optimum. In practical terms, the thickness and stabilizer sizes now in use are probably near optimum. Still, I think someone ought to have a serious look at the sizing problem.

"In regard to the stabilizer planform, some slight taper will bring the planform closer to the elliptical planform, which is better. Too much taper, however, will result in tip chords that are too small. The Reynolds number at the tip will be too low and there will be additional bubble drag that will not be offset by the reduction in induced drag.

"It was asked where is the deadband for the NACA0009. The deadband (meaning generally no output over a given range of input) in the C_l vs α characteristics can be seen at a Reynolds number of 100k in Fig. 12.61 of Soartech 8, p. 255. Over a small range in angle of attack near zero degrees, it is seen that the lift coefficient does not change by much as compared with points adjacent to this band. If this airfoil was used for the stabilizer and if the glider was trimmed to have nearly zero lift on the tail, changes in the angle of attack (- 1° to 1°) would produce little effect. Outside of this range, however, there is a sharp change in the lift coefficient, which translates into a sharp change in the trim moments - a big effect. The glider in this case would be tricky to fly precisely; a deadband in the lift is not a desirable

airfoil characteristic."

...More Answers

The following is from Jef Raskin:

"Daniel Hatfield's questions can also be answered briefly:

1. The choice of an all-moving stabilator versus a conventional stabilizer and hinged elevator is usually one more of mechanical and esthetic than aerodynamic choice. In a thermal aircraft or F3B the aerodynamic differences are minimal. The stabilator gives more force for a given small angular change than an elevator, but a stabilizer and elevator together create a cambered surface which can give a larger total force before the tail surface stalls (assuming the area of the stabilator equals the combined area of the stabilizer and elevator, and that the elevator gap is sealed). Thus the hinged elevator is definitely preferred for aerobatics.

2. In a conventional RC aircraft in level flight, the stabilizer produces a small downward force, thus it is most efficient in it's "lifts" downward, so if it is an asymmetrical foil it should be mounted "upside down". In a properly designed and trimmed model, the force on the stabilizer in level flight is very small; that is, it is operating at a very small coefficient of lift. Under these conditions, a symmetrical section is about as good as anything since camber does its work at high coefficients of lift. In fact, if the stabilizer airfoil has too much camber then, in level flight, the airfoil might be working "inverted" and thus less efficient than the symmetrical airfoil.

3. The only reason to make our tail surfaces have any thickness at all (again assuming a well-designed and trimmed sailplane), is to make them mechanically sturdy. Since you need some thickness, it turns out that a symmetrical airfoil has less drag than a flat plate. Compare the SD8020 or NACA 0009 or even the 12% thick J5012 with the flat plate in Soartech 8. They all have less drag! Flat plates are dreadful as stabilizers, as you can see from the curves. They are not nearly so bad when used as a conventional stabilizer and elevator though unless very thin, they will still have more drag than a streamlined shape even when the elevator is undeflected. For very small models, where the tail is flying at a Reynolds number of less than 50,000 or so, a flat stabilizer and elevator may actually be superior.

4. Stabilizer planform is not terribly critical. Look at real airplanes. At low Reynolds numbers increasing the aspect ratio (while keeping the area constant) is often counterproductive. Depending on the size of the sailplane, aspect ratios from 3 (for the smaller ones) to as much as 5 (for a three or four meter span ship) will do. A rectangle is fine as a stabilizer planform, but looks ugly.

5. Look at the angle of attack versus coefficient of lift curves, as those for the NACA 0009 on page 255 of Soartech 8. The little crinkle in the curve at the origin is the "deadband" being discussed. The slope of the curve flattens out near the origin. This effect is barely visible in the SD 8020 curves.

M.A.R.C.S. National Sailplane Symposium 1992

For the last ten years, the Madison Area Radio Control Society have been bringing together a very impressive group of speakers to speak before the gliding community. This year 1992 was no exception.

Saturday October 24th started with a welcome from Carl Mohs and Al Scidmore. The first speaker was Walt Good who talked of the early days, 1938, that he and his brother went through flying radio control models. This was the day of "hard tubes", a term some of you may have never heard before. Terry Edmunds and Stev Metz compared the similarities between full size and radio control flying. Tim Renaud talked about the new computer radios. At this point we broke for lunch. The next speaker after lunch was Stev Neu who told of his experience in flying electrics in world competition. Al Doig shared his building experience from the days of glue to composites. Lee Murray, Dave Beck and Al Scidmore talked about instrumentation and telemetry. At this time they have a package that contains a compass, altimeter, air speed and telemetry. All of this was seen in a Gentle Lady. Watch *RCSD* for more information about this, right Lee? The last speaker of the day was Martin Simons on the subject of aerodynamics. Martin's prepared talk was cut short because it became a question and answer talk. What a day!

That evening after cocktails and dinner, there was one more speaker, Gene Chase, a pilot's pilot. Gene flies over 300 different aircraft, and during his talk he showed slides of the many antique and vintage aircraft that he has flown. On Friday the 23rd, Gene had also gave us the grand tour through the EAA Museum at Oshkosh.

Sunday, October 25th started with table top clinics and show and tell. Then, Jef Raskin covered sailplane precision aerobatics, and Maynard Hill talked about his World Record Duration Records. The last speaker was Professor Roland Stull on Meteorology for model sailplane fliers. During his talk he showed some radar pictures of thermals, which was very interesting. Wished I had some to show you.

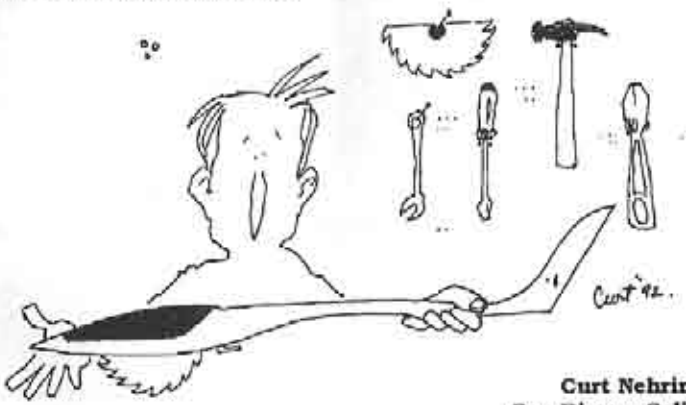
Watch *RCSD* and we will let you know when a hard bound copy of the 1992 Proceedings is available. There may be a picture of a thermal there...

Thank-you Carl Mohs, Al Scidmore, the committee and M.A.R.C.S. for hosting The National Sailplane Symposium. I'm looking forward to the next one.

I also wish to thank The Murrays for their hospitality as we (Martin and I) flew in early to the Appleton, Wisconsin airport where Lee Murray picked us up, gave us a grand tour and introduced us to many of the local club members. Unfortunately, the photographs taken at the Symposium did not come out, but maybe next time. Thank-you all, again!

On A Sad Note

Lee Murray of Appleton, Wisconsin dropped us a line to let us know that, "Walter Panknin had passed away on the 15th of November at his home in Gummersback, Germany. He had been ill for some time with cancer, and had left his job as a VP for a German boiler company to see as much of the world and his friends as time permitted. I know that I will think of him whenever I look at or fly the Flying Rainbow. His friends will surely miss him. He was a scientist, an artist, a thought leader, a gentleman and real patron of model soaring." ■



Curt Nehring
San Dimas, California

Jer's Workbench

Mold Making Part 1

I have been making molds for years and would like to share some of the techniques I use. (Hopefully, I have gotten or peeked your attention and this subject will be of interest to you.) I will walk through the steps of mold making over the next few months and explain my method of laying up a fiberglass fuselage.

Mold making is something that a lot of you model builders have probably dreamed about doing at one time or another, but for some reason you may never have started this type of project. Why? Perhaps you weren't sure how to get started, where to find all the material required or perhaps you did not have the time required to complete this type of project.

As a model builder you probably already have all of the tools required in your shop. Simple hand tools will do. The main thing required in mold making is time. Mold making is going to require at least 80 hours if not more to make a good mold. So, if you are still with me and want to give it a try, it's time to get started.

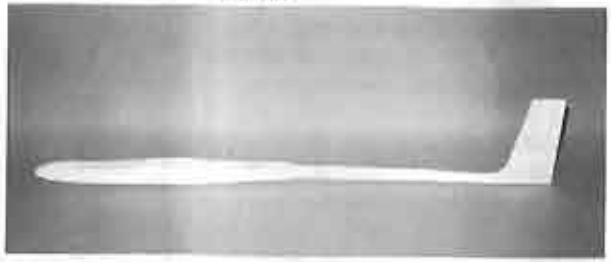


Figure 1 Dale's Elf 2m plug.

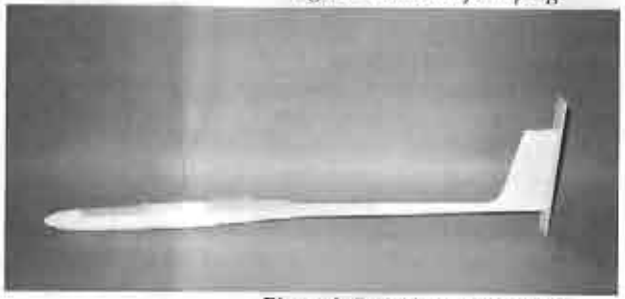


Figure 2 Dams have been added.

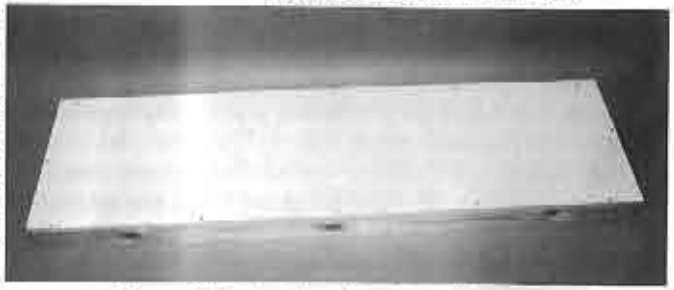


Figure 3 The tray is really a box with a very flat top.

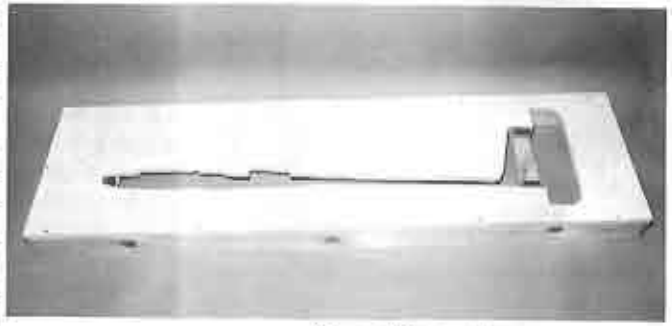


Figure 4 Cut out tray.

Start with a Plug

Getting started requires a great deal of preparation. First, we will need to make a model or plug from which to make the mold. The plug will be a model of what you want to mold. I got lucky in this initial stage, as Dale King, my neighbor and flying buddy, wanted to build a 2 meter model with a bolt-on wing and a pull off nose cone. Dale asked me how to make a plug, and made the plug that we will be using in this mold making series; he did a beautiful job and it was his first try. It is best to make your plug exactly the way you want your finished fuselage to look, because what the plug looks like is what the finished product will look like. See figure 1.

Add Dams

Ok, now that we have our plug, let's look at it for a few minutes. How do we eventually get inside to install the radio, push-rods and/or do the seams when the two halves are joined together? Access holes - how and where? Now, if you can think inside out and backwards or put yourself inside of the plug and look out it helps. But if you look at figure 3 you will see the 3 dams that I have added for access holes:

(1) At the nose for the radio and servos
(2) Under the wing in order to install the wing hold down bolts
(3) At the rudder in order to do the elevator controls and seams

Build a Tray

The next step is to build a tray. This tray will be used to lay up only the first half of the fuselage mold. As you can see, this is nothing more than a box with a very flat top. The sides are 1X4's and the top is a pre-finished particle board that I got at my local Home Depot. The tray size must be big enough for your project. Give yourself about 6 inches working space on all four sides of the plug. See figure 3.

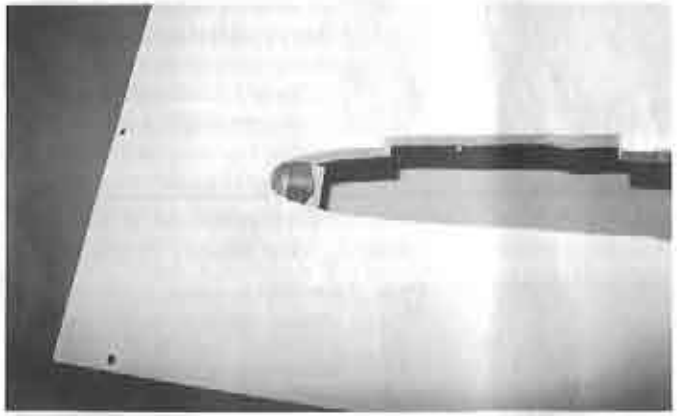


Figure 5 The nose is provided support with modeling clay.

Figure 6 The rudder is provided support with modeling clay.

Cut Out the Tray

Now, lay the plug onto the top center of the tray and trace the plug profile onto the tray. Then, use a saber saw to cut out the plug profile leaving about 1/16 inch clearance on all sides so that the plug will just drop through the top of the tray. See figure 4.

Add Stops

Next, add two stops to suspend the plug within the tray. Placement of these stops are at the nose and the rudder as seen in figure 4. Now, place a bit of modeling clay on these

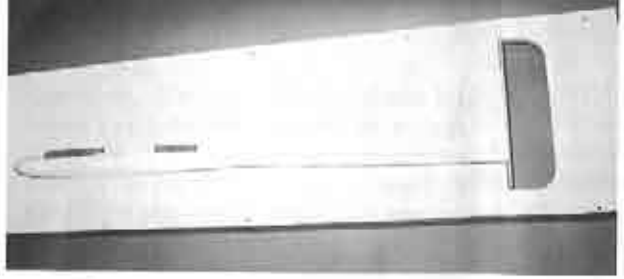


Figure 7 Plug is inserted into tray.

Figure 8 Caulking is done with simple tools.

stops to support the plug, as shown if figures 5 & 6. (The clay can be obtained from a local toy store.) The modeling clay will make for easy adjustments to support the plug at its center line.

Insert Plug Into Tray

At this step, use great care to mark the center line onto your plug, install the plug into the tray and adjust the plug so that its center line mates to the top surface of the tray.

Caulk

The last step is to add the caulking around the plug. The caulking spackle was obtained from a local Home Depot.

Next month we will do the lay up of the mold. ■

Understanding Sailplanes

...By Martin Simons

13 Loch Street, Stepney,
South Australia 5069

That's another question

Ron Richardson's request in the November issue of *RCSD* was for an article on "the theory that there is an optimum wing loading for a given airfoil and planform." He thinks there may be a link between wing loading and a cruising airspeed which may or may not equal the best L/D speed.

To reply fully would require several articles. I doubt if Judy could find room in a single issue of the magazine. Some of the points were discussed in my previous series on thermal soaring sailplanes, especially the early ones. Very recently, at the MARCS Symposium, I dealt with some other points. The Symposium proceedings should be available before long. Ron might have a look at these items. It would also be useful for any model flier to read some of the stock works used in full sized soaring, such as Derek Piggott's book *Understanding gliding*. All the important principles apply exactly to models.

Briefly

To give a brief answer now, I will offer the conclusions of the argument first and then add a short explanation. Remember, though, that there is much more to be said.

(1) There is no optimum wing loading for a given airfoil section or wing plan.

(2) There is no best cruising speed for a sailplane but whatever else may be said, the best L/D speed is not it.

Life is not that easy!

(1) The relationship of wing loading to the airfoil and wing plan.

A good section, carefully chosen in the first place for a particular kind of sailplane and a particular kind of flying, will not suddenly change its character if the wing plan is altered in any reasonable way, or if the wing loading is increased or decreased by (for instance) using or discarding ballast. The effects of changes of these two factors (plan and loading), are entirely predictable and calculable. There is no special magic and no particular section is going to show up in any astonishing way either good or bad.

The only sensible way to choose the section is to study wind tunnel test results and make an informed decision on their basis. Obviously experience with the section, direct or indirect (i.e. your own experience or that of other people), will help the process, but a little serious study of aerodynamics will also be very illuminating.

We are all influenced by our subjective impressions and often we mislead ourselves. We tend to think that our latest model is better than the last, or that the model on the other end of the score sheet is much better (or worse) than our own. Don't be too much influenced by this kind of thing and do not take too seriously the claims made by some enthusiastic club members, about their latest model. Maybe they just had a good day! We should not dream up peculiar theories when a particular model seems to do specially well or badly on some few occasions. It is more likely that the pilot or the weather is responsible.

Taking this just a little further, there are in any case many incalculable factors which would have to come into the reckoning if we were to match wing loading with the other features of any particular model sailplane. For example, in the F3B speed task, factors such as wind strength and variation with altitude at the time of the flight, the height obtained on the

launch, the kind of 'turn round' flown (steep or gentle turn, or roll and pull through etc.), the pilot's ability to fly accurately on track without excessive control actions, the amount of working time available, to mention only a few, would all affect the choice of wing loading.

For the distance task, additional factors come in, such as the time allowed for the task and time remaining, the presence or absence of thermals or sinking air. The duration task brings in yet more things, such as skill in making an approach to spot landing, the height 30 seconds before the time for landing, the power of air brakes, and so on.

The ideal wing loading inevitably varies, not only from flight to flight but even within one flight from moment to moment. If only we knew beforehand exactly what was going to happen! We never do and probably never can.

The best we can do is design our models for an average situation and then build in as much adaptability as possible on either side of the mean. This, in practice, means making provision for ballast and making it as easy as possible to change the ballast so that, at the time of launching, the sailplane is as close to the ideal loading as possible for the task ahead.

This applies equally to any other kind of flying that we wish to do, whether it is something really difficult or simply floating gently around on a pleasant afternoon with nothing much in mind except having fun.

Well developed judgment is one of the many important things that goes to make a good sailplane pilot. The only way to develop judgment is to fly, and try, and fly again!

(2) The best L/D

No sailplane should ever be flown at the speed for best L/D, unless the air is totally and absolutely calm - a very rare situation. Even then, the best L/D trim is needed only rarely for some special reason, such as performance testing and trimming.

The figure for the best L/D of a sailplane is a general measure of its all round efficiency in terms of aerodynamic drag. It has the advantage of being hardly affected by variations in wing loading. Adding or removing ballast does not normally make any substantial difference to the best L/D figure. (There is a very small improvement in L/D max with higher wing loading, but it is really **very** small.) The change of loading changes the airspeed at which best L/D is achieved, but not, in practice, the maximum L/D itself. (Exceptions may be found if very small models are concerned, but I am discussing the more usual types of radio controlled aircraft, not miniature 'peanut' or very light hand launched aircraft.)

Best L/D is a useful figure, often quoted in advertising literature. It does offer a fair standard of comparison between different sailplanes, but in the air there are practically no occasions when this is the correct speed to fly.

The sailplane should always be flying either slower than best L/D, for soaring, or faster, and often a lot faster, to achieve the highest efficiency in the real, mobile air in which we normally operate. To amplify this statement, consider **Figure 1**. This, taken from my MARCS Symposium contribution, shows the polar or performance curve of a sailplane. All sailplanes have such a curve, whether we know exactly what it is or not. The general shape of the polar will be something like the one shown. Detailed differences of curve shape arise in practice and of course the absolute figures for sink rates and airspeeds differ from sailplane to sailplane, but these do not affect the argument, which applies universally, to a *Gentle Lady* and to the latest full scale open class monster of 26 meters span weighting nearly a ton with ballast.

Figure 1. The performance polar of a sailplane

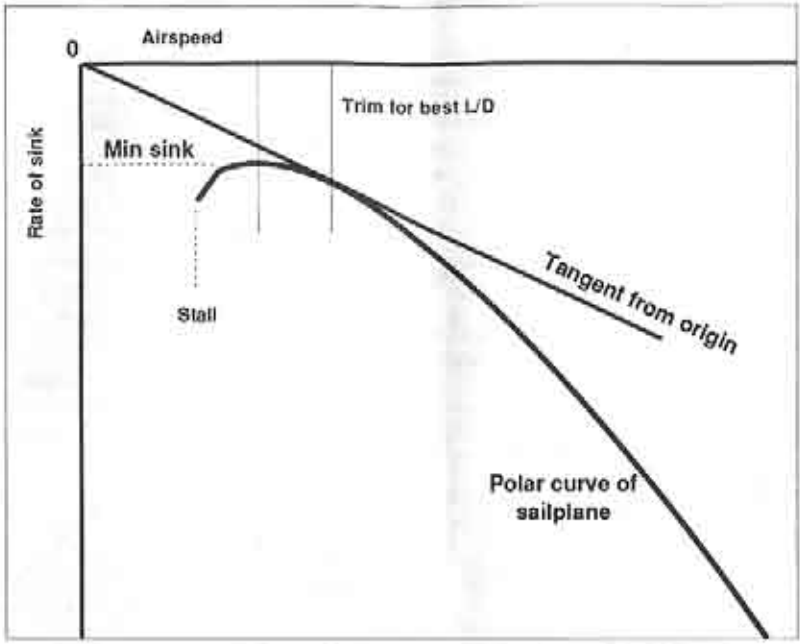


Figure 2. The performance polar of a sailplane in sinking air

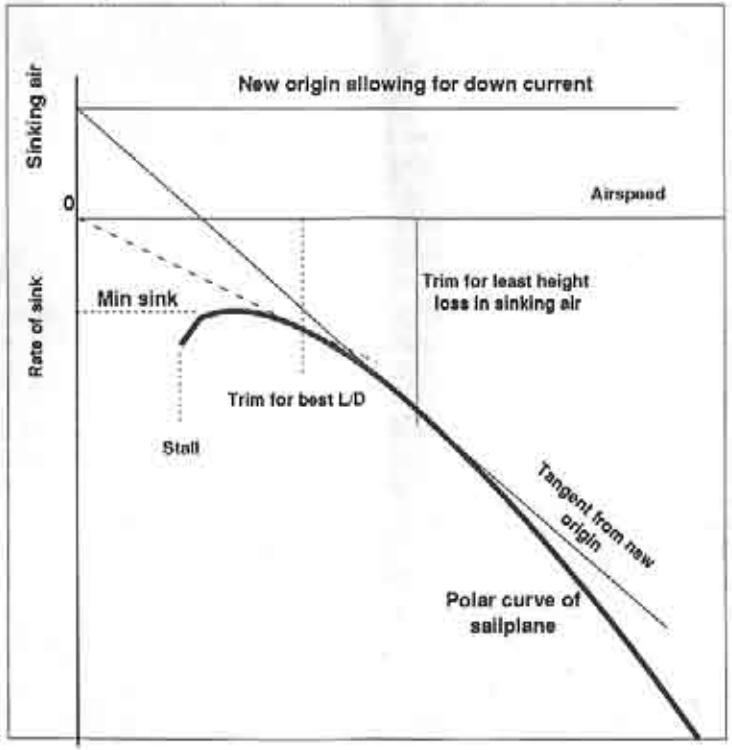
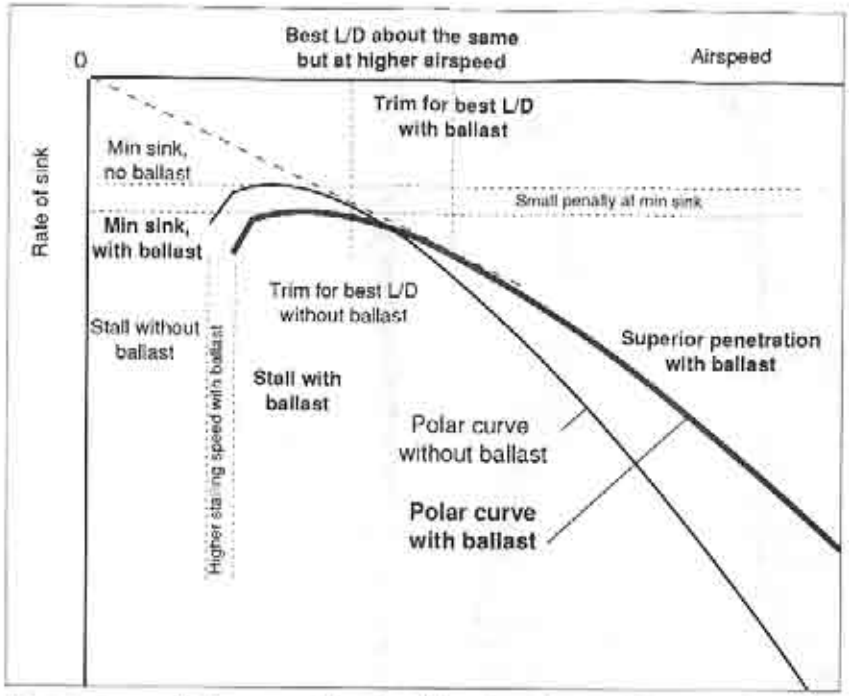


Figure 3. Sailplane polar with and without ballast



The minimum sinking speed for the sailplane is found where the polar curve is highest on the chart. The airspeed for this condition is found by projecting a line vertically upward to cut the airspeed axis. In flight, we aim to trim the sailplane to this slow airspeed for soaring. To find the min sink trim with models, we have to fly them in the real air and experiment. In turns, we cannot usually keep the speed down quite to this figure, but we get as near to it as we safely can.

On this chart, the best L/D, and the speed to fly for this, is found by drawing a tangent from the origin or zero-zero point on the axes, where they cross.

The effect of adding ballast is shown in **Figure 2**. The curve is flattened slightly and moves toward the higher speeds. A tiny improvement in best L/D results (because the Re number is higher) but the graph otherwise speaks for itself.

When the sailplane is not in rising air, it is almost invariably in sink. The air in up currents comes down in the spaces through which the sailplane has to fly whenever it is not actually gaining height. To find the best speed to fly for least loss of height in **penetrating** the sinking air, a line such as that shown in **Figure 3** is drawn on the chart. The strength of the sink is added to the vertical axis, and a new origin for the tangential line is found. This touches the polar curve at a point always faster than that for the still air best L/D. So the rule is: **fly slowly at minimum sink when trying to gain height, and fly faster than best L/D to save height when not in lift.**

Incidentally, if the model is trying to make headway against a wind, a graph of this kind can be used. If there is no sinking air but only a headwind, the tangent is drawn from the wind speed measured along the horizontal axis. Cover the upper part of the graph above the horizontal scale line, to get the effect.

Fly slowly at minimum sink in lift.

Fly faster than best L/D in sink, fly faster than best L/D in a headwind. In sinking air and a headwind, fly faster still. Never fly at best L/D. How much faster one has to fly, is, once again, a matter for experienced judgment. Get out there and fly, and try, and fly!

That is all I can say without expanding into a minor thesis. As mentioned above, any good book on full scale soaring or aerodynamics will provide those interested with a much fuller explanation. ■

Several of Martin's books ("Aerodynamics of Model Aircraft Flight", "Model Aircraft Aerodynamics", "Airflow") are available from Zenith Books at (800) 826-6600 U.S.A., FAX (715) 294-4448, and 1-715-294-3345 for overseas. Historic Aviation carries "Model Aircraft Aerodynamics" - (800) 225-5575 U.S.A. & Canada; other countries should inquire at (612) 454-2493; FAX (612) 454-8554. ■

LIFT OFF!

...with Ed Slegers
Route 15
Wharton, New Jersey 07885
(201) 366-2525 Day
FAX (201) 366-0549

Steve Neu - U.S. team member won 7th place with the plane he flew. Note some of the support equipment!

SE-X

By now, most of you know that the U.S. won the team trophy at this year's F3E World Championships. Jerry Bridgeman of the U.S. team was second, Jason Perrin of the U.S. was third and Steve Neu of the U.S. was seventh.

I met Steve Neu in person at this year's KRC meet in Pennsylvania. Steve brought with him the plane that he flew at the world championships. It is hard to describe; you have to see it to believe the performance of a 27-cell F3E plane. They accelerate going vertical and are nearly out of sight in a few seconds. In a follow-up phone call to Steve, he was kind enough to give me the specifications on his plane.

The speed controller that Steve designed will be available for sale in about 4 weeks. Steve does not use a BEC. He feels that they are really PEC's (plane eliminator circuits). The SE-X is an all composite, hollow core wing with the servos permanently molded into the wing. I asked Steve if he had a problem with the servo what would he do. He replied that he would have to remove it surgically. I also asked him if he would change anything on the plane for the next world championships and he said possibly only the airfoil.

Model SE-X Specifications

Airfoil	SD7003
Wing Span	63"
Weight	80 oz.
Batteries	Sanyo SCR 1000
Radio	Airtronics
Motor	Astro FAI 60, lightened by using a titanium shaft and removing 6 oz. of material from the motor
Speed Controller	Steve Neu's own design
Prop	Custom Made, close to a 12-7

Servo molded into wing on Steve's plane.

Swift T-1500E

Master model builder Mark Weiland of Colorado sent a picture of his son, Jeff, holding a pair of Flite Lite Swift T-1500E that he converted into a polyhedral plane. To keep the weight down, Mark lightened the wing with lightening holes which he then covered with Monokote. He used the Futaba MRC4A receiver speed controller combination with an all up weight of 25 oz. These models were built for Ed Hinkle of North Carolina and they fly well. Projects like this show that you do not have to stay with the manufacturer's original design.

Ventus

Going to the other extreme in size, Doctor Tom Moss of Canada sent along a picture of his Graupner Ventus, which he has converted to electric. (The Ventus is available from Northeast Sailplanes.) Tom's letter is too lengthy to reprint in its entirety, but the following are Tom's comments on electrifying the Ventus.

"A Keller (Robbe) 40/10 electric motor was installed and driven by two 6 cell 1200 mAh packs connected in series and regulated by a Sommerauer 45 amp switch. (The Graupner Mini-switch appears to be the same one.) The cells were placed exactly across the balance point, so that the plane flies with or without batteries, without the need for rebalancing. Two fiberglass boxes have now been made and installed on either side of the landing wheel, supported by a plywood former just behind the wheel and another further aft. They just pass underneath the original spoiler servo installation.

"Originally, the set-up used battery pockets made of foam rubber and tape and simply stuck to the fuselage sides with double sided carpet tape. Batteries were held back into the pockets with pieces of foam packed into the fuselage, a very crude set-up which, however, was used for 40 electric flights or >>10 hours of flying time. The motor was installed by simply slicing off the nose of the Ventus at an appropriate point to reasonably match the 11 x 7 Graupner folding propeller and fitting a plywood former in the nose and one further aft to support the motor. The nose section was retained and set up so that it can be replaced for slope flying or towing. The motor was set down at 8° to the wing and functions as nose weight, no other ballast being necessary, neither in the nose nor further aft, as a counter balance. No motor cooling vents were installed and the motor has been run more than 120 times for 1.5 minutes each run, without any hint of a problem. However, as a precaution, I am installing two vents in the nose and have drilled five large holes in the rudder post as an air exit.

"The flying weight of the Ventus is 3.20 kg (7.14 lb.) without batteries and 3.83 kg (8.5 lb.) with. This gives 48.6 and 53.8 gm/dm^2 (16.4 & 18.1 oz./ft^2) with and without wing extensions with no batteries and 58.1 and 64.4 gm/dm^2 (19.57 &

Jeff Weiland holding two Flite Lite Swift T1500E.

Dr. Tom Moss of Canada holding a Graupner Ventus converted into electric.

21.7 oz./ft^2) with batteries. At the highest wing loadings, the Ventus flies quite fast but extremely efficiently. It has enormous resource and in flat air will climb back after a dive, without perceptible height loss. The stall is very easily controlled and is mild. The plane has absolutely no strange habits and never reacts in an unexpected fashion. In light conditions it is possible to control it with rudder and elevator, though this is, of course, not an interesting way to fly such a beautiful glider. The motor-battery set-up gives 4.3 minutes run time. (It is very important not to mix batteries from different manufacturers. Mixing Sanyo SCR 1200 6-cell NiCd packs from Trinity and Graupner halves run time, and one battery, the Graupner in my case, retains much of its charge. Trinity batteries (Maxilla, Tower Hobbies) bought at different times, however, work well together.) A one minute flight takes the Ventus to a very comfortable flying height at a steady 15 to 20° climb. (I still do not have enough experience to really say what the height is, but it is very much higher than the heaviest, longest high start achieves with lighter planes like the Stratos or an Airtronics Legend.) However, the power is only just sufficient for the launch in flat wind conditions and it is necessary to give a fairly energetic running launch to be on the safe side. Changing to a 12 x 8.5 propeller did not improve power and reduced run time considerably. Even in heavy winds, flat field flights are never less than 15 minutes in total. With no detectable thermal activity, but otherwise more reasonable conditions, flights are normally 20 minutes and, of course, with thermal activity flights can last as long as one wishes. We have found that when loaded with batteries, one cannot expect the Ventus to rise detectably in very light lift. So, though this may extend a flight, it cannot be used to climb higher. However, by using a 1.5 minute powered climb, one can reach heights at which the lift is usually much stronger and from there we have thermalled the Ventus nearly out of sight. Indeed, one day I thought I had truly lost it from sight overhead and it was only with the aid of my colleague and teacher, George Ermani, that we recovered the plane, full spoiler for at least 10 minutes being necessary to bring it back to a comfortable height."

Tom was also interested in my conversion of the Falcon 880. This conversion has received more phone calls and letters than any other conversion that I have reported on. It seems that a lot of people are interested in large electrics. I told Ron Vann of Flite Lite about the interest in an 880 electric and he responded by making an electric Falcon 880 fuselage. It will be available by the time you read this and should sell for about $100.00. Give Ron a call for more information. Flite Lite is also making a 7 - 10 cell T-tail electric with an RG-15 airfoil. I will have some pictures in *RCSD*, soon.

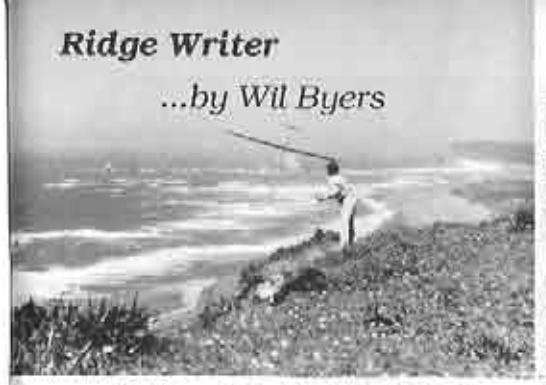
Northeast Sailplanes will have the 2-meter Chuperosa electric sailplane that I worked on available about February 1. This plane will sell for about $90 (great plane at a reasonable price) and will be called the Allegro. Sal told me that in about two weeks he will have something really revolutionary in electric powered sailplanes. We'll have to wait and see.

More and more companies are getting into electric and, as they do, I will try to get information and pass it along to you.

Good Flying! ■

Ridge Writer

...by Wil Byers



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

Every once and awhile as modelers we luckily stumble upon some very worthwhile information. Recently, in my neurotic search for the ultimate truth about R/C soaring I came across an article from 1986 which I felt was very good and I therefore want to share it with you.

First, however, let me tell you that the article was found in Soartech #5. Yeah, I know a lot of you know about Soartech #8, but how do think it got to be #8. That's right; there where other Soartechs that came before and they have mostly been forgotten. This is quite unfortunate since there is a tremendous wealth of knowledge stored within their pages. They include articles and ideas from some of the great minds of R/C soaring. As well, they include airfoils and building ideas that I'm sure you would or do find informative.

The Soartech series was and is a project of Herk Stokely. For those of you that don't know Herk, he is the notable soaring columnist of *Flying Models*. Herk is a super nice guy who has flown both R/C as well as full scale gliders for quite some time. He is one of the few people out there that has really dedicated himself to promoting R/C soaring and the entire Soartech series is a testament to this dedication.

Because of Herk's commitment to further all facets of R/C soaring he is generously allowing the reprinting of the following article by Rolf Girsberger. Rolf is the designer behind the RG series of airfoils. He like many of the airfoil designers of today has utilized the Eppler airfoil design program to generate some airfoils specifically aimed at R/C soaring. **(Do you ever feel like we owe a whole bunch to Dr. Eppler for his contributions to soaring?)** Rolf modified Dr. Eppler's code somewhat to allow modification for thickness and camber. In other words, the airfoil can be modified via the code either in thickness, camber, or both without changing the initial parameters that the airfoil was design around, i.e., C_l or C_d. As a result, Rolf designed some very winning airfoils.

Now let's read what he has to say about his design philosophy and how it benefited model aviation.

New Airfoils for R/C - Gliders

Rolf Girsberger,
Ennetbaden, Switzerland

"The special requirements of FAI-F3B class were particularly taken into account for the design of airfoils no. 12, 14, and 15. These requirements are low drag for good penetration and maximum speed as well as reasonable high maximum lift for launch and thermalling. The airfoils might also be a good choice for **slope soaring gliders** and electric powered gliders.

"An airfoil with very low drag is the E180 designed by Dr. Eppler. The calculated section characteristics of the E180 have been proven with its excellent qualities and with many fast R/C gliders. However, one disadvantage for F3B is the moderate maximum lift. Starting from these experiences, the following design objectives have been formulated:

a.) Section drag for low lift (C_e=0....0.4) comparable to the E-180.

b.) Lower edge of laminar drag bucket at slightly negative lift (C_e = -0.05 ...-0.1)

c.) Higher maximum lift than the E180

d.) Critical Reynolds number well below 100,000

e.) Higher pitching moment (absolute value) than the E180 is admitted but should be less than pitching moment of the E190.

f.) Relative airfoil thickness between 8.5% and 9.5%

"Airfoils 12, 14, and 15 have been calculated with Professor Eppler's computer program taking into account the above mentioned design objective.

"The input data for the upper side of the new airfoils were chosen in such a manner that the calculated transition point of the boundary layer steadily moves towards the leading edge with rising angle of attack. For that reason the section characteristics of these airfoils don't show a marked upper edge of the laminar drag bucket in contrast to the E 180 airfoil. The input data of the lower side were chosen in such a manner that the length of the laminar boundary layer varies very little in the range of higher flight speeds. The calculated transition point of the boundary layer on the lower surface falls between 58% and 66% of chord length for the RG 15 airfoil, between 67% and 75% for the RG 12 airfoil, and between 74% and 85% for the RG 14 airfoil. These numbers hold for the high speed range. The transition point moves rapidly forward to the leading edge for slightly negative lift. This behavior of the boundary layer produces the marked lower edge of the laminar drag bucket. The estimated maximum lift coefficients fall between 0.9 and 1.0. They are well above the corresponding value of the E-180.

"The calculations show that a drag rising separation bubble on the lower side may not definitely be excluded. Therefore, experiments with turbulators (e.g., saw-tooth type or blowing) on the lower side are recommended especially for airfoils 12 and 14. The turbulators should be placed between 60% and 65% of chord length for airfoil 15, between 70% and 75% for airfoil 12 and between 75% and 80% for airfoil 14.

"The airfoils 12, 14, and 15 actually are not designed for flapping. Nevertheless, flaps might bring some advantage for launch. A flap setting of 5 to 10 degrees down should be appropriate for the initial stage of launch (i.e., before zooming). A flap setting of 1 to 2 degrees down might eventually be advantageous for middle speed range and for thermalling. An upward setting of flap for speed task is not recommended. Anyway, the best flap setting is to be determined experimentally in flight."

Ralf goes onto say that at the time the article was written flight experiences could not be compared to calculations. However, it is 6 years since Soartech #5 was published and the RG series of airfoils have proven themselves to be very contest worthy. They are also quite good performers of gliders designed for speed, such as on a slope racer. I felt this article might help you better understand this series of airfoils. So, you may just want to consider one of these sections for you next winning design.

Some of the nomenclature Ralf used in this article is defined as follows:

Cd = Drag Coefficient
C_l = Lift Coefficient
$C_{l\,max}$ = Maximum lift coefficient
C_m = Pitching moment coefficient
C_{m0} = Pitching moment at zero lift
d = Airfoil thickness
R_e = Reynolds number with respect to chord length
t = Chord length of airfoil
x,y = Coordinates
ε_0 = Angle of attack with zero lift with respect to x axis

If you liked what you read and are interested in obtaining some of the past Soartech issues you can obtain them by contacting Herk Stokely, 1504 North Horseshoe Circle, Virginia Beach, VA 23451.

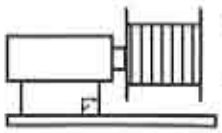
Pete Bechtel does a nice fly bye with his 1/4 scale DG-500. Model is copied after a open class two place ship.

Bob Lawhead about to launch a Multiplex DG-600 1/5 scale from atop Kiona Butte.

Don't need high tech to have a great time at the slope. This polyhedral is diving for the valley while riding lift generated by a light breeze at Eagle Butte.

They are quite inexpensive and they will certainly provide you with a wealth of information. I personally hope that Soartech #9 is in the making; "But who knows!!"

Airfoil of the month is, what else, the RG-12A. ■



Winch Line ...by Gordon Jones

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

Composite Wings Part 6

During the course of the past few months I have passed along some methods and alternatives to constructing composite (fiberglass) wings. During this period I have had a chance to get a good feel for a couple of new techniques and some different composite materials. The obvious result is that there are more than enough materials out there to play with to last a life time. There are practically no limits to different applications and building techniques that are being used across the country.

The chart depicts the wings I built with the cloth and the weights per panel. I was originally going to include a two meter, but got a little side tracked in the middle of things. The plug-in wing panels are all 55 inches long, and the three piece wing has a center section of 42 inches with tip panels of 34 inches.

All the panels came out within the weight range I was looking for per panel. In addition, I was surprised about the exceptional strength and light weight of the 3.2 UniWeb panels. The three piece wing was set up with plug-in tip panels using a rib/subrib arrangement and even with the additional plywood it came out at a real good weight. The figures were weighed prior to finishing the leading edges and cutting out the servo cavities.

During this project I learned a great deal about fiberglass and carbon fiber applications. I also tried a couple of different resins and mylar techniques. I did discover that the 5 ounce rule I used as the basic premise for the glass layups will work very nicely. I found that each of the composite suppliers, while each has a somewhat different inventory, provide high quality products for our hobby. Aerospace Composites have some very interesting carbon fiber products in addition to fiberglass. Composite Structures Technologies (CST) offers more in the way of exotic fiberglass cloth and have recently added some light carbon fiber cloth to their line. Aerospace and CST both have vacuum bag setups as well as a wide selection of bagging materials. Weston AeroDesign has the normal assortment of fiberglass and also has Kevlar and Spectra as well. Kennedy Composites, while a new arrival on the composite scene, has both fiberglass and carbon fiber products available, and is gaining in inventory every day.

With the tips and leading edges being the problem areas in vacuum bagging, I concentrated on these areas during the course of my trials. I also talked to other folks who are bagging composite wings to get a comparison of techniques that work well for each. The addition of a layer of cloth around the leading edge appears to be the best method to avoid problems with the leading edges. In addition, additional resin in this area is a good insurance against voids and problems. The rest of the wing basically takes care of itself, so to speak.

The tip problems can be cured in two ways, one by using a simple 45 degree tip as found on the Synergy and secondly by the use of an additional layer of fiberglass cloth over a gentle tip curve. When it is all said and done the secret is finding a technique that works well for the methods that you are using to lay up the wing. That means trial and error; but if you do several layups on short (12-18 inch) panels you will quickly find the methods that you are comfortable with and can apply to a full size wing.

There are a few sources for videos that do a good job of further explaining and showing various bagging techniques that are worth a look if you are going to start bagging your wings. Channel One Productions has tapes on foam cutting, bagging wings and making fiberglass fuselage molds. Composite Aircraft Engineering has a video that describes bagging wood and fiberglass wings, and shows arrowshaft hinging techniques as well.

The bottom line, if you are going to try to get into composite bagging, is to do your homework and get a good idea of the techniques and options that can be used to produce a good strong wing. If you have any questions or need any help give me a call, or call one of the suppliers mentioned in the chart. ■

Type Wing	Layup Composition	Weight	Supplier
Plug-In 1	3 ounce Plain E-Glass 1.4 ounce Plain E-Glass Carbon Fiber Spar Cap Rib/Subrib Spar System	15.5 ounces	CST
Plug-In 2	3 ounce Crowsfoot E-Glass 1.4 ounce Plain E-Glass Carbon Fiber Spar Cap Balsa/Plywood Spar System	16 ounces	Weston
Plug-In 3	3.2 UniWeb Carbon Fiber 1.4 ounce Plain E-Glass Rib/Subrib Spar System	15 ounces	Aerospace
Bolt-on	3 ounce Crowsfoot E-Glass 1.4 ounce Plain E-Glass Carbon Fiber Spar Cap Rib/Subrib Spar System	16 oz Center 7 oz Tips	Kennedy

Decalage, Again?

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

What a terrific day for soaring, Bunky. You should have that plane in the air chasing thermals. Instead I find you hunched over it mumbling incantations ... Oh. I stand corrected; those are definitely not incantations. I didn't realize your vocabulary extended so far in that particular direction.

Is something broken? Maybe I can help you fix it ... No. Then what's the problem? ... Your glider won't pass the @#!@% dive test no matter how hard it tries and how much you coach it. Why are you even administering that test to a plane of such doubtful heritage? ... OK, OK, I just asked.

... I sympathize. "That stuff" *[he means decalage]* is complicated. Also, pretty frustrating for us non-experts to follow the explanations and arguments and figure out who's right, isn't it?

First, there was Frank Deis' article in *RCSD* - neutral stability good. Then, hot on its heels, another *RCSD* article by Martin Simons - neutral stability not so good. And, icing the cake, an article by Hal deBolt, "A Primer on Aerodynamics", in the September issue of *Model Aviation* - neutral stability good. Then, another *RCSD* article by Frank Deis. Can't blame you for "praying" over your model - good, no good, good, - it's like follow-the-bouncing COG.

... I don't know Bunky. How can we decipher it if three very smart, experienced people don't seem to agree ... You want to take a crack at it anyway? ... Sure, we could try a very simplistic approach and see where it leads - maybe some basic concepts from Engineering Mechanics 101? ... Oh, no. Don't tell me! You took that class and you-know-who taught it. Well, snap out of your rumination, we've got other fish to fry. And it wasn't decalage that kept you spellbound, it was décolletage.

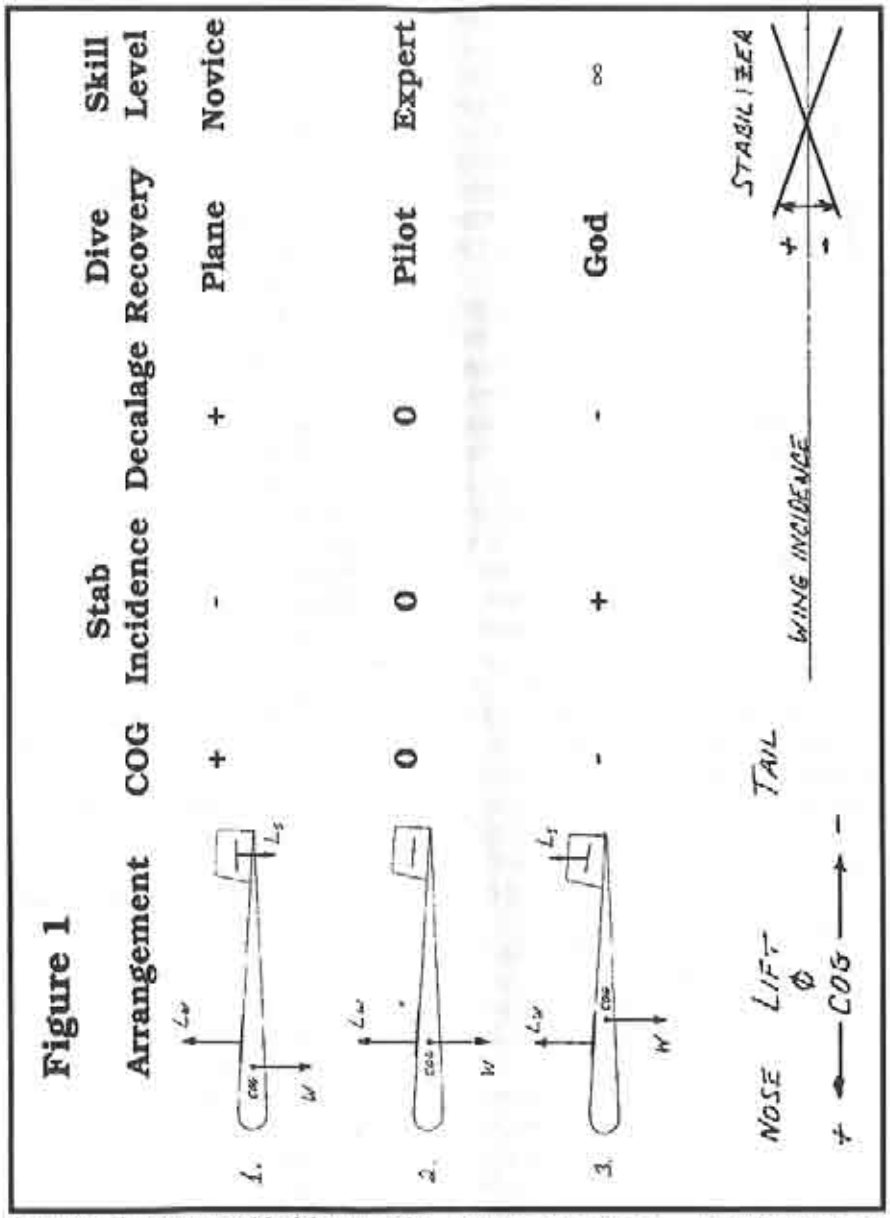
Where should we start? ... Now, why didn't I think of that Bunky? Start at the beginning. Where else indeed.

OK, then, what do we use an elevator for, Bunky? ... Yes, but, "making the plane go up and down", is a little too simple, don't you think? ... You're digressing, but correct. Several years ago general aviation pilots were told that it was the throttle that made the plane go up and down and the elevator that controlled air speed. The FAA finally settled the cacophony by saying that, "When power is fixed (e.g., full throttle), or not available (engine idled or dead), the elevator will control either speed or rate of altitude change, otherwise (variable power available) it controls altitude."

Had they only asked you, or another glider pilot, beforehand, they could have saved a lot of grief. We use the elevator basically the way the FAA said - to control altitude and airspeed. There never was a throttle to confuse the issue.

What does that have to do with decalage, neutral stability and dive testing? Hey Bunky, you're the one who diverted the conversation, not me. Why don't you answer that one? ... Close enough, I'll go along with that. If the elevator fulfills its function, if it controls altitude and airspeed the way you want, then chances are you needn't worry about those things. And, well designed kits, built carefully to spec, will usually perform quite nicely for average pilots like us.

But if, when coming out of a dive, your plane acts like an exuberant porpoise, or if it reacts strangely to elevator commands, then you need to understand



how to adjust it to get rid of those quirks. And it would be a good idea to understand the effects of the adjustments or you may not have to worry about them until you pick out your next kit.

Now, let's see if we can simplify things.

Try this. Picture a glider that's on a perfect glide path in calm air. If we could follow alongside it ... right Bunky, just like Superman - the glider would appear to be motionless. Which means that all of the forces acting on the plane - wing lift, stabilizer lift and gravity being the ones we're interested in - balance each other. This is called equilibrium.

... I don't know who owns the glider ...

OK, let's agree it's Superman's glider. Can we move along? ... Thanks.

Do you remember, Bunky, that a physical body, such as a plane's fuselage, can be in equilibrium when acted on by three forces only if each force exactly counteracts the combined effects of the other two? ... No, that's alright, remembering after I reminded you is just as good as remembering.

To be a little more exact about it, equilibrium exists when the sum of the moments of the forces about any arbitrary point on the fuselage is zero (moment = force x distance from the arbitrary point). Even that's not an complete definition, but it'll suffice for us.

Given that, Bunky, then there are three, and ONLY three, arrangements of those forces that will keep the glider we're flying next to in equilibrium (Figure 1). With any other arrangement, the sum of the moments will not equal zero.

In arrangement one, the plane's COG is in front of the lift on the wing. This creates a moment that tries to push the nose down. Therefore, stabilizer lift must be directed downward to counteract it with a moment in the opposite direction. This is done by angling the stabilizer down so it has a negative angle of incidence.

Wing lift and gravity completely balance each other in arrangement two by acting at the same point, so stabilizer lift is unnecessary. In fact, it must be exactly zero.

Arrangement three is the converse of one. Since the COG is behind the wing lift, the moment created by these two forces tries to push the nose up. This requires the stabilizer to have a positive angle of incidence so lift on it is directed upward, producing a compensating moment in the other direction.

Have you followed this Bunky? ... Sort of? ... No, let's not proceed. You have to be sure about this part. It's the key to the whole thing.

Let's try a different tack. Imagine that instead of lift on the plane's wing there is an invisible string holding it up and it's attached right where lift normally acts ... No, I don't know where the other end is tied. Maybe to a skyhook ... No? ... Good grief. OK, he owns the darn thing, so he's holding the invisible string. Can we get serious now?

... That's better. It is like when you balance your plane to get the COG at the right spot. When the COG is in front of the invisible string, the plane will hang nose down unless something pushes down on the plane's tail to keep it level. That's what stabilizer lift does. And if the COG is behind the string, the plane hangs nose up unless stabilizer lift pushes up on the tail.

... Of course strings can't be used to push things! If it'll make you happier, I'll say stabilizer lift is like a string pulling the tail up or down.

... You think it's clear now? ... Good.

... Yes! We're finished with it; he can have his plane back now... and his invisible string too.

... You're right Bunky, the third arrangement is the one you want to avoid ... You're not sure what's wrong with it?

Nothing would be wrong with it if the forces acting on the plane never changed. But remember that lift is a function of airspeed - higher speed, more lift; lower speed, less lift. And, it's changes in stabilizer lift that are of concern because their effect is magnified by the stabilizer's long moment arm - its distance from the other forces gives it much more leverage.

Ask yourself what happens to a plane set up like that when you give it down elevator ... You've got it. Down elevator adds to the already positive lift on the stabilizer, pitching the plane's nose down, causing it to speed up, which adds even more stabilizer lift, which adds more pitch, which adds more speed, which...

If you really want to challenge your flying skills and find out just how bullet-

proof your radio gear is, that's the configuration for you, Bunky.

The problem with this one is that the dynamic forces on the elevator caused by pitch/speed changes are in the same direction as the elevator force applied to achieve the change - they reinforce the control movement. In electronics, this is known as runaway positive feedback - what happens to a P'A system when the speakers are located too close to the microphone.

... How can we say a plane balanced like this is in equilibrium? Because, Bunky, there are different states of equilibrium ... not those kind of states, Bunky, they don't have capitals! And if you keep this up, we'll never get to do any flying today.

This particular equilibrium state is called "unstable equilibrium". It's like a marble balanced on top of a dome. If nothing bothers it, it stays put. But the least little disturbance and ... Right, you've lost your marble (some of us only have one left to lose, too).

The second arrangement is the neutral stability one: wing lift and gravity are directly opposed, so there's no need for any compensating lift at the stabilizer... Yes, this is the one Martin Simons said is flyable but twitchy. Little wonder, it's right at the hairy edge of unstable equilibrium. In this case, when given down elevator, the plane will do as expected, but the elevator stick has to be returned to neutral as soon as the plane reaches the intended dive angle or it will continue into an ever steepening dive. Slightly dangerous.

The first arrangement is the traditional one. When down elevator is applied, it reduces the lift pushing down on the stabilizer. The plane pitches nose down and picks up speed which increases the lift pushing down on the stabilizer.

In this case, the dynamic forces on the stabilizer oppose the control force - the equivalent of a negative feedback circuit that compensates for, rather than reinforces, changes. With this arrangement the elevator has to be held down to continue the dive; return it to neutral, and the plane will recover from the dive, assuming it has enough altitude. The degree of recovery and how quickly it occurs depends on how far forward the COG is and the stabilizer incidence angle.

This is the arrangement you and I have been using, Bunky, whether we understood it or not; we should stick with it and leave neutral stability to those who fly in the Nats ... "fly in the Nats," Bunky, not "fly gnats".

... It does seem counter-intuitive that adding weight to the plane's nose (moving the COG forward) makes it pull out of a dive. Maybe that's because most of us, without realizing it, got our introduction to this subject with dime-store balsa gliders. Remember those? Move the wing forward (same as COG back) and the glider looped. Move the wing back (COG forward), and the plane usually augured-in.

The difference with those was that their stabilizer angle was fixed, and trim adjustment was accomplished by altering the wing lift-COG moment (by shifting wing lift back and forth).

You could use the an equivalent approach and get the same results on an RC glider, Bunky, by moving the COG forward/back while ignoring stabilizer trim. This is the extent of what some people do to "correct" "nose heavy" or "tail heavy" planes. The problem with it is that it doesn't optimize the plane; it doesn't yield the best combination of weight, trim and stability.

Well? Did we succeed? Do you have any better understanding now of what this is all about? ... Good, because I don't think we can simplify it any more than we already have.

... No, we didn't overlook anything ... True, we never used the word "decalage", but that's only a name for the stabilizer's

incidence angle relative to the wing's, and we talked about it in those terms instead.

... Pitching moment? That one we avoided ... Why? Because it really would have made it more difficult to get to the essence of the relationship between decalage and the COG. But now that we have a better grasp of that, we can look at pitching moment:

- It has the same effect as placing the COG in front of wing lift (arrangement 1) - it tries to rotate, or pitch, the plane nose down. It has this effect no matter how the other forces are arranged.

- To explicitly account for it in any of the three arrangements, the COG would have to be further back for equilibrium. E.g., the COG would actually be behind wing lift for neutral stability.

- It varies with airspeed (just as the other aerodynamic forces do): the higher the speed, the greater the pitching moment.

- There is no arrangement of the other forces that can compensate for its variation at all airspeeds, which suggests that true neutral stability is possible only at one airspeed.

Anything else?

... Sure Bunky, we can summarize what's involved in adjusting decalage and the COG:

- Start with a positive decalage angle and a forward COG.

- Adding weight to the nose moves the COG forward. This normally requires more "up elevator" trim on the stabilizer (i.e. more positive decalage).

- Removing nose-weight moves the COG back. This normally requires more "down elevator" trim (less positive decalage).

- Fly the plane and trim the elevator for a satisfactory glide angle with a neutral elevator stick.

- Use the dive test to evaluate the new COG-decalage "settings". Too fast a recovery from the dive means the COG is too far forward, and vice-versa. You are the one who decides when your plane has passed the "@#!@% dive test".

- After it has passed, adjust the elevator pushrod so the elevator is trimmed to its new angle when the transmitter trim lever is in neutral.

- If your plane has a fixed stabilizer (w/ elevator) and you don't want to use the elevator to set the decalage angle, then you will need to change the angle of either the wing or the stab.

... Uh-huh, that's all. But it can take several iterations and a lot of patience to get it "right". Just don't be heavy-handed with the adjustments. Small ones are safer. And Bunky, make one of those simple gadgets for checking the COG. Your fingers are not exactly precision measuring instruments.

... No, don't waste your money on a forty-dollar, light-weight, state-of-the-art, precision-machined, battery-operated (but not included), digital incidence angle meter with an LCD read-out. You're an engineer. You have a calculator that can do trig functions, right? ... No! ... You're still using that beat-up old K&E slide rule! That's you Bunky, high tech all the way. No real problem. You can still do it:

- Mount the wing on the plane. Put the plane on your building board so it's flat and stable (it may need a temporary cradle because of the toe-hook or if it has a rounded fuselage).

- Measure the height of the wing's TE near the fuselage. Subtract it from the height of the exact L.E. Divide the result by the wing chord at the point of measurement. The result is the Sine of the wing's incidence angle (relative to the building board). Find the angle with your slide rule (normal people can use a calculator).

- Do the same for the stabilizer. If the plane has an elevator, make sure it's in its trimmed position.

- Then, decalage angle = wing incidence angle - stabilizer incidence angle.

An alternative, if you're handy, is to build your own incidence angle meter. Check your back issues of *RCSD* - there was an article in one of them that showed how.

... Who was right? Bunky, I'm not sure there's a binary answer to that question. Maybe, as Frank Deis suggested, it's partially a semantics issue. Remember that all the planes herated as satisfactorily trimmed had positive decalage angles. That suggests that technically they aren't neutrally stable, but he placed them in that category because of their flight characteristics.

... Of course not. Even with his (he's on Superman again) help we didn't do anything more than try to educate ourselves in the very basic concepts involved. You're just going to have to accept the fact that not every debate has a winner and loser.

Consider this Bunky. If Frank Deis hadn't written his article, then Martin Simons wouldn't have written his, etc., you and I wouldn't be having this conversation (everything has its downside) and we'd still be in the dark about this subject ... That makes you feel much better because you're afraid of the dark. I didn't realize that Bunky and I'm really glad you chose to share that little secret with me.

Anyway Bunky, the reason we're no longer in the dark, the reason you don't have to be afraid, is that there are people who are willing to share their thoughts and ideas and debate their merits. That helps us all learn.

... Sorry. But you asked, and you know I never leave home without my soapbox.

Uh oh. What book did you get those incantations from, Bunky? Did you realize the power you were wielding? If that cloud were any darker, I'd trade my soapbox in for a judgment-day-is-here sign. Thanks a lot. I'm much happier having spent the afternoon jawing with you instead of wasting it in the air. Let's pack up and get out of here before we get toasted or drowned... ■

By the way, Bunky is a fictitious character called up on occasion to explain one or more aspects of R/C sailplane flight, and Martin says, "He's got it right!" ED. ■

Spalinger S-18-II modeled in 1:4.5 scale from 3-views in "The World's Vintage Sailplanes" by Martin Simons. This particular model was modified from the original by Willi Schwarzenbach (Switzerland) by lowering the wing pylon and modifying the cockpit canopy (less drag). Scale model designed and built by Gerry Knight and held in this photograph by Cliff Whybra of Nigara Falls, Ontario.

Spalinger S 18-II

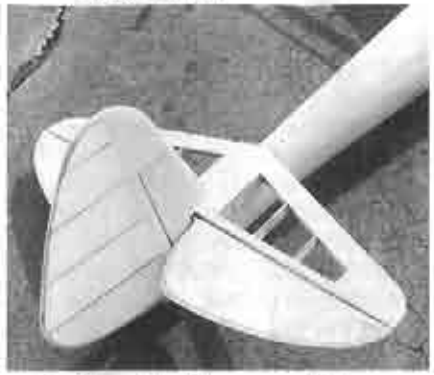
...by Gerald Knight
St. Catharines, Ontario, Canada

(This is an update to the letter by Gerry that was printed in the February, 1992 issue of *RCSD*, page 4.)

My own design, Spalinger S 18-II, I got from 3-views from Martin Simons' book "Vintage Sailplanes".

After several mishaps due to learning experiences, the sailplane now is trimmed out nicely, and the tip stalling has been rectified not by changes in the wing tips, but by adding nose weight to bring the CG further forward and flying the bird faster. Incidentally, the airfoil for this sailplane is a Wortmann FX-1261 as opposed to the original Gö 535. I did as on the full size and blended the FX-1261 to a thin symmetrical section with washout to give the effect of a dihedral at the tips as on the original. This dihedral is only an illusion but certainly is unique in the air.

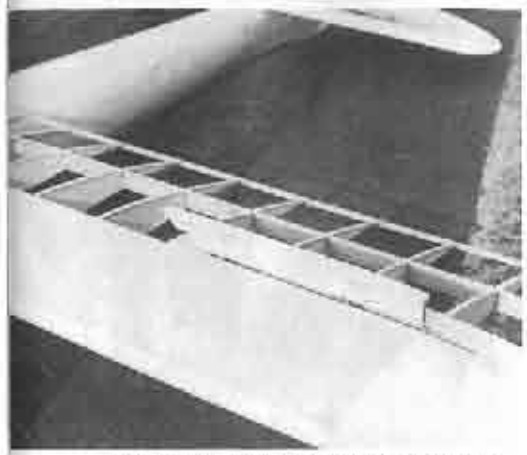
The August issue of RCSD has articles by Martin Simons (page 54) and Bruce Abell (page 29) wherein they're discussing the take-off characteristics of scale birds. Note that both planes are gull winged as is my Spalinger. We have individually discovered, probably by accident, that these ships have to take off fast. All these ships evidently take off from the ground. By trial and error I found, with the Spalinger, that even a notch or two of "down" elevator helps until the sailplane is well and truly moving. Once on the launch and reasonably high, I feed in trim to "neutral" or a couple of clicks of "up". It seems the windier the better, within reason. Once off the high-start or winch, I can put in maybe another 2 notches of "up" to get a beautiful flat and fast glide, which eliminates any tip stalling tendencies. As



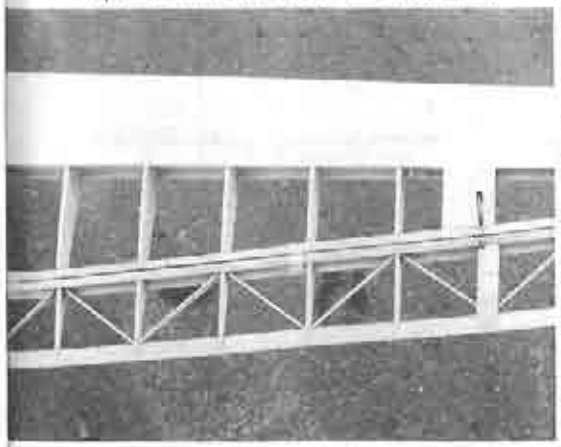
Rudder and tailplane assembly in one piece. Keyed and one bolt to rear of fuselage. Note that all ribs are stained to simulate spruce originals. Covering is "Solartex" antique with a coat of clear or "Glasscoat".

Scale	1:4.5
Wing Span	125" approximately
Area	1125 Sq. In.
Controls	Rudder, Elevator, Ailerons, Releasable tow hooks for Aerotow and winch launches. Also, has home made scale spoilers. (5 channels)
Radio	Futaba 7 channel FG series FM (gold case)

Wing root - section, Wortmann FX-1261. Note the two wing rods vertically mounted at the main spar. Since this picture was taken, the aileron servos were installed - one in each wing. The spoiler servo is in the fuselage. Wings are retained to fuselage pylon by big elastic bands. All my big birds have the dual vertical wing rod system which is very strong (and successful).



Shows home made scale spoilers (top of wing, only). Note the curved top to conform to the gull dihedral break. Spoilers made with 1/16" bass wood sheet.



Outer wing panel showing aileron. The Wortmann FX-1261 has a very thin trailing edge which was difficult to maintain, but can be done. The cap strips at the T.E. bear most of the T.E. load.

Bruce Abell points out, speed is of the essence in these types of soarers.

I fly from the ground using uncoupled aileron and rudder. On the launch, the main control always is rudder until released. This method is used on high-start and winch launches. On aerotow, ailerons are the main control to keep wings level on take off.

Once released, I switch to coupled aileron/rudder which gives lovely coordinated turns with just a touch of "up".

I also fly a 1/4 scale ASK-18 which now has to be 7 or 8 years old and find that the aforementioned tip stalling tendencies do not exist. This plane is too heavy for all but the strongest winch, therefore most flying now is on aerotow. I think the gull winged ships need to be flown in a much more cautious manner, probably because of the lack of outer panel dihedral. (Some types even have a degree or two of anhedral.)

Personally, I'm sorry only that I designed the Spalinger at 1:4.5 scale; I should have done it in 1/4 scale. It flies superbly, and I often wonder what that extra bit of wing span/area would do for it.

Next project? Ah well, maybe an Olympia 26 or a Scheibe Motor Glider. I like the big ones. They fly well and look fantastic in the air.

Incidentally, we are aerotowing now. Have three tow planes as I mentioned before and are getting quite proficient at it. It's a learning process. ■

on the Wing

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

Overview With Transmitter

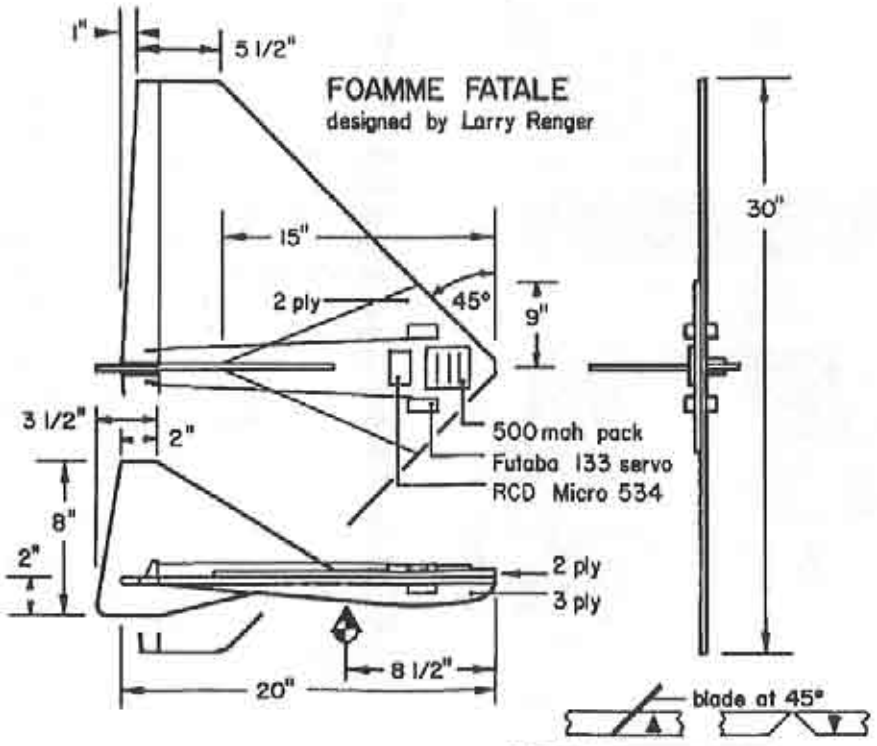
Larry Renger's
"FOAMME FATALE"

Build and fly a slope ship in one day, including travel time!

Now that we have your attention, we will tell you "Foamme Fatale" is a fun to fly tailless creation from the fertile mind of Larry Renger. Constructed of foam board with hot melt glue and tape, this little soarer builds rapidly and can take a lot of abuse.

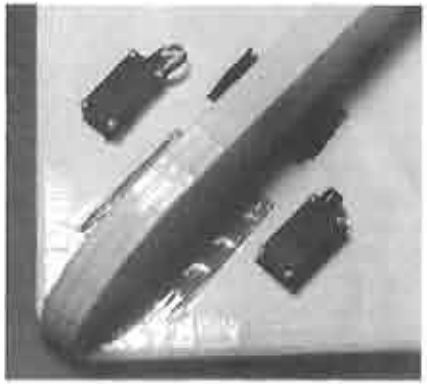
You can also build this 30" span cutie from cardboard, but as Larry says, "Cardboarde Fatale" doesn't quite do it.

"Foamme Fatale" rolls easily, but due to a low terminal velocity will not loop. Still, one most likely could not find an RC 'ship with a higher fun to cost ratio. Build one (or several) tonight! ■



ELEVON CUTTING HINT

Radio Installation - Upper View



Radio Installation - Lower View

Instructions

1. Lay everything out to minimize waste. You can get it all on 1 1/2 sheets of foam core.

2. Cut everything out with a straight edge and a new #11 X-Acto blade. Hint: Hold the blade at a 45° angle while cutting the elevon hinge line, then switch them side for side.

3. The entire model is glued together with hot melt glue. Use clear tape top and bottom for hinges.

4. Position the RC gear to get the proper CG, then inlet into the foam. Tape in place as needed.

5. Reinforce the leading edge of the wing and the lower fuselage with 'glass package strapping tape.

6. Arrange linkages for 3/32" "up", then set controls to get about 3/8" each way on aileron, and 1/4" on elevator.

7. Go throw it off a cliff!

Product Review

Anabatic Aircraft's Anabat Trainer

...by Yesso J. Tekerian
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The Anabat series of slope soaring sailplanes represents a brilliantly unorthodox concept in terms of construction techniques, materials, aerodynamics, and even aesthetics. Its amazing flight performance belies its homely appearance and will endear itself to the toughest critic.

A balsa purist may be more than a little taken aback on discovering that the primary construction materials are a light foam or "expanded polystyrene" and a 3 mil thick "Scotch" industrial tape. To alleviate some wood dependency withdrawal anxiety, one is relieved to find that the well-packaged kit also contains balsa aileron stock and balsa sheet for the empennage, and some spruce spar and longeron strips. Last but not least is a fifteen page instruction book which is one of the most comprehensive and well-written documents that I have come across.

The Anabat Trainer is a primary elevator and aileron ship that is intended to help beginners and intermediate fliers develop basic flight and aerobatic skills. In my case, I was looking for something to help me transition from the rudder-elevator mode to ailerons and basic aerobatics. I can honestly say that the Anabat is an unqualified success where other aileron ships left me frustrated and wondering whether I would ever master aerobatic flight. My Anabat was the genie that flew out of the box and proceeded to show me the way. I shall have more on its flight characteristics, later.

Construction starts by reading the complete and informatively entertaining instruction manual. I encourage builders to follow it to the letter as this will ensure the shortest building time and obviate any mistakes due to the unusual construction techniques. Once the spars have been glued into their pre-grooved slots, the pre-cut wing is covered by the special tape in a logically thought-out sequence. The full span ailerons are hinged to the wing using the same tape applied to the top and bottom of the assembly with an elegant and foolproof spacing technique that I have not seen before. This method of hinging is as simple as it is strong, gapless, and aerodynamically clean. I intend to use this method for all future hinges.

The completed wing ends up being quite tough as the foam/tape construction forms a stressed skin monocoque structure. Its toughness was proven on many occasions at the slope where some less-than-perfect landings would have "re-kitted" any conventional built-up wing.

The pre-cut fuselage is constructed in similar fashion to the wing and the whole entity is assembled with silicone sealant (caulking compound). This is another uncommon technique that adds to the plane's resiliency. Inclement encounter with *terra firma* do not bother the Anabat and if a crash is severe enough to displace the wing or stab, a little silicone sealant soon puts things right.

Radio installation and linkage hook-up are surprisingly simple. The exposed control rods may appear ungainly, but they are precise and accessible. The plane can be balanced without the addition of any dead weight and my Anabat tipped the scales at twelve ounces with a pair of *'Airtronics 94501'* micro servos and a 250 mah battery pack.

Total construction time from box opening to pre-flight adjustment was just shy of seven hours. This kit is definitely recommended for those who prefer flying to building. Everything is straight forward, and the instructions are explicit enough for a novice.

The Anabat will fly in 6 to 30 mph winds and, properly trimmed, literally flies itself. It has no difficulty penetrating strong winds and there is no need for ballast. Thanks to its symmetrical airfoil, it flies as well inverted as it does upright. The generous ailerons make rolls trivial to fly and, because it is so easy to fly, it inspires confidence in aerial maneuvers that one would shun with a fancier ship. Crisp four point rolls are the norm rather than the exception. The Anabat certainly inspires confidence in me and I can honestly say that it advanced my skills.

The heart of the Anabat is its unusual wing section. Designer Jef Raskin plied his computer to create and then empirically tested the WE3008 symmetrical airfoil which is only 8% thick. It is curved to about 50% of the cord after which it is perfectly straight. This makes it easy to build a truly flat wing. This plane is as comfortable in "Gentle Lady" weather as it is in high winds. It can be flown as slowly as you please without any nasty tip stalling. When the stubby wings stop flying, it just stalls gently and straight ahead. In capable hands, I have seen the Anabat perform vertical rolls and its precise aerobatic capability is reminiscent of a powered pattern ship. I have also seen one win an aerobatic competition against many better-known aerobatic planes.

The Anabat Trainer with reduced control throws has stable flight characteristics that make it a good primary tutor. With increased throws, it becomes an experts' aerobatic delight. Given its modest price, simplicity, ease of construction, and exhilarating performance, the Anabat is a winner. Nothing translates foam, tape and a bit of balsa into such spectacular fun. ■ Yesso Tekerian is the President of the San Francisco Vultures model airplane club, now in its 54th year of continuous operation. The club's members primarily fly sailplanes with a bit of electric RC and free-flight for variety. Yesso, when not flying models, manages aircraft maintenance for United Airlines. ■ For additional information or help regarding the Anabats, Jef Raskin can be reached at Eight Cypsy Hill Road, Pacifica, California 94044; (415) 359-8588 or FAX (415) 359-9767. ■

Jef Raskin received the following from Jonathan M. Collins: "Dear Jef: I wrote this for our club newsletter. If you can use any of it, go ahead. We love the planes." (signed) Jonathan

Anabat Combat & Anabat 2

The Anabats are a bit different than any slope soaring sailplane I've ever seen, and quite spectacular in their flying performance. Since this review covers two kits, I will start out with what they have in common and then go on to the differences between them. I'll save the best part, the flying, for the end.

All the Anabats were designed to fly aerobatically. As far as I know they are the only conventionally-configured sailplane kits made in the U.S. that have fully symmetrical airfoils. This gives them outstanding performance in inverted flight and outside maneuvers. The surprise is that they seem to fly as well as more conventional airfoils when in upright flight. The planes all use designer Jef Raskin's WE3008 foil, which I will talk about in awhile.

Another shared attribute is their unique and fast construction techniques: the fuselage and wing are each

made from 1 lb. / cu. ft. white foam. Each is grooved for two 1/4" X 3/32" spruce spars (in the wing) or longerons (in the fuselage). After gluing the spruce parts in place with odorless CA, a structural tape (very similar to Scotch 355, a rather stiff 3 mil tape) is applied in what seems a careful sequence to form a stressed-skin monocoque structure. This special tape is provided with the kit, it forms both the structure and the covering. No further covering material is required.

As a result of these construction methods, an Anabat builds quickly. Anabatic Aircraft claims a four to ten hour building time. I did my first in six hours and the others went a bit faster, so I'd say their claim is a fair one. Another result of the building technique is that the plane does not have the slick appearance I've become used to in my sailplanes. Though their aerodynamics are good, the Anabats look a bit crude. Some trim Monokote and a few strips of colored tape help, but these planes won't win any beauty contests. Fortunately, they fly better than they look, and there's no competitive models to choose from, though I suspect other manufacturers will jump on the bandwagon once they see how these birds fly.

The instruction manuals are complete, well-written, clear, and full of detail drawings. They come close to the standard set by Carl Goldberg's recent kits or the Mid west Success Series. They don't look like they were produced by a small company, are professional and even fun to read. The novel method that Anabatic Aircraft has devised for making smooth-working, sealed hinges is praiseworthy. It takes only a few seconds and you get perfect hinges every time. The kit contains more of the covering and hinging tape than you need, so you can make hinges for a few other models with the left-overs.

Another technique that I learned from building the Anabats is the use of silicone caulking compound for attaching the empennage (of 3/32" balsa) to the fuselage. It is stiff enough to not shift in flight, but has some give that helps match the stiffness of the balsa parts to the softness of the styrofoam. The silicone plus the foam-and-spruce-and-tape construction makes all the Anabats quite tough. Most crashes that would crack fiberglass or smash balsa leave the Anabat ready for more flying. The plane was clearly made to survive hard slope landings. I've since used caulking on some of my more conventional models. It's easy, you cover the entire surface, and then just glue covering-to-covering. (The covering had better be firmly adhered.)

The Anabats are smaller than what I am used to flying. They span only 36", weigh about 13 oz. all up, and this worried me at first. My worries were wrong. The planes fly smoothly and have reasonable vertical penetration; you can get a full upward roll and still have enough energy to do a hammerhead at the top. The small size means that you can carry them in one piece in the car and they will fly at tiny sites. It also means that if I try to fly out to some lifts spots I use with my bigger planes, they disappear. You have to fly them in close. Their low weight and kinetic energy means that you can set them down on a dime. On speaking to Raskin on the phone, he advised me to not ballast the planes for high winds. I was pretty sure he was off base, but I flew on a day with measured 38 mph winds and he was right. The plane moved right out and I had an aerobatic ball with it. Some pilots of larger, heavier planes were sitting it out, waiting for the winds to back off. They were amazed at what the Anabat 2 could do in those conditions. I have also flown the plane in winds as light as seven or eight mph. Since the wing is symmetrical, if it will fly upright, it will fly inverted and I could practice aerobatics in winds that no other aerobatic plane I have owned could even stay up in.

The models are not all that different from one another. I haven't flown combat, but it looks like it would be fun. The rules are printed in the instructions. The Combat plane is shorter than the other Anabats, has an F-18-ish twin tail and a thicker fuselage (to better survive combat). The plane is actually easier to build than the other models in the series and can fly up a storm. As their catalog says, it is for combat and hot dogging. Like all the Anabats, if you crank up the aileron throws to plus and minus 30 degrees (a gage is provided) its roll rate makes it look like a propeller. It has almost no roll inertia, so rolls start and stop sharply; four and eight-point rolls are easy. There aren't many slope fliers around here, so I will have to wait to see how this plane takes to real combat.

The Anabat 2 is for two-channel radios but I added rudder, which was easy to do since the linkages (as on all the Anabats) are external. This looks draggy to me, but the plane flies fine and it is easy to adjust. Without rudder this plane is advertised as a first precision aerobatic ship, and it handles much like a .40-powered fun flier. It does rolls and loops easily and it has plenty of control authority so that you can fly it through maneuvers. With rudder (and I don't see why they didn't put instructions for how to add a rudder in the manual) it can do inside and outside snaps, spins, hammerheads and even brief knife-edge flight. That symmetrical airfoil is something else. All the curve is up front. From about halfway back to the trailing edge it is a dead straight line. Raskin tells me that the full size German aerobatic Extras, which are popular as a subject for models, have similar airfoils. This straight area makes it easy to line up the ailerons and also makes it easy to make sure the wing is flat. It is 8% thick, which is pretty thin but it doesn't have any nasty stall. In fact, you can slow it down as much as you want (with the rudder straight) and it won't snap on you at all, it stalls dead ahead and gently.

The Anabats are nearly indestructible, easy-to-build, low cost (especially since you don't have to buy covering), and fantastically aerobatic slope soarers. Nothing is better for improving your skills as a pilot. Nothing is like an Anabat. It is pure joy in the air and more fun to fly than anything I've owned, and that's a lot of airplanes. ■

The RG-15 Thermal Eagle

...by Geoff Drought
El Dorado Silent Flyers
6161 Hazelbrook Ave.
Lakewood, California 90712

I had been thinking about my next glider for awhile and, when someone turned a transmitter on in the pits while I was launching, it became more than an academic exercise. My thoughts had been running in the direction of Flite Lite Composite's Falcon 880 but I felt a few calls to other manufacturers and distributors would be prudent to get a better handle on what was available in the current marketplace. After quite a few calls and a lot of questions about weight, performance, price and delivery time I ended up on the phone with Ron Vann, the new owner of Flite Lite Composites, fully intending to order a Falcon. After a few questions about the Falcon, I innocently asked Ron how the Thermal Eagle was coming along and suddenly was hearing a description of the "greatest Thermal Duration Sailplane ever". Ron informed me that they are using the RG-15 airfoil and have the weight down to 60 oz. and it flies like a dream. After he mentioned that he and Mark Allen would be flying T.E.s at Visalia I realized that I was now giving Ron information, like name and address. As soon as I hung up I started looking for the UPS man and Ron was true to his word, a week later I had a large box of very well made glider pieces.

Being in a hurry to get back in the air with a competitive airplane, I had ordered the pre-sheeted wings and one look at the Obechi sheeted beauties nestled in those foam core beds told me I had made the right decision. A look over the plans told me that there shouldn't be any problems going up on our rather robust club winches. The Thermal Eagle uses a 3/8 balsa spar with heavy glass shearwebs and 1 inch wide carbon fiber top and bottom, double layered 8 inches out at the inboard ends and the wing rod tube rests on hardwood blocks at both ends. The leading edge and flap and aileron facings are bass wood and there is a strip of carbon fiber sandwiched in the trailing edge making them strong and arrow straight. The only change I made on the wing was to inlay a piece of 1/64 ply into the trailing edge of the balsa tip blocks to try and cut down on hanger rash. The stab halves are Obechi sheeted foam also and as well made as the wings and LIGHT! The fuselage is molded glass with kevlar reinforcing the full length and very few pin holes and very SKINNY. Plan your radio installation beforehand; there is no room to move things around. I cast my nose weight to fit the nose and I don't think I could have gotten enough lead shot into the area I had available. I won't go into construction details as there isn't that much to do; it's mainly installation and finishing, and anyone building this bird has done a few before.

I had planned to use a clear finish on the wings to keep the weight down and not cover up that beautiful Obechi, but after trying to keep track of a few natural finish ships in the air, I opted for a more visible finish. I have trouble flying a glider I can't see and this one has the ability to cover a lot of ground. I've gotten tired of ironing down wrinkles so I went with a painted finish. Use whatever works best for you but keep it light. Don't try to fill the grain on Obechi with primer - too heavy. A system that works out well for me is to thin out light spackle with a little water and trowel it on, let it dry a couple of minutes and then scrape it off with an old credit card at a 45 degree angle to the grain. After the spackle dries, sand down to the surface and apply a light coat of Behr Water Base Sanding Sealer. Sand down to the surface again with 220 paper and then spray on a GOOD lacquer base sandable primer. I say a good primer because you want to be able to sand it all off and the cheap primers don't sand well. I use U.S. Chemicals Lacquer Primer Surfacer and it works great. For the finish coat I use Illinois Bronze Epoxy Spray; at the price of thinner now days spray cans are almost cheaper than the thinner to clean out the gun and so much easier. The IB Epoxy has a good nozzle and gives a good finish that is durable and relatively light. I went with white for the fuselage and top surfaces and dark red on the underside of the wings and stab and my Thermal Eagle is about as visible as a skinny airplane can be. I didn't match Ron's 60 oz. mark; mine came in at 66 oz. I'm sure 60 ounces is achievable, but I used Futaba 9601 servos in the wing instead of micros and 5101's in the fuse which added a couple of ounces and the painted finish added two or three.

How does it fly? It's got about 5 hours in the air now and I'm in love. I can unequivocally say this is the best flying sailplane I have ever flown. I'm in a wheelchair so launching ease is high on my priority list. I've only had someone else launch it once (the first flight) and he fell off the pedal at about 50 feet, no sweat, shoved the nose down and came around for a normal landing. It doesn't require tons of line tension or javelin type throws. At its light weight it accelerates instantly and goes up like it's on rails. I'm using the same flap and aileron settings (7 degrees flap and 3.5 degrees aileron) on launch as I use for thermaling with 12% up elevator. It zooms with the best of them although at the lighter weight it doesn't have quite as much energy to give back as some. Once in the air the L/D at cruising speed is phenomenal and when I get an indication of lift I'll usually make one circle at cruising speed with the wing clean; if it's not worth working just continue merrily on with energy intact, but if it is worthwhile, drop the flaps and instantly convert that energy to altitude and the Thermal Eagle becomes the most docile thermal machine you've seen. With the flaps down, speed seems to be cut by about a third with almost no pitch change and the handling is a dream. It'll make big lazy flat turns in light lift like a Paragon but stand up on a wingtip to core a tiny thermal with no tendency to tip stall. I've worked thermals with up to a 60 degree bank and have yet to see a tip stall and I'm not aware of applying any opposite aileron to counteract over-banking. It rolls from shallow to steep and into opposite banks with the fuselage on the proverbial rails. It simply handles like a dream. When you suck the flaps up to go hunting for another boomer there's no sink or pitch change; it just accelerates. Landings have suddenly gotten easier. The amazing L/D lets you look a lot longer and when you roll out on final and drop the flaps it just drops the nose, slows to a walk and homes in on the tape. In my first contest with it I decided at 3 min 30 sec to go for 4 minutes and I was at the other end of the field (about 1/4 mile away) at about 150 feet in heavy sink. My time ended up 3 min 59.85 sec and I was 2 inches off the pin, a 1000 point round and I'm not that good a pilot.

I'm using a Futaba Super 7 so I can't give you Vision drivers any settings but my travels and locations are: CG aft limit shown on plans, tow hook as shown on plans, rudder 3/4" each way, ailerons 1/2" up 1/4" down, stab 1/2" up and down, thermal and launch flaps 1/4" down, ailerons 1/8" down, landing flaps 90 degrees and no crow. (Doesn't seem to need it, but I'll play around with it later.) As I said earlier, my weight came out at 66 oz. which gives a wing loading of 10.3 oz./sq. ft.

Would I recommend the Thermal Eagle with the RG-15 to others? You bet, to anyone I'm not flying against in contests. I'm just starting to really get the feel of the airplane, but already I feel completely comfortable flying it. The new airplane sweaty palms went away after the first flight. I'm already thinking about my next glider, another Thermal Eagle as a back-up for this one. I can't imagine going back to anything else. Thanks, Ron Vann and Mark Allen. ■

Dad, what's a Chuperosa?

A conversation with Stan and his four year old son, Alex:

Well, it's the smallest in a family of high quality sailplanes offered by Uncle Sal and Dad at Northeast Sailplane Products.

Family? Do sailplanes have brothers and sisters?

Umm, sort of. I guess that you could call the open-class Alcyone the Dad, and the Alcyone 2-meter the big brother.. The new Dove could be thought of as the Chuperosa's sister. It's really a 2-meter Chuperosa with a beautiful fiberglass fuselage.

Is there a Mom? Why are they a family?

Oh, they have a Mom. The open-class Alcyone with the fiberglass fuse is the Mom, and the wood fuse version is the Dad. The real reason they are a family is that they all feature the same high level of kit quality, design excellence, and superb flight performance.

Is there a dog?

No Alex, there are no dogs in this family. The flight performance of the Alcyones, Chuperosas, and Dove is outstanding. The airfoil that Uncle Sal designed into the Alcyone works especially well. Its 7032-7037 trans-foil thermals very well, yet also penetrates great. The 7037-based Dove is a joy to fly, and the Chuperosa history of very high customer satisfaction speaks for itself. Couple the flight characteristics of this family with the kit quality and you have a group of sailplanes that represent super values in R/C soaring.

Do people that buy them like them?

Absolutely. People who buy sailplanes from this family have been so consistently satisfied that we offer a money-back guarantee on each purchase..even after the airplane is built. Anyone looking for a new kit who has not considered this family should give them a try. We feel confident about this because of our own experiences and the experiences of our customers over the years. People love 'em!

You sound like an adbatizement on TV, Dad.

Sorry, bud, but I get excited when I talk about these kits. It's easy to sound like an ad when you really believe in the quality of a product.

Uh huh...can we go get a Ninja Turtle video now?

Sure, pal.

Take home a member of the family. Call NSP today.

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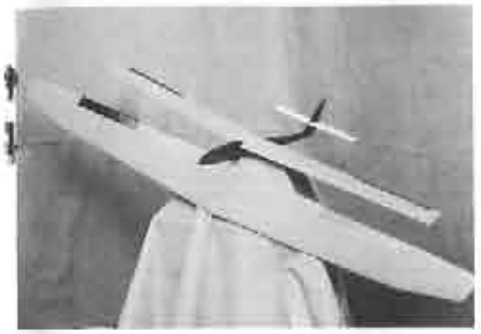

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- SD7037 or E214 airfoils
- Gentle and stable flyers
- Like two airplanes in one
- Great for slope or hand launch

Alcyone

$149.95

- Superb thermal performer
- 7032-7037 transitional airfoil
- Only requires 3 servos!
- Ailerons, Flaps, Elevator, Rudder
- Fiberglass fuse version available

Alcyone 2-Meter

$99.95

- Honey, I shrunk the Alcyone!
- Same great performance as big bro
- Standard servos are OK (only 3!)
- Takes a mean launch
- Also lots of fun on the slope

Dove

$114.95

- The latest family member
- Beauty and grace: the Dove
- 7037 2-Meter thermal ship
- Georgeous fiberglass fuse
- Easy and fun to fly

R/C Soaring Resources

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

Seminars & Workshops

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

Fall & Winter 1 day seminars on composite construction techniques. Free with purchase of Weston Acrodesign 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. Delivery in U.S.A. is $3.00 per copy. Outside U.S.A. is $6.00 per copy. Set of 8 sent UPS in U.S.A. for $75.00. Walt Seaborg, 1517 Forest Glen Road, Oregon, WI. 53575

BBS

BBS: Slope Tech, Southern California; (310) 866-0924, 8-N-1

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

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

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

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

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

Contacts & Special Interest Groups

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

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

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

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

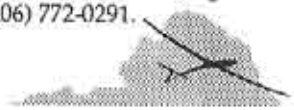
Maryland - Baltimore Area Soaring Society, Steve Pasierb (President), 21 Redare Court, Baltimore, Maryland 21234 U.S.A., (410) 661-6641.

Nevada - Las Vegas Soaring Club, Steven Smith (President), 6978 Starwood Dr., Las Vegas, Nevada 89117 U.S.A., (702) 873-9591.

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

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

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



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

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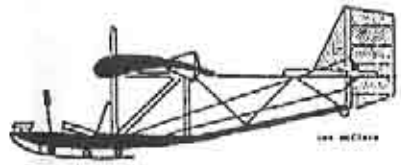
T.W.I.T.T.

(The Wing Is The Thing)

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

Send SASE for membership application and flyer: "What is T.W.I.T.T." or, send $2.00 for full information package including one back issue of our newsletter, postpaid. Full membership is $15.00 per year and includes twelve issues of the newsletter. Back issues of newsletter are $.75 each, postpaid.



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

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BLUE FOAM, COMPUTER-CUT WING CORES. Specify airfoil, root/tip cords, LE sweep, wingspan, skin thickness. Optionally: airfoil thickness %, LE/TE sizes, spar channel dimensions, washout. $20 per pair plus $5 P&P. Chris Greaves, 92 Williamson Crescent, Winnipeg, Manitoba, R3W 1E2, Canada.

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

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Multiplex ASW-22, new in box...$350.00 + Ship. Contact Scott Landers, 6845 Inwood Dr., N. Richland Hills, TX 76180; (817) 581-6508.

4.3 meter SALTO, gelcoat fuse, plug-in wing tips...asking $325.00 plus shipping. Contact Mark Foster on (213) 257-4573 Calif.

Flite Lite Composites THERMAL EAGLE, new in box, w/pre-sheeted wings & stabs...$350.00. Call John at (805) 388-5674 eve. Calif.

1/3 scale each: DG-300 & LIBELLE (each ready to fly) and SALTO (kit)...$1350.00 each. Call Dan Troxell at (714) 831-8013 before 6:00 P.M. Calif.

Muller COMET 89T, all 6 servos (Airtronics) included along with 1200 Mah receiver pack. Steep climb-out on winch, excellent roll & pylon turn characteristics, F3B proven ('92 US Team Trials back-up ship)...$750.00. Contact Manny at (714) 492-9553 So. Calif.

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FOKA-4, 1/4 scale, all glass, orange gelcoat, RG-15 airfoil, excellent condition, sale or trade for Multiplex DG-300 plus cash. Bill Liscomb at (619) 931-1438 Calif.

FALCON 600, used but not abused, w/ wing servos 2-141, 2-133, flying weight is 45 oz...$450.00 + shipping. Will be shipped in wooden box. Kraft series 80 radio system w/ 2 receivers and 8 servos on freq. 53.400 mhz...$150.00 + shipping. Call Gary at (509) 773-5257 Washington.

Wanted

Northern California CAD operator with software to do drawings for foam cutter. Possible Tech. manual. Contact George Hollidge, 338 Primrose, Pleasant Hill, CA 94523.

Software Evaluation

AFEDIT

Airfoil Compare and Edit Software for IBM PC & PS/2 Computers

...by Lee Murray
Appleton, Wisconsin

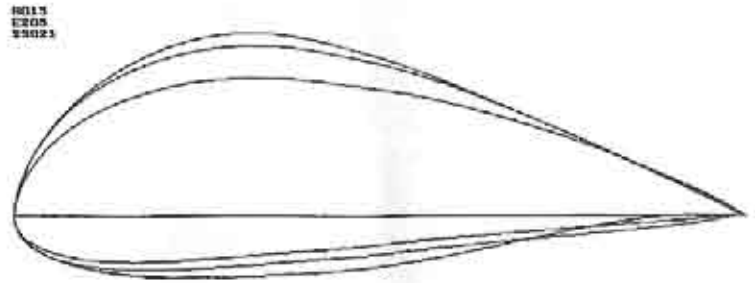
David Squires of "Hardened Wing Rod" fame also has good computer programming skills. He has been working on a program, AFEDIT, to display and compare airfoils on a computer monitor for a couple years. Dave has provided me with his development versions for my critique. Because I feel that Dave really has a valuable program, I offered to share my evaluation of his latest version which is a commercial product. This is the first program of its kind, I believe.

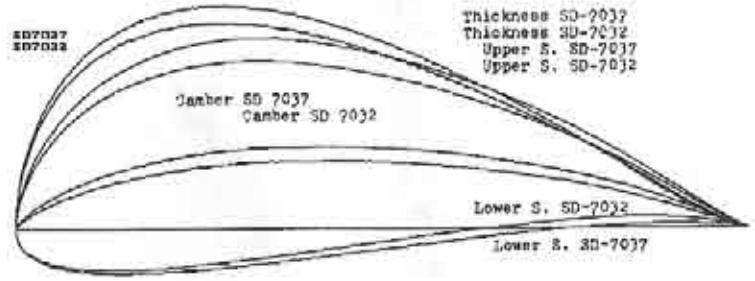
Dave's program goes far beyond the original concept and is both a useful airfoil comparison tool as well as an excellent way to modify an airfoil in numerous ways. The program would be worth its cost if only to see the changes on the screen, but it has practical aspects for putting the modified airfoils into a file format that can be read by Foiled Again or Chuck Anderson's airfoil plotting program. The entertainment and educational value will keep your eyes glued to your monitor while time runs by at an incredible pace. How many times have you said to yourself, "These airfoils look the same. What's the difference?" This is the tool that will answer those questions **and more**. The program will display the important parameters of an airfoil such as % thickness and % maximum camber along with the location of maximum thickness and camber.

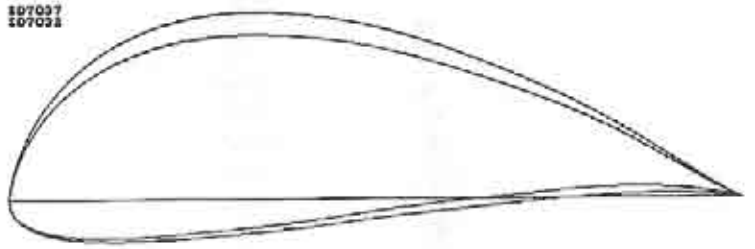
AFEDIT allows the user to load up to three different airfoils from an alphabetized list of 54 popular airfoils for examination, comparison or modification. You can do it with the blink of an eye and in different colors. Airfoils can be displayed horizontally, spaced apart or overlaid. With the resolution of the monitor, you could have difficulty in seeing small differences at normal scaling, but by expanding the airfoil vertically and/or horizontally, say 3 or 5 times (You specify a continuously variable amount.), you can observe subtle differences with ease. If you expand horizontally you can scroll over the length of the airfoil using arrow keys to see the whole airfoil. In the first example you can see the RG15, E205 and S3021 all compared with the height expanded 3X normal. The differences are easily seen. Many of you know that the S3021 is an improved E205 according to Michael Selig. Look at how the top and bottom surfaces differ. In the second example you will see SD7032 and SD7037 compared with 3X expanded height. Dave's comparisons in this example show mean camber lines as well as total thickness profiles for the airfoils. These plots are certainly educational and go hand in hand with the descriptive language that is offered in Soartech 8.

The editing features allow the user to modify camber, thickness, where the high point occurs and to mix the top of one airfoil with the bottom of another. This last feature will allow you to make an airfoil that can be built easily on a flat board by using the bottom half of the E205, or some other mostly flat bottom airfoil. These modified airfoils can be saved and then compared to ones already in the list provided.

The only difficulty I encountered was when my computer and another I used ran short of memory while computing a second set of airfoils. The error was successfully handled by the software and all I had to do was load the program again. I have also seen a few text characters get scrambled but this may be a symptom of the memory situation. I believe this is because of the several memory resident programs that I load onto my computer at start up. Dave has never seen this problem himself or with







others who examined the program. Lastly, there are no guarantees that the modified airfoils will represent an improvement in performance. That's what your job could be after using this to construct your next model. In conclusion, AFEDIT is a nice, easy to use, program and I have no reservations in recommending it to anyone interested in knowing more about airfoils. ■

AFEDIT price is $29.95 plus $3.00 S&H. For additional information, contact Dave Squires, 920 Quercus Ct., Sunnyvale, California 94086; (408) 245-8111. ■

Watermelons!

...by Rick Palmer
Springerville, Arizona

I was thinking, "Why watermelons?" when I looked over the contest announcement for Arizona versus New Mexico to be held here in Springerville. This was more of a grudge match than a contest, and the Arizona bunch (Central Arizona Soaring League - CASL) had the better of the Albuquerque bunch (Albuquerque Soaring Association - ASA) in an earlier grudge match. So, we were to be treated with watermelon at Albuquerque expense. Thanks, gang!

For me, this was to be a cussing match. Being the host, I wanted everything to be just right for all who showed up. The contest was to be a two day bit. Saturday, July 11th was to be a 10-10-10 contest or flying slope if the wind was right. Sunday, the 12th, was to be a 15 minute add-em-up and the top four scores from both teams would be used to find the winning club.

Rick Bothell & Mod. Legend

Two days before the 11th, the weather was great, calm with breezes. The conditions were just right for slope or thermal flying. But, Friday, the 10th, the monsoons came in and gave the site about 3/4 inches of rain; I was afraid the flying would be a washout. Saturday dawned and I went out to do some power flying before everyone showed up. And, who was there to greet me? Dave Thornburg. (The back of his little car contained a kiddie wading pool which contained watermelon.)

More and more people were showing up. A few gliders were being test flown. Unfortunately, a couple were destroyed. The weather was starting to change. Before the pilots meeting, the wind went a full 360 degrees. Rain and a bit of lightening hovered around Greens Peak; I didn't want to send anyone up there to slope fly, but it looked as if conditions were changing at East Ridge, my other slope site. So, at the pilots meeting, I told the gang that it would be best to stick it out at the airport for a bit until the weather was good for East

Ridge. When the wind was just right, a band of hardy fliers followed me out to the site just in time to see the rain move in and the wind stop! Just great#*%! So, more or less, Saturday was a write-off! But, we did have a good get together at the Safire Restaurant where we ate and talked real loud. Good fun stuff!

About 7:00 A.M. on Sunday morning I woke to find it raining lightly; it looked as if it might stop, soon. I was still hoping that the contest would be held. Out at the field, people were readying their gliders; the weather was getting better. I had put an ad about the contest in our local paper, and a lot of people came out from town to see what the glider flying was all about. (This in itself turned out to be a plus for me, and I'll explain, later.) The pilots meeting was held and the only groaning was over the fact that we would only be given one pop-off. The object of the contest was to fly 3 rounds of thermal duration totalling 15 minutes. Spot landings counted 100 points on each round. No round could exceed 7 minutes, or 1 point would be subtracted for each second over. No landing points could be had if you exceeded the flight time. Well, I thought things were off to a bad start when I watched Mr. Thornburg's plane pop-off the first round.

Watching others, it looked like it might come down to just luck as the winds were gusting and showing gliders the art of digging holes. Still, I had seen a few good flights. My turn came and I was able to get 1 minute and 13 seconds. I laughed it off and decided to do better next round. To calm myself, I set my glider aside and tried to do some good as a timer. It's fun and you get to cheer someone else on. The first person I timed for, Mike Harvey, was just hooking the tow up when the launch next to us did a 180 and went to ground, scaring the daylights out of me! Calm down, did I say?

By round two, the wind was up to 15 - 20 mph and the heavy ships were showing better. I got ready to launch, and Mr. Thornburg said he would time for me. I was calmer, now, and once up, I found just the right amount of lift to play with, and I still had time to talk with Thornburg. At 6 minutes, I started running for the landing. I guess I didn't pay enough attention to the amount of wind; I took both wing tips off in a cart wheel landing. Oh, well...a lesson learned.

At the end of the third round, I thought

Terry Tombaugh & Algebra 2.5

it apparent as to who might win. I was cheering for Bruce Twining of Albuquerque and our own Craig Trout from Phoenix. I knew that I could get my ship back flying if I sat down and got with it, but I wanted to watch the others fly. So I asked to use my back-up, a Guier Flying Wing. I drove back to the house to get it and was back at the field in about 5 minutes. (How many of you can do that?) I thought, "I can't give up now. Any points earned are good points. And for some reason, people seemed to like to watch it fly."

In the end, Albuquerque had the team win and the CD, Phil Gilbert, took first place overall. We will look forward to showing up the Albuquerque fliers next time.

In spite of all the wild weather and crashed gliders, no one told me that they didn't have a fun time. I think they just like getting out and flying with each other. Some did some camping, while others took in the sights such as they are. I think everyone took some time at getting wet. I ended up a tie for 12th place with Terry Tombaugh from Albuquerque. In the public relations department, I won. Why? The ad I took out in the paper...There are now two more people that want to fly gliders with me. Both are gas plane fliers, and I have now given three people their first try at R/C gliders. One of the bystanders told me how to get a wind advisory from the forest service for Greens Peak. The local EAA chapter said they would like to know when there will be another contest so that they could look into having a Pancake Breakfast for the fliers. I had been trying to find some way to be able to take some of the fliers into our football dome to do some indoor flying; someone came up and told me who to contact for that. Last, but not least, Mr. Thornburg told me about Mr. Casper who lives here in town and I had known for years.

It seems that, at one time, he worked with Harvey Bowlus. I most likely will take him out for tea to find out what he did. Of course, Mr. Casper came out to watch the flying. His words were, "I didn't know you did this kind of flying here!" I will try to get him to try a flight with one of my gliders.

Overall, it sure looks like I win!! ■

Addenda To Programming the X-347 Glider Radio

...by Tom Long
Alpharetta, Georgia

Since writing the first article which appeared in the September issue of *RCSD* (p. 32ff), a few more quirks of the X-347 radio with the glider modification have been uncovered that need to be passed along. Additionally, two other possible setups for the "Crow" or "Butterfly" switch are described which 1) allow the Crow configurations to come in progressively as the flap lever is moved, or, 2) allow the entire trailing edge of the wing to be drooped progressively for aid in thermalling.

Please refer to the X-347 Data Sheet which is included with this article; it shows the various function settings in the approximate order in which they appear while working down through the menu. It also contains notations which show where the "non-obvious" settings must be entered. The setting for **POT.7** appears just after SP: and must be set to INH. Likewise for **POT.5**. Otherwise, an inadvertent movement of the pots on the upper right of the transmitter will change your aileron and flap trims. The option to set the **FLP.PT.ADJ** occurs after the program mixes, and, as discussed below, must be set to a value other than INH.

The elevator settings for the "UP" or "DOWN" positions of the mode switch (MOS) are entered as values in Flap-Elevator Mix. But, unless the **Flap-Pot. Travel (FLP.PT.ADJ)** is set to a value greater than zero (INH), the elevator will not move. The FLP.PT.ADJ value works like a 100% throw adjustment for the MIX F-E values to work on. I suggest that you set FLP.PT.ADJ to "Trim" or 50%. This is true even though the physical Flap Pot on the top of the transmitter has been disconnected and does not function anymore.

Quirk # 2

The position of the Aileron-Rudder mix switch (MixSw) changes the behavior of the Mode Switch. Make all of your Mode Switch settings with the MixSw on (forward position) and then make sure that your Mix Switch is on whenever you use the 'up' and 'down' positions of the mode switch. In the normal or center position of the mode switch, the Aileron-Rudder mix switch behaves as it should.

Progressive Crow Configuration

Refer to the function **Mix SP:** (Butterfly/Crow mixing): "0" and "1" refer to positions of the BTF switch. Back is the normal or "1" position. Forward is the Butterfly configuration. Cycle through E, A, and F with the "ch" key. I set the crow configuration to come in proportionally as the flaps are lowered.

- mix SP:E.1 sets FL-EL compensation in MOS normal pos'n.
- mix SP:A.1 sets FL-A mix in MOS normal position.
- mix SP:F.1 sets Spoiler-Flap mix in MOS normal. This allows you to drop full flaps by moving the throttle lever.
- mix SP:E.0 sets elevator travel in crow configuration.
- mix SP:A.0 sets aileron travel in crow configuration.
- mix SP:F.0 sets flap travel in crow configuration.
- Spoiler Offset should be set by pressing "store" with the spoiler lever in the normal flight position (+174).

Progressive camber changing

Another option which was suggested to me by Mike Stump and the Michigan Duck fliers is to use the "0" position of the BTF switch to set up a proportional trailing edge camber change for help in thermalling. Just reduce the amount of coupling dialed in for the Mix SP: values of Elevator, Aileron, and Flap so that, for example, with the throttle lever pulled back all the way, the flaps and ailerons will droop about 1/4 inch. You can make the aileron droop less than that of the flaps to prevent tip stall.

I suggest that you make notations on your X-347 Data sheet similar to those

shown in Figure 1 to remind you where you need to enter the data to get the surface positions and movements to be as you want them. After you have worked through the programming, the notated Data sheet is all you need to carry with you to the flying field to help you trim your airplane. When you have the plane trimmed, write down the values you have arrived at in the appropriate boxes so you keep a record of what you did.

Make templates for the trailing edge of the upper surface of the wing airfoil at the root position of the flap and at the flap/aileron junction point. Use these to assure yourself that the flaps and ailerons are correctly positioned to produce the design airfoil. Unfortunately, I have found that I have to readjust the trim settings occasionally because of a slight drift in the surface positions. ■

X-347 Data Sheet GLID

Model No. _____

Model Name _____

Modulation PCM • PPM _____

			Ailo	Elev	Rudd
Dual-Rate EXP	0	D/R	%	%	%
		EXP	%	%	%
	1	D/R	%	%	%
		EXP	%	%	%

	SPOI	AIL 1	ELEV	RUDD	AIL 2	FLAP	AUX 2
Reverse SW	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV	NORM REV
Sub Trim (S. TRIM)							
Travel Adjust (T. ADJ)	H %	L %	D %	L %	+ %	U %	+ %
	L %	R %	U %	R %	- %	D %	- %

Elev → Flap Mix (Mix E-F)	Up (U)	%
	Down (D)	%
Flap → Elev Mix (Mix F-E)	Up (U)	% ← EL in MOS.DN
	Down (D)	% ← EL in MOS.UP
Flap → Aile Mix (Mix FL-A)		% ← AIL pos'n in MOS.DN
Flap Offset		
Differential (MIX DIFF)		%
Aile → Flap Mix (Mix AL-F)		% ← In normal MOS pos'n

CROW Settings / Butterfly (Mix SP:)	0	Elev (E)	%
		AILE (A)	%
		Flap (F)	%
EL compensation for Full FL →	1	Elev (E)	%
SP-FL Coupling Normal flight →		AILE (A)	%
		Flap (F)	%
Spoiler Offset			

Flap-Pot Travel (FLP.P T. ADJ)	Trim INH Full	%

		Channel	+POS	-POS	SW	Offset
Program Mix	A	→	%	%	EL-F	← Ail-Fl mix in MOS UP OR DN
	B	→	%	%	ON	+ pos'n = FL pos'n in MOS.DN
	C	→	%	%	ON	
Ail-R Mix in Normal pos'n	D	→	%	%	MxSw	- pos'n = FL pos'n in MOS.UP

Fail Safe (FAL.S)	HOLD • 1.0 • 0.5 • 0.3	
	Memory	

V-Tail (V-TL)	INH • ACT
Dual Flap (DUA.F)	INH • ACT

POT.7 = INH; POT.5 = INH

Brian Nicolson applies power to his winch to launch John Lightfoot's Sagitta - good launch but "zoom" lacking!

Southern Soaring Club Goes 'Green'

...by Brian Nicolson
Chairman and Treasurer of the Southern Soaring Club, South Africa

On Sunday the 25th October, the Club launched its campaign to help conserve energy!

About six weeks ago I saw a welded pipe structure at Johann Nepgen's house. It had two rollers on it which attracted me and, as he no longer wanted it cluttering up his property, said I could take it with me. He's obviously also a scrounger! Well, it lay in the rain for some time, until one day I was looking around for a way to set up my mountain bike so it could be used as a pedal-powered winch. My eye lit upon this weird structure and, quite remarkably, I found it to be almost custom-built for the purpose. It turns out that it was an exerciser of the type that accepts an ordinary bicycle *sans* front wheel.

With a bit of chopping and welding, adding a few struts and guides, my mountain bike became a winch!

The rear wheel, without its tyre, can hold about 40 metres of line easily, and after a few trials we found a satisfactory combination of gear ratios and successfully launched gliders all morning! The only hassle we had was a series of overwinds when the 'chute was being retrieved. This problem should be easy to sort out by providing a steady gentle resistance to the wheel when it is being unwound - the normal brake action is too coarse.

Pedal power launches are definitely feasible and possibly smoother than normal electric winch launches but the zoom at the end is not so good. This may well improve with practice and it may help to change gear just before the zoom. We didn't change gears at all once we had found a workable ratio and changing may be tricky since just when a change may be useful, the winch has stalled and then gears can't be changed! The gear ratio we found best was 38 : 19 - counting teeth on the front and rear cogs respectively.

The experience of pedalling was quite fascinating. At the beginning of the launch it's easy and quite a lot of line comes in - then pedalling gets difficult and in fact for most of the rest of the launch it is possible to simply retain tension in a steady 'kiting' climb. This was of course possible largely by virtue of the fair breeze which prevailed but was quite natural for this launch system. The electric winch cannot match this since it has to be either winding in or unwinding and transmits an uneven tension to the model.

Two comments in particular, capture the mood of the morning -

Here, let me have a go at pedalling! and

The glider has stalled the pedaller!

...to which some wag added, *"Watch it - he'll change down a gear and take the wings off!"*

- - - o o O o o - - -

The term "Gorilla Winch" takes on a whole new meaning... (John Lightfoot, Editor of the Southern Soaring Club newsletter, Southeaster, sent in this article and the photographs with a suggestion that perhaps some of you would like to offer a different caption for this photo. He also says, "Of course, if you suggest one, you might be advised to think twice before inviting me to drive the winch for your next launch!" Send in your suggestions to RCSD and we'll look to print "suitable" ones in a future issue of RCSD.)

Novice Competition - They Said It Would Never Work

...by Sherman Knight
Bellevue, Washington

Competition, the first one, can be very intimidating. You can't sleep the night before, your stomach doesn't feel quite the same and you just know that there is something wrong with your airplane. I was so nervous at my first sanctioned AMA event, I crashed so bad in the first round they refunded my entry fee. Not just intimidating but embarrassing! It didn't take long to realize that other novice pilots had similar experiences and were reluctant to try again.

During the Fall of 1991, four of us got together to plan an event for the novice/beginner that would significantly reduce the intimidation factor. We wanted to make the new pilots first competition fun, regardless of how he placed. There were many that said a novice competition would never work based on their past experiences. More importantly, however, was the fact that many pilots sat, watched, and said nothing. Most of these were new pilots or pilots who had never tried competition. If we could just remove their fears.....

The Seattle Area Soaring Society is probably similar to most other soaring clubs. There are a few hard working individuals that make it all happen. Usually, but not always, these individuals are pilots with considerable experience and are usually the movers and shakers when it comes to putting on competitor and expert level competitions. For these individuals in every club, we are grateful.

However, more than half of the fliers in a typical club are flying two meter Gentle Ladies or Greatplane Spirits. Marty Simonson and his son David, Joseph Conrad, Michael Frederick, and myself got together to determine if we could develop some type of a contest which would attract these types of aircraft and pilots. After several meetings among ourselves and multiple meetings with other pilots that might be interested, we came to the conclusion that it was not important to attract pilots to a novice competition. More importantly we needed to remove their fears. We then assembled the "fearless" format, and published that format in the club newsletter requesting input from the members.

Over time the "fearless" format was finalized. Advertising was assembled and distributed to hobby shops within a thirty-five mile radius of the flying field. 550 flyers were distributed over a five month period. The local hobby shops responded **very** favorably to a beginner/novice event. Information was provided to the local press and several local hobby shops were asked to help sponsor the event. An extensive letter writing campaign requesting sponsorship by various manufacturers was also entered into. We ultimately received donated prizes from several local hobby shops and over eighteen different manufacturers. Our thanks to the following sponsors: B & B Hobbies, Abernathys N.W. Hobbies, NE Sailplane Products, Dodgson Designs, Peck Polymers, Pierce Aero Co., Dynaflight, Eastern Tool Supply, Aerospace Composites, Composite Structures Tech., Hobby Dynamics, Horizon Hobbies, Airtronics, Futuba, Goldberg Models, Coverite, Sig Model Co., and Bob Martin Models.

Four separate one-day events approximately one month apart were held. We averaged twenty-three pilots at each event with a fairly even spread between two meter and unlimited class. Although many individuals flew in more than one event, forty-eight separate individuals participated over the season.

We found that the following "fearless" format contributed to the success of the events:

1. Two classes were organized: wing spans of two meters or less and everything else.

2. Any individual placing fourth or better in a sanctioned AMA competitor event was not considered a novice/beginner and was not qualified to fly.

3. All launches were by high-start. We found that three high-starts worked the best. More than three caused tangle problems, and less than three resulted in a back-up during launch. Retrievers were not used. Instead, each pilot's timer waited on the field for the chutes to reduce time between launches.

4. Bonus points were provided for landing in a circle. Although three, five, and seven minute rounds were flown, landing points in all events was a simple bonus of 100 points. Two concentric landing circles were prepared with chalk lines. If your model contained landing control devices (spoilers, flaps, air brakes, etc.) you had to land in a circle with a twelve foot radius. If your model did not have landing control devices, the circle was enlarged to a 25-foot radius. If any part of your model came to rest inside the circle, you received the 100 bonus points.

5. If you failed to land your aircraft on the flying field, your score was reduced by 50 percent.

6. Throw-out rounds were provided. If more than six rounds were flown, the lowest score for each pilot was thrown out. If eight or more rounds were flown, the two lowest scores for each pilot were thrown out. This encouraged pilots to range further from the field or provided time to repair aircraft between rounds.

7. The pilots' meeting was held at 9:00 and the first flight was launched at 9:30. The lunch break was 30-40 minutes long. We completed eight rounds by 3:00 in all four events.

8. Trophies were not provided. Instead, we procured prizes ranging from Greatplanes Spirits and Oly II's to bottles of CA. A couple of evenings before the event, prizes were placed in clear freezer bags (quite often, a single bag may contain three or four different items). Upon completion of each event and places were determined, the pilots were called up in order of placing and allowed to choose their prize. In each contest prizes were typically provided down to sixth place and were awarded to ninth place in the last competition.

9. Finally, of fundamental importance is that the individuals who make up the novice committee be comprised entirely of individuals that can compete in the event. I recommend a sub-committee of four people. Between advertising, administrating and the planning of the series of events, four is almost a minimum number. Remember, all committee members are novices themselves and probably have little experience in planning an event. To those on the committee, the first event will seem like a real hand full, the last event will nearly run itself. Not only are novice pilots introduced to a fun form of flying, they are also introduced to the running of an event.

The events were well-attended, and the atmosphere was a lot of fun. We did not have any problem with sand baggers, as everyone came to fly. It was typical to have two or three pilots waiting in the on deck circle to fly the round. The typical round lasted 34 minutes.

To simplify the administration of the event, the timers for each pilot calculated the scores. Scoring tables for three, five and seven minute durations were photocopied on the back of each pilots score sheet. It was an easy job for the timer to calculate the points. All the CD had to do at the end of the event was add them up.

Feedback from pilots and Hobby Shops has been very positive. With such a success, I'm sure next year's novice/beginner events will be more fun and better attended than last.

If you want to establish a novice/beginner event in your area please give me a call at 1-206-822-9305 evenings or 1-206-455-2345 during the day. I would be happy to send you copies of our score sheets and pilot instructions. ■

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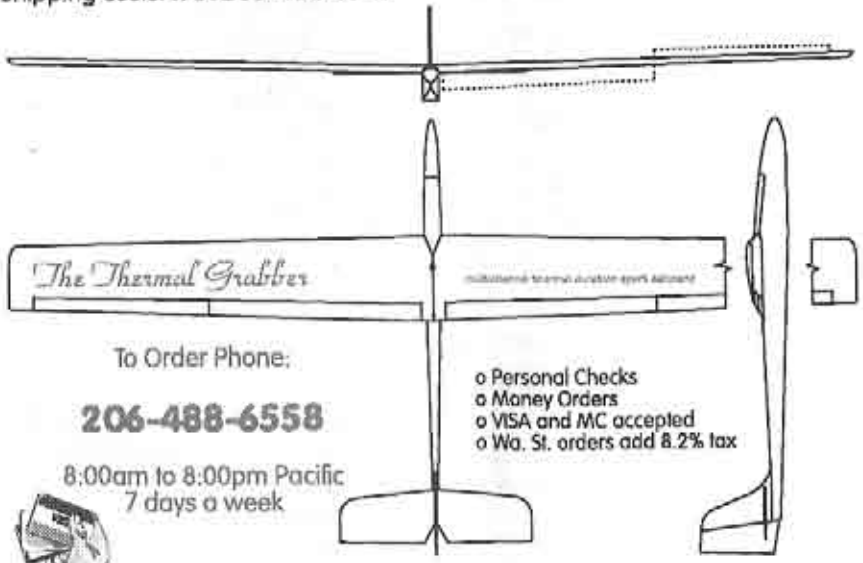
Construction: Built up lite-ply/balsa/carbon fuselage, balsa/spruce stab, balsa/spruce rudder, balsa/ply/obechi fin; obechi sheeted white foam wing with simple plywood spar

Specifications: span - 70 in.; length - 35.5 in.; weight - 21 to 26 oz; wing loading - 8-9 oz; airfoil - SD 7037 or SD7032 root w/ SD7037 tip; aspect ratio - 11.2:1

Skill Level: Recommended for all skill levels

Partial Kit Includes: Detailed Computer drawn plans with very clear building instruction manual; Accurate SD7037 white foam wing cores cut with computer generated (CNC) laser templates; Precut oversize Obechi wing skins; Wing skin sheeting tape. Full color Thermal Grabber T-shirt iron-on logo.

Price of **$48.00 (US)** includes same day shipping and handling in the continental US. For orders outside the continental US please phone or fax for shipping costs. **FAX 206-488-9745**



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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*.

Genesis

...from RnR Products

Genesis is a multi-channel, high-performance thermal sailplane designed for everyone from the serious contest pilot to the average sport flyer. The construction of the model is the same high-quality, all-molded, composite construction RnR Products has become known for with the Synergy models.

When you look at the three-view of Genesis, you may notice the basic lines resemble the Synergy III quite a bit, but, Genesis is a *completely* new airplane. This new ship takes some of the design features that make the Synergy III such an excellent thermal machine and incorporates them with the features today's pilots in AMA thermal contests are looking for in a competitive airplane.

According to Rich Spicer, "We asked serious pilots what they really wanted in a competition thermal ship...and listened carefully. We took what we learned and developed Genesis. It's a lightweight, efficient, precisely-molded, super strong composite sailplane that's affordable."

The design specifications were put through a computer test by a member of the South Bay Soaring Society to see how it measured-up against other top thermal competition planes. The results reaffirmed that Genesis will be a winner.

The molded construction is extremely strong so you can achieve maximum launch height on any winch with complete confidence. The SD7037 airfoil with its high-lifting characteristics and wide speed range, coupled with Genesis' polyhedral design will allow you to core and drift with any size thermal, in any wind conditions, and have no worries about making it back up wind. The unique parabolic planform reduces tip vortex significantly and virtually eliminates drag at the wing tip. The benefit is a cleaner wing that resists tip stalling. Not to mention that the parabolic shape lends a very sexy look to the plane. The large flaps will give you accurate glidepath and airspeed management so you can nail your spot landings. In short, with Genesis you will be able to out launch, out soar, and out land the competition!

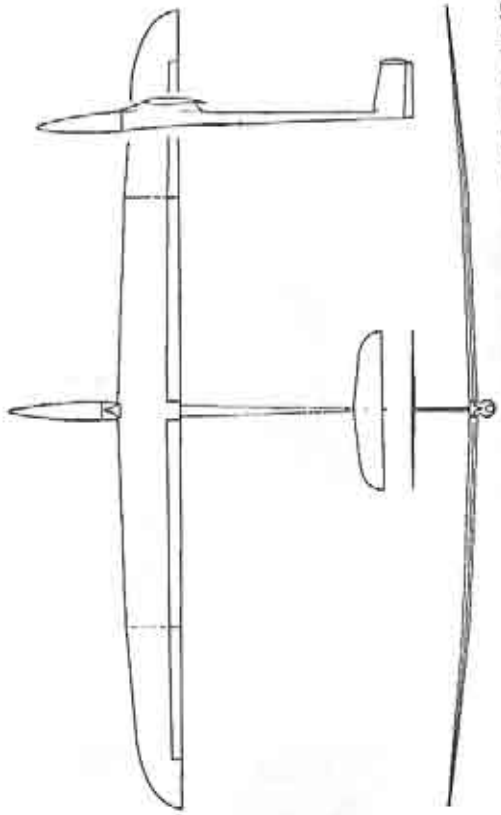
Genesis construction features: Hollow-core, three-piece molded wing made of fiberglass, Rohacell and carbon fiber.

The servo wires are already installed in the wing. The upper surface features a glossy white finish and the bottom is precolored with a dark color for visibility. The ailerons utilize the unique flexible skin hinge eliminating flutter potential and producing a perfect gapless hingeline. The flaps use a tape hinge on the bottom with gap seals for the upper surface.

The stabilizer is full-flying with a symmetrical airfoil section and is also hollow-core molded of fiberglass and Rohacell with a finish to match the wing. The t-tail stab is mounted on an aluminum rocker assembly that is uniquely keyed so the stab is held securely in place with only one bolt. The top of the fin is recessed into the stab for a clean, gapless fit.

The fuselage features a slip-off nosecone and a pylon-mounting system which keeps the flaps up off the ground and also allows for an excellent fit of your hand around the fuselage for sure-grip throwing.

Building time required is minimal because of the molded construction. An experienced modeler can get a Genesis air ready in around 20 hours. The construction required is simple and is explained in detail in a photo-illustrated instruction manual. Construction is primarily linkages and radio installation. A computer radio such as the Airtronics Vision or Infinity 600 is recommended. Four servos are mounted in the wings and two in the fuselage.



Specifications:

Span:	113"
Flying weight:	70 ounces
Airfoil:	SD7037
Wing area:	855 Square inches
Wing loading:	11.7 oz. per sq. ft.
Aspect ratio:	14.2:1

Genesis kits will be available in February. The price upon introduction will be only $395.00. Call or write to Rich Spicer and/or Richard Tiltman at RnR Products for more information and to place orders. 1120 Wrigley Way, Milpitas, CA 95035; (408) 946-4751. ■

"The Enthusiast's Guide to Model Clubs and Flying Sites"

...from Pat Hart

"The Enthusiast's Guide to Model Clubs and Flying Sites" covering the Los Angeles/Orange County Area and portions of San Bernardino, Ventura and Riverside Counties (California) is now available.

"The Guide" lists 64 model flying clubs and 68 flying sites within the 10,000 square mile region.

Club meeting time, date and location are referenced to both the Thomas Bros. map books and the AAA Los Angeles County & Vicinity map. Information of club contact person, dues, newsletter and liability insurance (AMA, SFA) requirements are also given.

Flying sites are shown on a centerfold "master" map and further detailed via individual mini-maps. Coordinates from both Thomas Bros. and AAA references are included along with resident club, types of models flown, runway/landing area, flying hours, etc.

"The Guide" is available at participating hobby shops throughout the five counties. Suggested retail price is $3.00.

For modelers outside the region, the guide can be ordered by mail for $3.00 (cash please) from Pat Hart, 2410 Loftyview Dr., Torrance, CA 90505. ■

JR PCM-10S Computer Radio

...from Horizon Hobby Distributors, Inc.

JR's new PCM-10S computer radio system is a top-of-the-line ten channel airplane control system and features 1024 resolution, dual conversion, ABC&W modulation and sophisticated programming options. Setting out to refine and improve their highly successful PCM-10, JR has created the ultimate computer radio with this new S-class system.

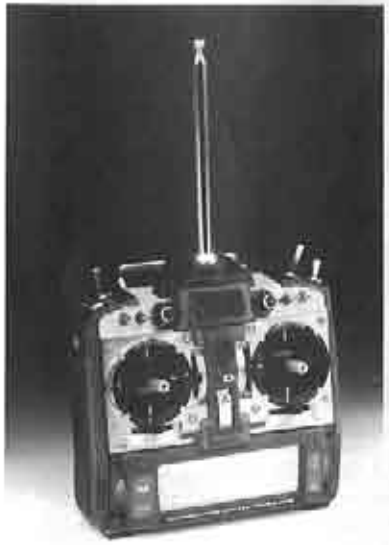
The system is faster, smoother, and more precise. Response time has been doubled, making it the fastest in the industry, according to independent lab tests. The look is rounded with softer side grips for superb ergonomic feel and control. Dual conversion with ABC&W on all channels insures maximum resistance to interference. And the programming is the most sophisticated available, featuring a multitude of control options, yet the functions are easy to access, understand and use.

Compatible with most previous JR radios and available with a choice of servos, the PCM-10S combines simplicity of use with sophistication of operation.

JR Radio Control Systems and accessories are available through hobby dealers nationwide. ■

Specifications

- 1024 dual conversion with JR's patented ABC&W interference rejection circuitry
- New 20ms processing time
- Programmable mixing to all 10 channels
- 10 model storage
- New 3 position Aux 2 switch
- New Quadra flap programming for complete mixing of 4 wing servos
- Adjustable intensity LCD touch panel

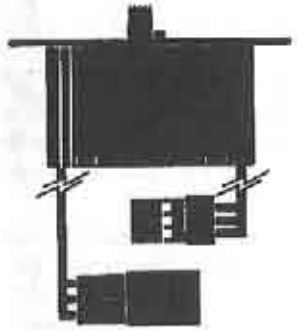


The JR ChargeSwitch

...from Horizon Hobby Distributors, Inc. The JR ChargeSwitch is an idea whose time has come. Placing both the charging jack and the on/off electronics switch in the same convenient case, the ChargeSwitch is the essence of convenience. This innovative unit ends the common frustration of pushing the battery jack through its old-type plastic holder. No other switch on the market can match this unique, practical design.

At .73 oz., the lightweight ChargeSwitch will not affect the flying characteristics of your model. Installation is clean and uncluttered with its compact size of .57"W x 1.3"L x .76"H. Redundant power contacts in the switch mechanism ensure power to the model; should one connection fail, the other connection continues to provide power. Gold-plated, corrosion and oxidation resistant pins in both the jack and leads afford maximum reliability.

JR Radio Control Systems and accessories are available through hobby dealers nationwide. ■



Scale Aircraft Documentation & Resource Guide

...from Scale Model Research

Bob Banka's Scale Model Research, the world's largest commercial collection of FULL-COLOR aircraft documentation FOTO-PAAKS and 3-view drawings has expanded their inventory, again.

The 1993, 132 page, 10th anniversary issue of their catalog and resource guide lists over 4,000 FOTO-PAAKS *(500 new)*, 22,000 3-view drawings *(2,000 new)*, and includes 11 scale related articles written by some of the top competitors and authorities in the scale movement.

The FOTO-PAAK (studies) are full-color 3 1/2" x 5" pictures takes with the modeler in mind, to show details like paint scheme, markings, instruments, landing gear, etc. These Paaks are sold on a satisfaction guaranteed basis, and because of the large inventory, orders are usually mailed within 24 hours.

Bob Banka, the owner/photographer, states that in his Catalog/Resource Guide, you will find different FOTO-PAAKS listed for Pre 1920's, Seaplanes, Multi-engine, Sailplanes (200), Jets, Civilian, Helicopters, WWII Fighters/Tmrs, and Aircraft Engines.

Most FOTO-PAAKS have 3-view drawings available that will enable the modeler to have complete documentation for their project. The 3-views are either KOKU-FAN drawings, or copies of drawings gleaned from modeling and/or full-size aircraft magazines and other sources. Bob has more than 22,000 drawings in stock. Scale Model Research is the world's exclusive dealer for the KOKU-FAN 3-views, considered by many modelers to be the world's standard in accuracy and detail.

For the first time, Scale Model Research is adding scale related articles to the Catalog/Resource Guide with articles such as preparing a documentation package, kit manufacturing processes, how to shoot your own documentation photos, and others. these articles are written by leaders in

the scale movement.

Modelers and enthusiasts can get their 1993 Scale Aircraft Documentation and Resource Guide *(Catalog)* by sending $5.00 (overseas $10.00 to cover air post) to Bob Banka's Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, CA 92626; (714) 979-8058.

Bob Banka has been involved in building model aircraft since 1948. He started out with hand launched gliders, then to rubber, towline, free-flight gas, U/C sport, combat, and finally tried R/C in 1957 with single channel escapement. Bob became more involved with scale R/C in the early 70's and has made this his major interest since.

Scale Model Research is run from Bob's home/office and when not there, is usually off shooting pictures at an airshow or museum or at a Model Trade Show or event. The best times to call are 7:30 A.M. to 10:30 A.M., 11:30 A.M. to 2:30 P.M., or 4:00 P.M. to 7:00 P.M., all Pacific time, of course. He now accepts Visa and Master Card purchases with a $20.00 minimum order.

Scale Model Research has dealers in Germany, Japan, Australia, England, Italy, Denmark, Spain, and France. ■

Chuperosa Combo

...from Northeast Sailplane Products

The Chuperosa Combo is Northeast Sailplane's latest offering from Culpepper Models. It combines the Chuperosa HLG with an extra 2 meter wing that is interchangeable on the single fuselage supplied.

This combination allows the pilot a higher degree of versatility for different flying conditions with a simple and quick change of wings. Both wings are supplied with sufficient hardware to make them with ailerons, but the pilot has the option to use either in the polyhedral mode. The Chuperosa is designed to accommodate either poly or aileron wings. Due to the unique and ingenious control system developed for the Chuperosa, any type of wing (poly, aileron, 1 1/2, or 2 meter) can be bolted to the same fuselage **with no adjustment** or **change in servos!**

For the thermal pilot, a polyhedral 1 1/2 meter wing is an ideal handlaunch; then, just unbolt it and bolt on a 2 meter wing with ailerons for high start or winch launching. The two meter wing is light enough to handlaunch and thermals extremely well. The fuselage is designed with both a fingerhole and tow hook (supplied).

For the slope pilot, the 1 1/2 meter with ailerons will fly in 5 to 18 mph winds without ballast. It is surprisingly agile and fun even at relatively low speeds. The SD 7037 airfoil is responsible for a large part of the Chuperosa's wide speed range. When the lift gets really light, bolt on the two meter wing and out float the floaters while still having superior maneuverability and speed range. The 2 meter version will turn in a surprisingly small radius for its size. This combination is great for trying out those small slopes you never would have thought of trying. We have even slope soared small buildings successfully with both size wings.

The 2 meter Chuperosa wing has a tapered tip panel that extends the wing and increases and redistributes the wing area in a beneficial way. The tip panel better approximates a Schuemann planform. The performance is still all Chuperosa, and the slight dihedral in the outer panels makes it turn and climb better than the original. Adding optional flaps to this wing allows it to launch higher and land on a dime.

Included in the kit are materials and hardware in the Culpepper tradition. This new kit incorporates the new wing joiner system that allows the wing to be broken down for storage and travel (2 meter, only).

Wingspan	60" & 78"
Wing area	432 & 510 sq. in.
Weight	16 oz. & 21 oz.
Wing Loading	5 - 6 oz./sq. ft.
Airfoil	SD7037
Skill Level	Nov/Nov
Radio	Micro or Mini servos, 270 mah battery pack

Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482. ■

Introduction of Duration Modi

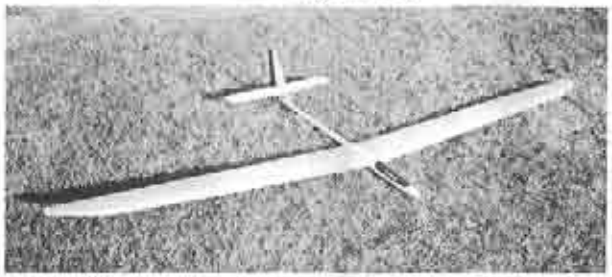
...from Greco Technologies

Now available from Greco Technologies is the Duration Modi. This new addition to the Greco line of planes is specifically designed for low lift conditions and for competitive Thermal / Duration contests that currently place an emphasis on spot landings. Recently, Greco has been getting many request from pilots who like the performance and durability of the Modi 900 Series, but were looking for something with a lighter wing loading - something built specifically for low lift conditions and spot landing. The Duration Modi was created to handle these requirements and it is based on the same design principals that helped Daryl Perkins win the 1992 LSF Nationals in Open Class with a Greco Thermal Modi.

Greco feels they have achieved the lightest possible sailplane while still maintaining the needed strength. The Duration Modi tows on line very well with few tip stalls. Its strong spar construction and sleek design allow for spectacular launches, and with its feather light wing loading the plane maintains an excellent L/D rate.

This elegant plane when built right weighs a mere 65 ounces with a wing loading of 10.8 ounces per square foot. The fuselage is 50 inches long and like all of Greco's fuselages is made out of fiberglass and two strips of Kevlar that run from nose to tail. The stabilators and rudder are built-up to reduce the weight in the tail, in turn reducing the amount of nose weight needed. The wings are constructed out of white foam covered with Obechi. The spar spans almost the entire length of the wing and has the addition of a fiberglass shear web for added strength.

The wing planform is the proven triple taper, Shuman planform. This is designed to add surface area to the wing, reduce tip stalls, and retain esthetics. The Duration Modi is available in two different airfoil profiles: the S3021 and SD7037. The S3021 is excellent for the pilot who wants a basic airfoil for thermaling and landing. It has good overall characteristics for contest performance. This airfoil is good at low speeds and has excellent speed range. It responds well to lift and will climb quickly in thermals. This sailplane with the S3021 airfoil is ideal for the intermediate builder and pilot who is looking to make the step to aileron ships. The SD7037 is an airfoil for the slightly more advance pilot who wants a bit more speed and performance. It has great flying characteristics and with an enhanced speed range the pilot has more options. It thermals well with a good L/D and has good penetration to cut though the air. The use of trailing edge camber further increases the speed range. The Duration Modi is designed with a straight wing construction to cut through air more efficiently and it is more aerodynamic, but if the modeler wants to he can tip the wing tips up for more stability. The extremely low wing loading coupled with the large flaps allows the pilot to stop the plane on a dime, perfect for spot landings.



The Duration Modi kit comes complete with a detailed instruction manual with comprehensive drawings and diagrams, an extensive hardware package, and other material needed to complete the project. The instructions are straight forward and easy to follow. They are illustrated with computer drafted plans and detailed diagrams. The extensive hardware package includes all the materials needed for completion of the plane. It features 48" long music wire pushrods with aluminum tube housing, a machined aluminum bellcrank with a precision bearing, and aluminum control horns.

The specifications for the Duration Modi Kit: Wingspan: 106 inches; Wing Area: 860 inches^2; Approximate Weight: 65 ounces; Approximate Wing Loading: 10.8ounces/foot^2; Root Chord: 10 inches; Airfoil: S3021 or SD7037; Wing Planform: Triple Taper; Aspect Ratio: 13.1 : 1; Retail Price: $350.00. For more information about the Duration Modi or any of Greco's other kits please write to P.O. Box 10, South Pasadena, CA 91031, or call (213) 680-2070 during standard business hours. ■

RnR's Synergy 91

...by Ron Swinehart
Huntsville, Alabama

I would like to give you my input on a sailplane that I personally feel is one of the best buys on the market for the money, when you consider the finished product, the type of construction, and the amount of work required by the builder to have the plane ready to fly.

The sailplane I am talking about is RnR's Synergy 91 all molded, hollow cored wing, totally composite sailplane. At a finished weight of 92 oz, and a wing area of 975 sq in, giving a wing loading of 13.58 oz / sq ft, this plane will thermal up through the floaters. The feature that makes this plane's SD 2048 airfoil really work is the ability to camber the total trailing edge via the use of a computer type radio (Airtronic's Module with ATRAX conversion). Also adding to the overall appearance and efficiency of the plane is the fact that all control linkages are internal to the wing, and the hinge lines to the flaps and ailerons are completely sealed. Note that the aileron hingeline is an integral molded part of the lower surface of the wing, with the top surface having a wiper to completely seal this surface. The flap is fully taped on the lower surface, with a curved plastic wiper installed on the top surface to seal that side. This design allows for very accurate control centering, with all four surfaces returning to a perfect trailing edge each time. This function is very useful and highly efficient when applying camber to the wing airfoil.

I have built two of these planes to date, with the first taking 34 hours to complete, ready to fly with radio and gear completely installed, while the second one was finished in 25 hours. The plane comes completely fabricated from a structural standpoint, with only joint flashing to remove from the wings and the fuselage. The color is already molded into the finished product, which really speeds up the process of getting a plane ready to fly.

The speed range of this plane has to be seen to be believed, since the wing camber at neutral is only 1.7 %, with a thickness of 8.7%. When the plane indicates lift, feeding in approximately 2 degrees of camber, mixed with 8 degrees of nose up elevator, will really cause this sailplane to climb like a lonesome dove. This past summer at our local flying field on the Redstone Arsenal in northern Alabama, I managed to complete a one hour and forty two minute flight with this ship. The ultimate to this flight was at 1 hour - 15 minutes into the flight where I was at an altitude of approximately 30 feet, when the plane indicated lift. I rolled in some camber and started to circle. The plane held its own for what seemed like forever and then it slowly began to climb. One of the fellows (Rob Glover) yelled that if I managed to work that one up he would really brag on me. Well, to make a long story short, in the next ten or so minutes I managed to work it on up to about 800 feet. Boy will this plane thermal in addition to indicating lift as well as any sailplane I have flown.

This sailplane is very strong, stressed to 35 G's, and will launch as well, or better than anything I have seen fly. Despite its weight and speed, it will slow down to a fast walk on landing, with 85 degrees of down flap, and 10 degrees of crow. So far this year I have managed to place second twice in a five round AMA thermal contest with 25 to 30 entries. Note that the contest format gave 90 % of the score to the thermal flight and 10 % to the landing score, ie., 900 points perfect flight time and 100 points perfect landing.

This plane is very stable, yet has a very fast roll rate due to the coupled flaps to ailerons. Anyone who has flown an aileron plane before will have no problem with this sailplane. I am convinced that once a person learns to fly and land an aileron sailplane with flaps, they will never want to use any other type of plane. Four years ago, I was the only one at our club with an aileron ship, but now ten of the regulars are flying them. You can definitely land more consistently with flaps, than was ever possible with spoilers. Believe me, I flew spoilers on everything from Sagitta's to four different Meteor's, all with wing loadings of above 12 oz per sq ft; and flaps are the only way to go. At our annual Fall Soaring contest, this fall, with 49 pilots, there were at least 50 % of the entry flying ailerons/flaps. This is in an area where two years ago, less than 15 % of the fliers had this type of plane. I think the fliers in California and Texas knew this ten years ago.

I want to personally think Rich Spicer and Richard Tiltman for a great sailplane design, the very best type of construction possible for true wing airfoils, and above all, their personal touch on any question one might have during the construction phase or on the set-up required for flying this sailplane. ■

Composite Building Without the Pump

...by Bryan Cuervo
Jacksonville, Florida

I've always wanted to try vacuum bagging flying surfaces with epoxy/fiberglass skins because the results are very impressive. I'm also tired of using Monokote! However, I've shied away from this technique because of the expense of buying a good pump and all the difficulties with using bags. My solution was to replace the bag and pump with a board and a bunch of cement blocks. I like this "press" technique for applying skins because it's easier, cheaper, you can use white foam, and the skin isn't sucked down into any irregularities that may exist in your foam core.

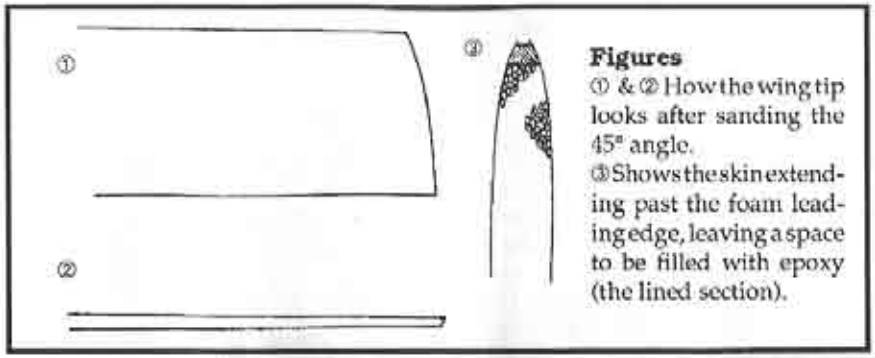
All of this sounds great so what's the catch? The catch is that you'll need a very strong, straight bench and you don't have a flexible bag sucking that skin down around your leading edges and tip. Mylar doesn't work so hot around compound or severe curves. Well, you're on your own making that strong bench, but I want to share with you my technique for solving the second problem. I'll also describe how to prepare the cores, skin and mylar or acetate for those who may want to try this for the first time.

You can buy sheets of acetate from the arts and crafts store. It's cheaper than mylar and works just as well. These sheets are great for small projects like stabs and rudders. For the horizontal tail, you can get away with 10 mil thickness. It conforms to the small airfoil nicely but leaves a very slight "waviness" to the finished product. This "waviness" is removed easily with light sanding before applying your finish.

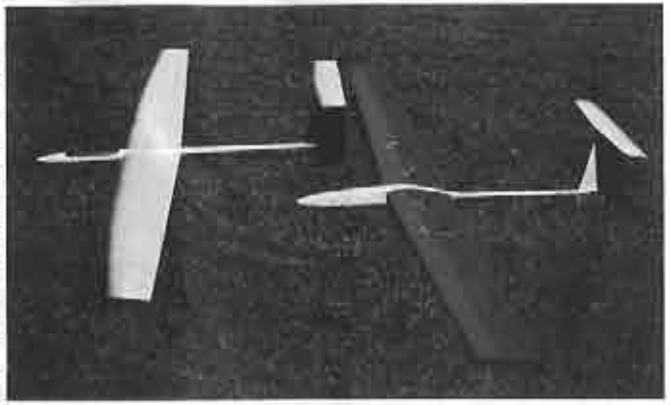
I cut all my cores from white foam. If you don't cut your own cores but would like to learn how, get Channel One Productions' video tape. It's very informative, complete and easy to understand. Cut cores for stabs or vertical fins full size with 2 mm left off the leading edge (L.E.). For wings, leave 1/8 inch off the L.E. Cut two sheets of acetate to the shape of your flying surface with 1/8 - 1/4 inch overhang at the L.E. and tip. With masking tape, join the two sheets at the trailing edge leaving a small gap so they will lay flat when folded over. For stabs. and fins I use 2 oz. E-glass. In high stress areas, such as the bottom center of a one piece stab, I'll sandwich a strip of kevlar or carbon fiber laminate. Cut the E-glass just larger than the shape of the unfolded sheets. Lay it on the acetate and apply your epoxy resin. I've found a great 50/50 resin at Do-It-Yourself or Boat Supply stores packaged by EVERCOAT. This works well for glassing or sheeting wings with wood. Scrape off the excess resin and lay the core in with the trailing edge against the acetate fold. Fold your layup around the core, place it in the foam beds and lay a solid concrete block on top. This is enough weight for one stab half. For wings, lay a board on the beds and place lots of blocks on top. Wing sections should be pressed with at least two hundred pounds, depending on their area. Make sure the beds are on a flat surface and if everything is done right, you should see the folded masking tape just sticking out from the trailing edge of the beds.

After curing overnight, remove the blocks and peel off the acetate (or mylar) and check out the results. It's amazing how accurate an airfoil you can achieve using fiberglass and foam!

Now to solve that problem with forming L.E.'s and tips. The L.E. fiberglass overhang is used as a former. Cap off the root and tip of the leading edge "formers" with tape and inject epoxy resin mixed with micro-balloons into the space. I use syringes purchased from a drug store and if you have trouble injecting the leading edge, simply heat the epoxy in the syringe with a heat gun. Leave the piece standing on its trailing edge to cure. After the resin/micro-balloon mixture has fully cured, mark a line where the true L.E. is supposed to be and with a sanding drum on your Dremel tool, sand down to the mark. Now use a sanding block with 60 grit paper to form the L.E. to final shape.



Figures
① & ② How the wing tip looks after sanding the 45° angle.
③ Shows the skin extending past the foam leading edge, leaving a space to be filled with epoxy (the lined section).



You have a few options for finishing the tips. You can use the same technique as with the L.E. and pour in a thin layer of epoxy. If you have to, make a former with tape sticking halfway off the tip. To make a slightly curved tip, scrape off some foam at the L.E./tip corner so that the epoxy will fill the space. Then, after curing, round off the corner. You can also simply sand the tip square and flush and coat the exposed foam with epoxy glue. For wing tips I like to use the Dodgson Lovesong technique and sand a 45 degree angle into the tips before coating the exposed foam.

I'm sure pressing composite wings on foam cores has been done before but I don't recall ever reading about this. It is a practical, inexpensive technique that is not difficult once you've broken through that barrier of trying it for the first time. Once you've tried it, you'll be hooked on fiberglass and foam; I guarantee you will be very pleased with the results! ■

Schedule of Special Events

Date	Event	Location	Contact
Jan. 9	Calif. Slope Racers TPG 60"		Hal Krammer North (510) 449-0441
		Duane Gibbs	South (714) 731-3461
Feb. 6-7	Southwest Winter Soaring Contest	Gilbert, AZ (602) 831-1905 or 839-1733	Iain Glithero
May 28-31	Mid Columbia Cup Slope Races	Richland, WA	Roy Lightle (509) 525-7066
June 26-27	NASF/MASS Mid-South Soaring Champs	Huntsville, AL	Ron Swinehart (205) 883-7831
July 10-11	North American Scale Soaring Assoc. Rally	Richland, WA	Wil Byers (509) 627-5224
July 16-27	AMA NATS	Vincennes, IN	
Sept. 18-19	TNT Texas National Tournament	Dallas, TX	Henry Bostick (214) 279-8337

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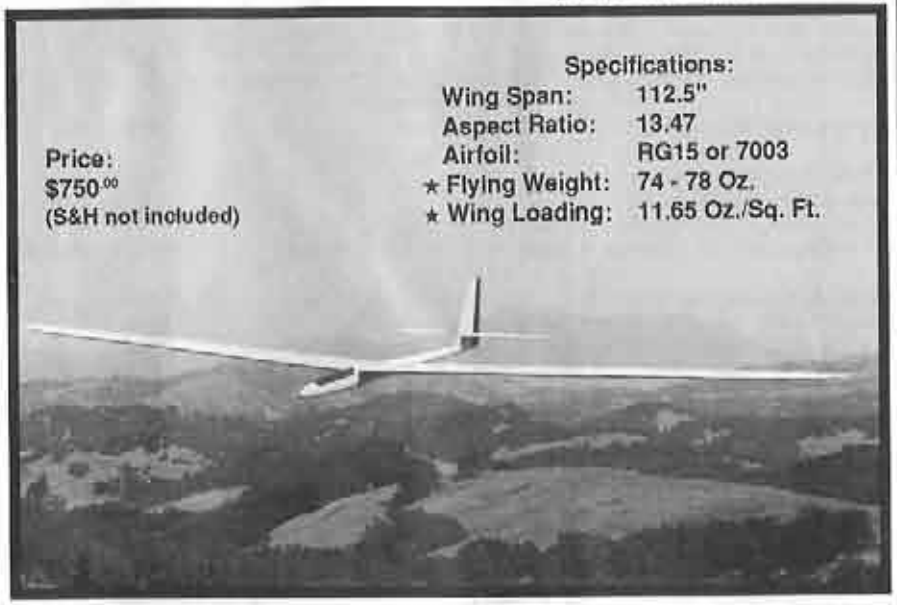

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Call Ron, Flite Lite Composites, at (707) 838-9020.