R/C Soaring DIGEST

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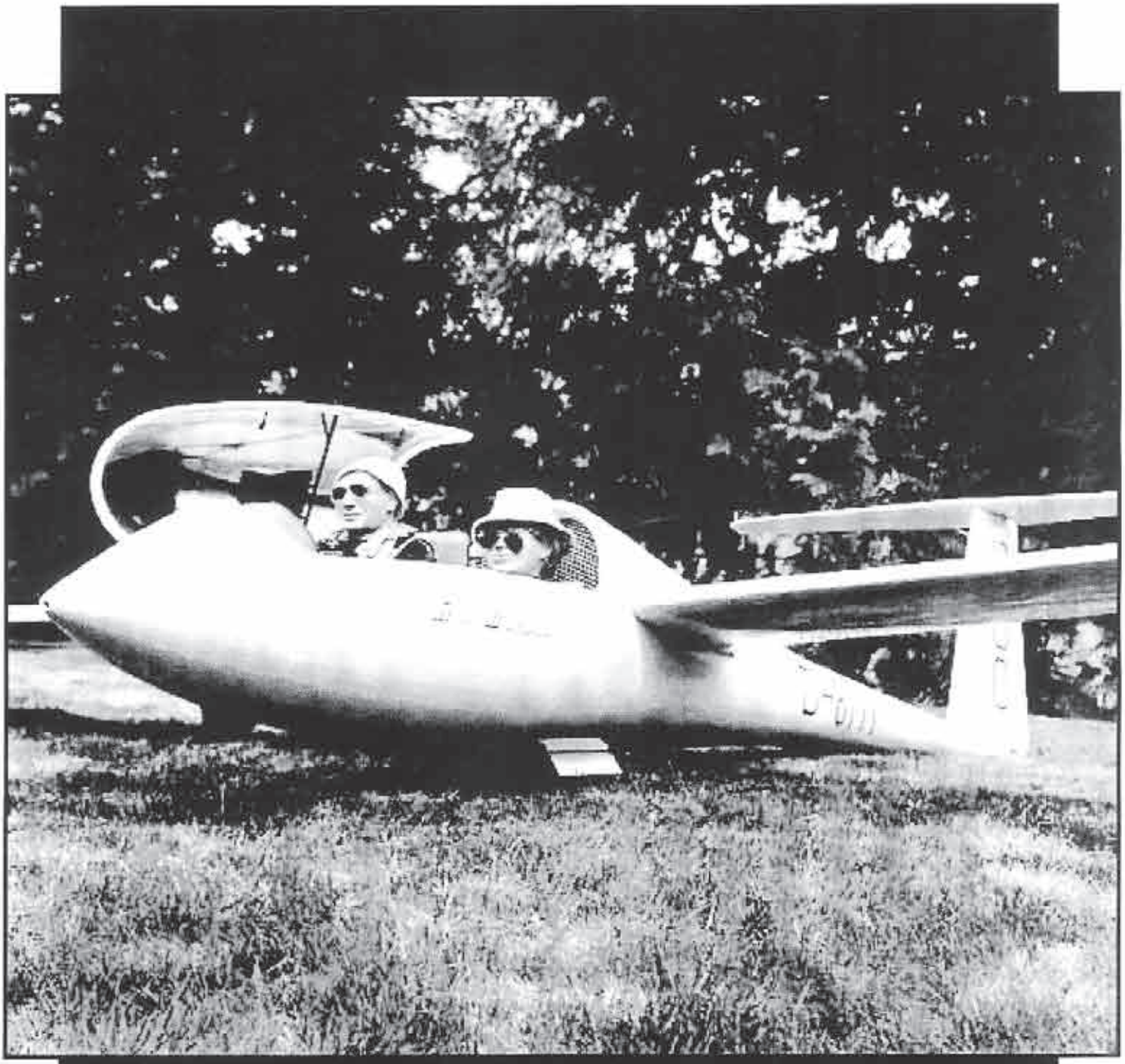

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1/4.5	ASK 21	E393	165" (4.2m)
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1/3	ASW27	HQ2.5/12	196" (5m)
1/2.7	ASK18	E203-201-193	209" (5.53m)
1/3	Ka6E	E207-205-205	196" (5m)
1/2.7	ASW19	Ritz3 mod.	212" (5.4m)
1/3	ASK13	E68-67-66	209" (5.33m)

Mueller

1/3	Discus	HQ2/12	196" (5m)

Bruckmann

1/3	Salto	Ritz 2	176" (4m)
1/3.8	ASK 18	E 203	165" (4.2m)
1/3	Fox	E 374 SD 6060-6062	183" (4.66m)

TOWPLANES

Frisch: 1/4 Wilga 109" (2,78m)
Brauer: all glass 1/4.5 Pilatus Porter Turbo 139" (3.52m)
Roedelmodell: 1/4 Jodel Robin 86" (2.18m)
Roedelmodell: 1/4 Piper Super Cub 105" (2.18m)

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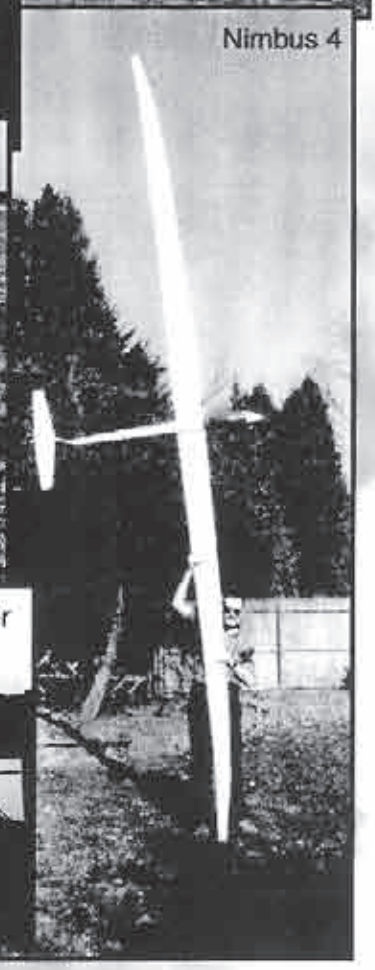
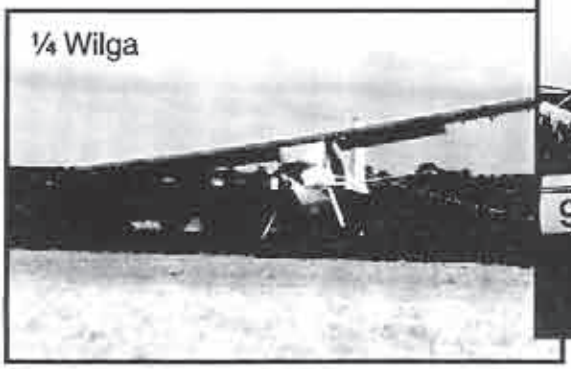
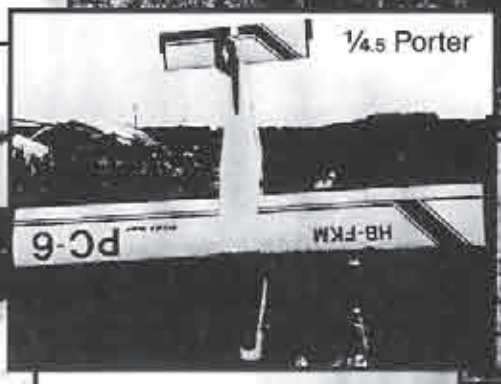
1/3 all glass ASH 26		HQ3/14-10	235" (6m)
1/2.5 all glass ASW15B		HQ3/14	235" (6m)







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R/C SOARING DIGEST
The Journal for R/C Soaring Enthusiasts

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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; (520) 474-5015, <jimpeg@netzone.com>.

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***RCSD* Staff**
Jerry Slates - Editor/Technical Editor
Judy Slates - Desktop Publisher, General Managing Editor, Subscriptions
Lee Murray - *RCSD* Index/Database
[Material may be submitted via 3.5" Disk or e-mail, and is most appreciated!]

Please address correspondence to:
Jerry & Judy Slates
R/C Soaring Digest
P.O. Box 2108
Wylie, TX 75098-2108 U.S.A.
(972) 442-3910, FAX (972) 442-5258
e-mail: rcsdigest@aol.com
http://www.halcyon.com/bsquared/RCSD.html

Feature Columnists
Bill & Bunny Kuhlman (B^2), Robin Lehman, Fred Mallett, Mark Nankivil, Dave Sanders, Steve Savoie, Jerry Slates, Gordy Stahl
Artwork
Gene Zika is the graphic artist who designs the unique ZIKA clip art.

OTHER GOOD STUFF

The Soaring Site

Off to Vermont

Steve Savoie, your "Short Cuts" columnist, has a new job in Vermont. Wife, cats, and sailplane toys have now joined him at 926 Gage Street, Bennington, Vermont 05201. His new telephone number is (802) 442-6959, and he's ready to answer questions about flying in Vermont!

Behind Schedule

Ah, yes, we're still in catch up mode, and still having press problems, as well. With no firm commitment on machine repair, we'll continue to contract out the work. Thanks to all of you who have not complained, and we're real sorry about the withdrawal symptoms some of you have experienced with the later delivery!!

Viking Models, U.S.A.

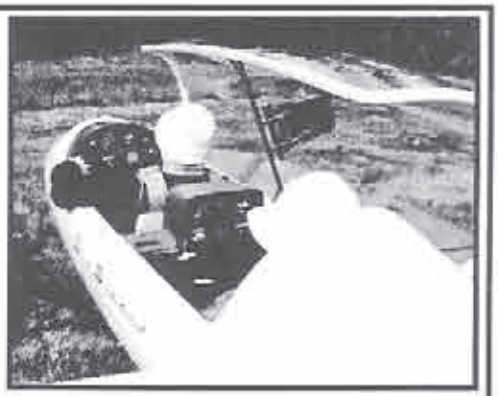
We're still receiving e-mail messages and calls asking if we've started making fuselages, again. Nope, sorry. Not yet. However, for those of you that have obtained a fuselage and are looking for wings to go with it, contact Alan Oliver at Airemaster. Alan says, "I'll work with folks to try to fill their custom work into what I have." Alan does custom wing work, but not tied to a computer.

Airemaster
1630 Renoir Lane
St. Louis, MO 63146
(314) 878-7701
airemaster@aol.com

Happy Flying!
Judy & Jerry Slates

RIPO DUO DISCUS

Steve Dentz took four months to build this 38 lb., 6.75 meter span beauty, and another three to scale out the cockpit. Dieter & Axel are at the controls.



Photography courtesy of Robin Lehman.

See page 4 for more photos.

Jer's Workbench

Jerry Slates
P.O. Box 2108
Wylie, TX 75098-2108
(972) 442-3910
RCSDigest@aol.com

Covering a Model

Let's take a step back in time, to 1941 or 1942, which is when I started building models.

Those first model covering techniques were done using tissue paper, silkspan, Japanese silk, and nitrite dope. Many of these items were hard to obtain, as those were the war years; everything went to the war effort. We considered ourselves lucky to even be able to cover a model.

After the war, we stopped using tissue paper, as silkspan was available in many different colors and weights: light, medium, and heavy. Also readily available were synthetic silks, nitrite, and fuel-proof dope. For those of you not familiar with the old covering techniques, I would like to share with you how it was done.

Having completed a model, and sanded it smooth, a coat of nitrite dope was applied. Then, the model was sanded smooth, again. Silkspan or silk was wet out with water, and draped over the model. Working very carefully, the wrinkles were smoothed out; another coat of nitrite dope was applied around the edges of the silkspan or silk, making sure that the nitrite was absorbed and would bond to the wooden frame of the model. The model was allowed to dry overnight.

As the water evaporated, the silkspan or silk would shrink. If I was lucky, all the wrinkles would disappear. If not, more water was applied to the wrinkled area, and the model was once again left to dry out overnight.

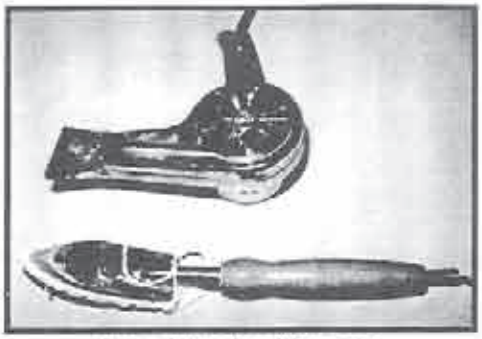
After all the wrinkles had been removed, 4 - 5 coats of nitrite dope were applied, in order to seal the pores of the silkspan or silk. Once sealed, I used a dope containing a color of my choice, to complete the model. At that time, I worked nights, so only one layer could be applied each night.

Overall, it took one to two weeks to cover and finish a model.

It was around 1960 that I saw the first iron-on covering film. Wow! I remember thinking, "This stuff is neat!" There were wonderful colors; you simply ironed it on. A model could be covered in only one or two nights!

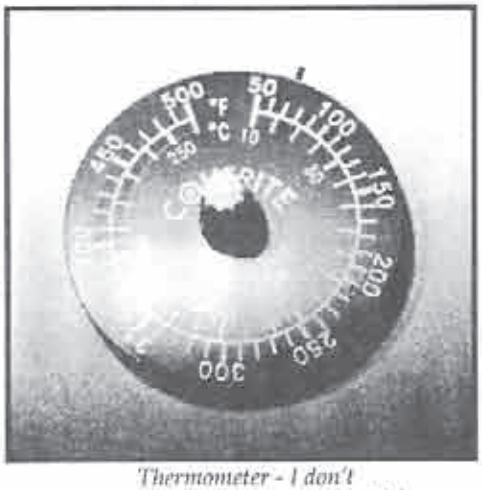
My first experience using the iron-on film was a bit frustrating. There were wrinkles that could not be ironed out; the edges were rough. Thinking that practice made perfect, the next models were, indeed, looking better, until I saw the covering job on a few models at the local flying field. I knew then that I was doing something wrong.

"Think!" I told myself, "When all else fails, why not read the directions. Come on, Jer. Remember the little sheet of paper wrapped around the iron-on film. When you unwrapped the package, there was a little scrap of paper that you threw in the trash. Maybe it's still there..."



Iron with sock and heat gun.

Model knife, small scissors, large scissors, T-pin, and razor blade.



Thermometer - I don't recommend covering without it!

Sure enough, the manufacturer had indeed suggested using different temperature ranges. So, I got myself a thermometer and adjusted the iron to the correct heat setting. And the next covering job? Well, it sure looked a great deal better; the wrinkles were gone and the edges were smooth. It seems that the manufacturer included those directions in the package for a reason.

I can't easily show you how to cover a model using iron-on film, but I can share the tools used in the process. To start with, an iron with a sock and a heat gun are required. Other tools include: model knife, razor blade, scissors, T-pin, and thermometer. I do most of my work using a pair of scissors, razor blade, and T-pin. The smaller pair of scissors and model knife, shown in the photograph, are not used much, but nice to have.

Should any of you decide to cover your next model using iron-on film, set your iron for the manufacturer's suggested temperature settings. Keep your iron clean, and read the instructions.

Good Luck! ■

About the Cover

RIPO DUO DISCUS

Even with Steve's 6'4", the fuselage still looks big!

The fuselage is 9.5 feet long, and Steve built an addition to his truck for transport.

LESSONS FROM GEESE

Fact One

As each goose flaps its wings, it creates an "uplift" for the birds that follow. By flying in a "V" formation, the whole flock adds 71% greater flying range than if each bird flew alone.

Lesson

People who share a common direction and sense of community can get to where they're going quicker and easier, because they are traveling on the thrust of one another.

Fact Two

When a goose falls out of formation, it suddenly feels the drag and resistance of flying alone. It moves quickly back into formation to take advantage of the lifting power of the bird immediately in front of it.

Lesson

If we have as much sense as a goose, we stay in formation with those headed where we want to go. We are willing to accept their help and give our help to others.

Fact Three

When the lead goose tires, it rotates back into the formation and another goose flies to the point position.

Lesson

It pays to take turns doing the hard tasks and sharing leadership. As with geese, people are interdependent on each other's skills, capabilities, and unique arrangements of gifts, talents, or resources.

Fact Four

The geese flying in formation honk to encourage those in front to keep up their speed.

Lesson

We need to make sure our honking is encouraging. In groups where there is encouragement, the production is much greater. The power of encouragement, to stand by one's heart or core values and encourage the heart and core values of others, is the quality of honking we see.

Fact Five

When a goose gets sick, wounded or shot down, two geese drop out of formation and follow it down to help and protect it. They stay with it until it dies, or is able to fly, again. Then, they launch out with another formation or catch up with the flock.

Lesson

If we have as much sense as geese, we will stand by each other in difficult times, as well as when we're strong.

Reprinted from *CECO Report*, (CEC/Oklahoma), 10/94. "Lessons from Geese" was transcribed from a speech given by Angeles Arrien at the 1991 Organizational Development Network and was based on the work of Milton Olson. It circulated to Outward Bound staff throughout the United States. NSM '97 handout, provided by Martin Simons. ■

T.W.I.T.T.

(The Wing Is The Thing)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $18.00 (US) or $22.00 (Foreign) per year for 12 issues.

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

on the Wing
B²
P.O. Box 975
Olalla, Washington
98359-0975
E-mail: bsquared@halcyon.com
http://www.halcyon.com/bsquared/

CO8 Part 1 - The Airfoil

CO8, the seventh in a series of tailless models by a team led by Hans-Jürgen Unverferth, has now been flying for some time. It is substantially different from CO7, its immediate predecessor, in a number of ways, and so we will be devoting two columns to its description.

The first departure from most of the other models in the series is the use of an airfoil with a substantial negative pitching moment. Hans-Jürgen used the EH* sections as the basis for airfoil choice until CO7, for which he chose the RS001 and its derivatives. All of the EH sections have good lift capacity, excellent stall characteristics, and near zero pitching moments. They perform well in a variety of applications and are extremely popular with modelers of tailless aircraft.

CO8 uses the Reinhard Sielemann designed RS004A. Reinhard is quite adept at designing airfoils, and is author of PROFILEplus**, a multi-purpose computer application. The RS004A is 9% thick, which is fairly standard for sections designed for swept wing tailless gliders. With 1.64% camber it should perform well in both F3B and F3J. The pitching moment is calculated by PROFILEplus to be -0.0418, while the Eppler code gives -0.038.

Hans-Jurgen's arguments for using this new section rather than one of the EH series are compelling. The EH sections were designed for use on swept wings where flaps are used only for landing. Deflecting the flap downward causes a lot of drag, as would be expected, but does not provide the expected gross change in lift. This is especially true when deflecting the flaps downward in small increments in efforts to improve thermal performance. Deflecting the flap upwards is not desirable as it simply increases the section reflex, increasing drag and decreasing lift. The RS004A, on the other hand, has no reflex. In fact, it has substantial positive camber near the trailing edge. Flap deflection can be used for landing, as with the EH sections, and small downward deflections can be used to augment lift during launch and while thermaling. Additionally, the trailing edge of the RS004A can be reflexed for high speed flight. These advantages outweigh the increased twist which must be put into the wing.

The included Table provides the RS004A coordinates, and geometric and aerodynamic data.

RS004A

X	Y
100	0
99.726	0.0271
98.907	0.1177
97.553	0.2809
95.677	0.5044
93.301	0.7715
90.451	1.0796
87.157	1.4314
83.457	1.8233
79.389	2.2421
75	2.6868
70.337	3.1665
65.451	3.6739
60.396	4.1886
55.226	4.6781
50	5.1261
44.774	5.5202
39.604	5.8232
34.549	6.0203
29.663	6.1008
25	6.0526
20.611	5.8694
16.543	5.5528
12.843	5.1110
9.549	4.5538
6.699	3.8939
4.323	3.1421
2.447	2.3175
1.093	1.4527
0.274	0.6395
0	0

X	Y
0.274	-0.4865
1.093	-0.9317
2.447	-1.3795
4.325	-1.8051
6.699	-2.1959
9.549	-2.5208
12.843	-2.7540
16.543	-2.8938
20.611	-2.9504
25	-2.9356
29.663	-2.8618
34.549	-2.7373
39.604	-2.5742
44.774	-2.3822
50	-2.1791
55.226	-1.9611
60.396	-1.6926
65.451	-1.3849
70.337	-1.0865
75	-0.8108
79.389	-0.5631
83.457	-0.3553
87.157	-0.1884
90.451	-0.0656
93.301	0.0095
95.677	0.0426
97.553	0.0431
98.907	0.0253
99.726	0.0069
100	0

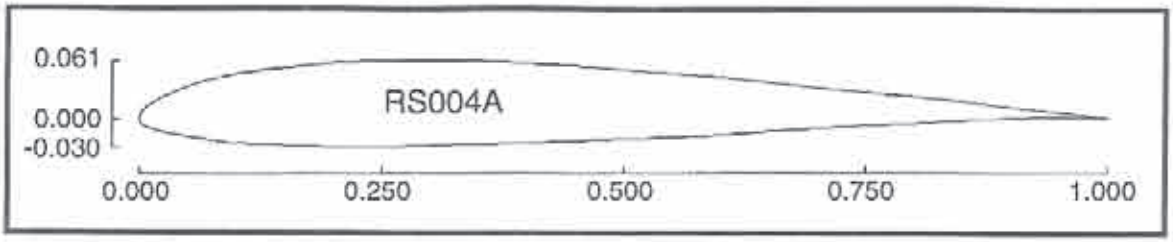
Thickness: 9% at 26.5% chord
Camber: 1.64% at 34.5%
Pitching moment: -0.0418 (-0.038 per Eppler)
Zero lift angle: -1.8062 degrees
Neutral point: 25.39%

We'll describe the CO8 airframe in Part 2.

* "EH" stands for "Eppler Horten." The EH sections were developed by John Yost using the Eppler code and following the ideas formulated by the Horten brothers.

** PROFILEplus (German) for MS-DOS is available from Reinhard Sielemann Software, Sonnenkamp 5, 49504 Lotte, Germany. PROFILEplus is a coordinate editor and airfoil plotter, and can make use of scanned images. It computes geometric and aerodynamic data, and can export files in .dxf (CAD packages) and .xls (Microsoft Excel) formats. The package includes a "profile bibliography" of over 600 sections, and a demo version is available. If writing for information, please include at least three International Postal Reply Coupons.

On the internet, go to <http://home.t-online.de/home/reinhard.sielemann/>. ■



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Martin Simons about to launch Pterosaur MK1. Photo by Adam Lockett.

Another Sort of Scale Soaring:

Saurian Soaring

By Martin Simons
Stepney, South Australia

Adam Lockett, a retired University of Adelaide teacher of Anatomy and now member of the SSL, a few years ago became fascinated by the aerodynamics and structure of the pterosaurs, those wonderful flying creatures of the Mesozoic era.

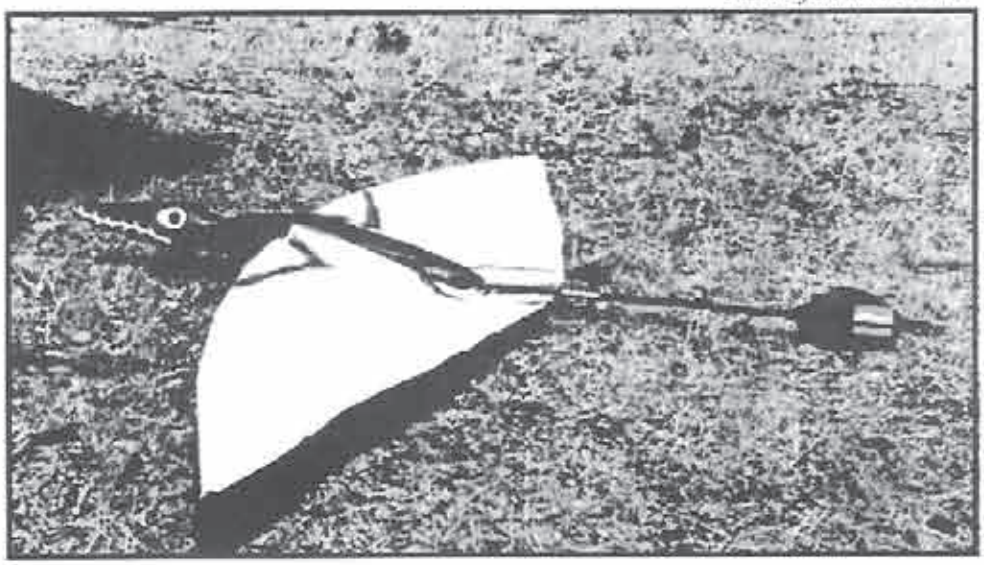
During a trip to Germany he read about some model pterosaurs in kit and ARF form. These use moulded components and although they are essentially gliders, the wings can be made to move gently up and down to simulate flapping flight. The wing plan is not quite accurate on these models, but they do fly.

Adam soon also discovered that there is a scale plan for a radio controlled gliding Pteranodon, by Stephen Winkworth, available from England (Number RC1583 on the Nexus Plans Service list). Stephen built and flew several examples for a television program some years ago, following the best anatomical advice available at that time. The wings of the Winkworth model are rigid, whereas the real pterosaurs had flexible, membranous flying surfaces.

A good deal of publicity attended the building and flying of the half sized, computer controlled Quetzelcoatlus by Paul Macready's team in the USA. Thus dawned Adam's ambition to build and fly an accurate model of a pterosaur.

Adam had no experience of flying with radio control so when he approached me with the idea the first necessity was for him to learn to manage a simple two control glider. This he has now done, although,

The Pteranodon model Photo by Martin Simons.



like the rest of us, he is still learning! Meanwhile, studies of the flying reptiles was proceeding, special attention being paid to the magnificent Illustrated Encyclopedia of Pterosaurs by Peter Wellnhofer. There is very little about pterosaurs that is not included in this book and, considering its quality, it is not expensive. I picked up my copy for $20 from the South Australian Museum shop.

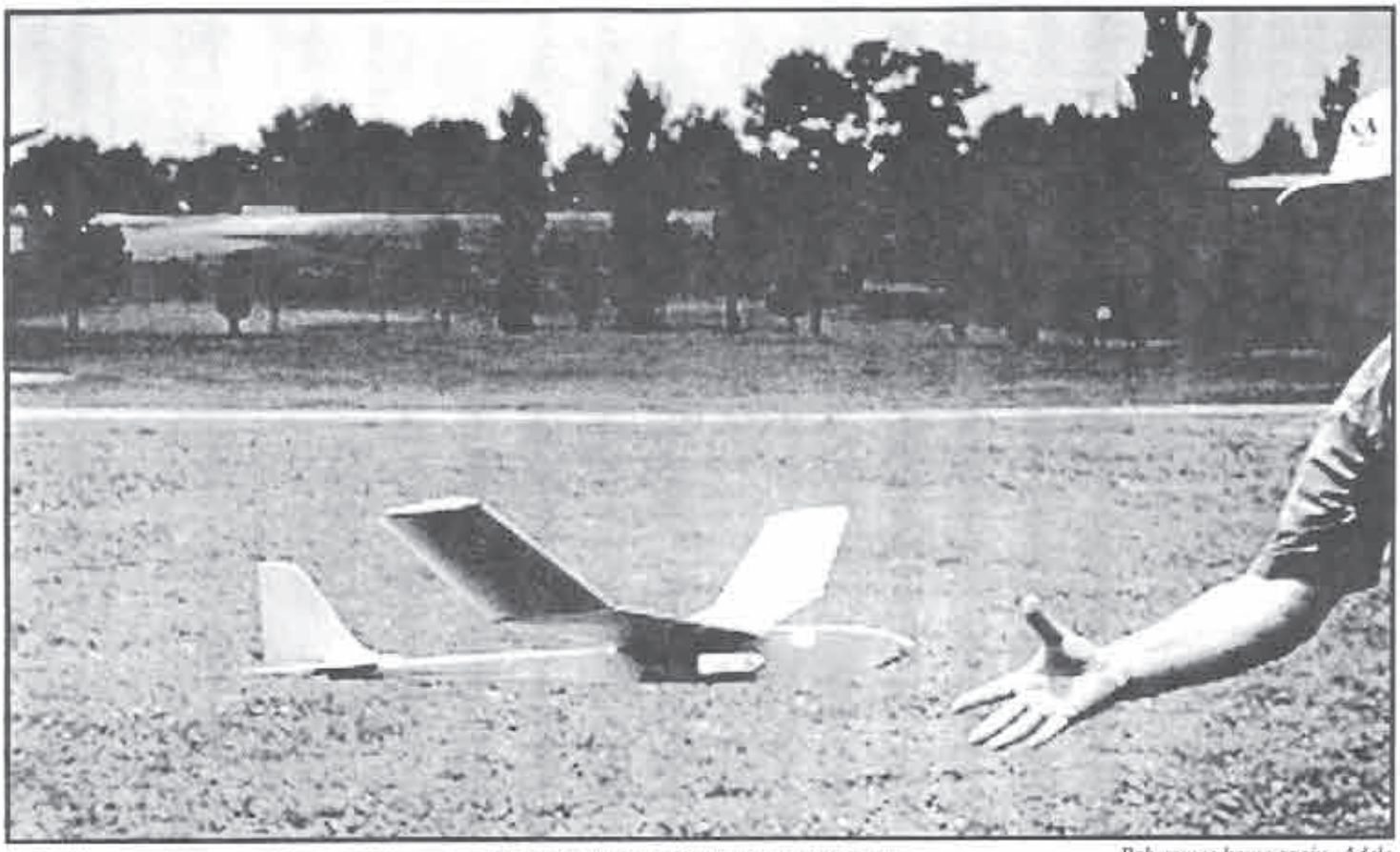
The pterosaur is a tailless aircraft and is not likely to be easy to manage in the air. The original animal had a very sophisticated auto pilot, known as a brain, which enabled it to cope very well. We have already discovered that we are not nearly so clever.

Adam made some experiments with small 'free flight' models of balsa wood and plastic film. These fly quite well. The first radio controlled model version (see photo) followed. This has two servos driving a V tail control system, flexing the cloth surfaces by moving the legs together up or down for the elevator, and differentially for lateral control. The membrane is made from Coverall, with a single, slender, spruce leading edge spar with some carbon fibre stiffening. The body is built up from wood and foam, painted with a fierce expression and large eyes.

The model was tried out at Tapanappa on 5th March. I was volunteered to act as test pilot. Neither Adam nor I was very surprised to find that it did not fly successfully. It is, after all, very early in the research program. Immediately after launching into the moderate breeze, the model veered off in a steep bank to the left and cartwheeled into the ground. There was no damage but on a second try the same thing happened and this time one of the wing spars snapped at the root end. Back to the workshop!

My impression is that the 'aileron' control is completely lacking at present. Moving one pterosaur leg up and the other down flexes the membrane a little near the roots of the wings, but there is no effect outboard. There was no response to corrective aileron. Pitch control, on the other hand, was very sensitive.

I hope we won't need sixty million years of evolution to get it right! ■



Bob comes home again. Adele Register photography.

Out to Launch. Adele Register photography.

BOB - The Little Airplane That Could

By Dave Register
Bartlesville, Oklahoma

Flying hand launch gliders (HLG) is a lot like eating popcorn - if you really like it you just can't seem to get enough. Based on its popularity over the past 4 or 5 years, RCHLG clearly meets the popcorn test. But how do you get a good taste for this side of the sport without breaking the bank? Joe Galletti of the Torque and Recoil Club has the answer for you in BOB, the plane named for a cat... (You gotta read the manual!)

A few years ago, I had a spare 5 channel Rx (Hitec), a couple of S133s, a 225mAH pack and an interest in giving HLG a shot. About the only 'entry' level kit available was the Skeeter, which is easy to buy (<$30), but is a little short on capability compared to the high priced spread. If you find you really like RCHLG, then some of those ships are a great way to go. But how to get a taste and not wind up with $300 gone and something you don't really like?

Some 5 years later comes the answer that I wish had been available back then: BOB, the 'Volks-Plane' of RCHLG. This is a ship you can afford, is easy to build and provides surprisingly good performance. The construction is REALLY different, but it's a lot more rugged than you would suspect. The wing construction, in particular, is much more durable than I ever would have thought and has led to a couple of custom built wings using the same method. (Thanks, Joe!)

BOB first caught my eye in *RCSD*. I had worn out 6 wings, three tail groups, a couple of fuselages and at least one shoulder joint tossing my 14 oz. behemoths. Fun but not real top grade stuff. Bob looked neat, the price was right and promised to come in around 10 oz. Yea, right! Let's see what really happens in the hands of a true klutz!

A couple of e-mails to Joe Galletti and a rather smallish box shows up on the doorstep. Open it up and - - what the heck!! (Well, not really, but this is a family type magazine...) A couple of blue foam blocks, a balsa sheet and some plywood. Jeez, Louise! This **isn't** an airplane.

Well, one of those blocks looked sort of like a fuselage. The other had some wing cores in it. And there was this little book that begged to be read. About an hour later (Read the book first before even THINKING about attacking this kit!) and I'm beginning to be impressed. Joe has some really neat ideas here. He's had some help from some of the best pilots around. So, let's give it a try.

The basic concept of BOB is to minimize weight where you don't need it, but maintain strength where it's important. The fuselage is blue (extruded) foam for light weight and ease of construction.

Plenty of room in the fuselage for a 5 channel Rx and 225 mah pack. Adele Register photography.

Stiffness is obtained by use of ply sides and 1/64" plywood stiffeners in the tail boom. Even the pushrods are set up to add rigidity and thus serve a dual function.

The wings are also extruded foam, but with no reinforcing sheeting. Spanwise stiffness is provided by 1/8" square full span spars (top and bottom). Since launch loads are minimal, no shear webbing is used. Covering is accomplished by using 2" wide clear packing tape (non re-enforced!). This makes a very light, very easy to build structure, but with surprising durability. A really neat idea. After quite a few months of dumb-thumbing, I've broken a few things on my BOB but never put the slightest break in the wings. A lot stronger here than conventional wisdom might suggest!

Rather than do a blow-by-blow on construction of this plane (The manual is one of the best I've seen on a ship of any size,

so I don't think I can add much to the building sequence.), I'll highlight a couple of things I found that might be useful if you're thinking of buying this plane.

First of all, read the manual from cover to cover before you do anything. I almost never do that, but in this case I'm glad I did. Construction is a bit different from the usual stick and sheet or composite types, so it pays to take a good look at some of the tricks used. There are also several choices that you have to make about construction depending on your available equipment and skill level.

The wing comes in two halves. I built each half intact and then cut each for the polybreak. It can be cut first and then built, but with a small table saw and angled blade the former method worked better for me. Joe suggests foam safe CA for the spars. I used 5 minute epoxy. Either way will work fine. The only changes I made to the wing were:

1) A cap piece of 1/8" balsa at the tip. This allowed a solid surface for getting the tape down and for sanding the LE and TE even all the way to the tip (makes it easier to get wrinkle free tape application).
2) Joe suggests taping around the LE and TE and then working from there. Definitely the way to go.
3) I joined the polybreaks with epoxy. Current construction suggestion is to just tape them on.
4) After joining all the pieces, I then wrapped 1/4" automotive striping tape around the tips to hold everything down. I also used 1" vinyl tape around the polybreak to clean that up and keep the clear covering from coming up. Taylor Collins white wing tape works well here.
5) I taped the LE with 3/4" prismatic tape (O'Reilly Automotive). It sticks really well to the packing tape, adds a nice flash at a distance, but most of all it provides a dent-proof leading edge for those not quite so graceful hand catches.

Based on the above, I would guess that Joe's idea of just taping the polybreaks would work just fine. The kit instructions also indicate making a one piece wing. I deviated here and made it in two pieces separated at the root as written up in Fred Mallett's *RCSD* column of October '97. Joe suggests making a one piece center section and taping on the tips if you want to break down the wing for traveling. Joe's way is lighter. Fred's works better for my traveling. Take your pick or just make it a one piece as originally planned.

For the fuselage, foam safe CA worked fine for the sides. Make the battery, Rx and servo cutouts as suggested first! I had a little problem with the CA on the tail boom. You don't get really great gap filling with this adhesive and the 1/64" strips would pop up every now and then with a hard launch (or landing!). I pulled them off and re-attached with 5 minute epoxy and haven't had a problem since. Since these are pretty narrow strips, there isn't a real weight penalty for this and it really helped keep the stiffeners down tight.

When it comes to mounting the servos, I'd strongly encourage using the dowel rods for mounting. I'd also suggest the following way of doing it. Before gluing the ply sides on the foam, spot the location for the servos and then drill one of the 1/4" dowel servo rails through both of the fuselage halves. Cut the dowel rails to approximate length and mount the servos on them. Remember to pre-drill the dowel for the screws (1/16" drill is right for the screws on Futaba micros), or they're likely to split. Now fit the dowel into the pre-drilled hole and mark the location of the second dowel on the fuse. Then drill that out and you've got a perfect fit. Once the fuse sides are glued on, install the dowel rails and sand them flush on the outside. The servos should then drop right in snugly.

Joe also recommends using the small fittings supplied with the kit for attaching the pushrods. (By the way, EVERYTHING you need is in the kit - no trips back and forth to the shop for extra widgets!) I opted for z-bends at each end. Since the rods are the small diameter cable, tin the last 1" at each end with solder to stiffen them up and keep the individual wires from fraying. Then z-bend the flying surface end, align the neutral position of the tail surfaces and z-bend at the servo end. Although this doesn't give you any adjustment at the clevis or mounting post, with a little care you can get it pretty much right on. Mine is well within the trim range of my Tx and it makes a very simple and trouble free connection. You can also drill the plywood control horns for an exact fit to the cable diameter to minimize any control surface play. Oh yeah, I made the control horns out of 1/32" ply scraps and CA'ed them right where I wanted. A little lighter and simpler than using any type of plastic horns.

Two last things I'd suggest would be:

1) Add a little of the 2" clear packing tape to either side of the fin. The design uses a counterbalance rudder and there's more area in the moving part of the vertical stab than the fin. This provides very good yaw response, but the part that's cracked most often is the fin. The tape seems to have cured this tendency.

2) I wrapped the nose with 2" wide prismatic tape (O'Reilly Auto again). The usual extra visibility but also makes for a tougher nose when you have the inevitable dork landing, or hit a tree, or your car, or your kid, or whatever.

Bottom line

My two piece wing, removable tail (That's another story - maybe a follow-up article some time?) BOB, with a metal joiner rod, Hitex RCD 5 channel (in the case) Rx, 225 maH battery pack (no switch), and 2 S133 servos came in at just a titch under 10 oz. I'm sure the one-piece version with a little retentive building could easily come in at a tad over 9 oz. Truly remarkable by my standards.

We've talked a bit about building this ship and some care is needed. But it pretty much aligns itself the way it's set up. Chris Boultinghouse was working on a BOB and sent the following comment: "One thing you may want to mention is that I built mine (well, the wing anyway) in the middle of the living room floor while watching TV. Just to see if someone without a workshop could build it straight. The answer is yes." My experience is similar. It's not unusual to build a warp or twist into any ship. But with BOB it's just awfully hard to mess it up! The wing was taped on the kitchen counter and it came out as straight as anything I've put together over the years.

Before heading to the field, it was time to check the balance. Usually this is the trickiest part of the setup and it came out a bit behind the average value. Joe suggests there is a wide CG range for this ship, so it looked close enough. Elevator set at – 2 degree decalage (incidence gauge). One straight pin in the right wing tip for lateral balance. Visual check for warps or twists and we're off to the field.

After putting on the funny little fluorescent rubber bands that come with the kit (told you it was complete), the finger dowel was gripped with grim determination and a mighty heave produced a screamingly high launch. Criminey, that thing really got up there. (Well, you gotta remember I'm used to heaving the 14 oz. Godzilla types.) The wind was blowing ~ 7 - 10 mph, the temperature was about 34 degrees and overcast with some mist starting to come down (cabin fever had really gotten bad). Even so, 45 second flights were pretty easy and the thin section gave good penetration in the wind. After a couple of trim tosses, I switched the battery and the Rx to see if the CG change would make much of a difference. Seemed to be pretty insensitive so it was left in the more rearward location. This required just a click or so of down elevator which also flattened out the launch angle a bit. Otherwise flight performance seemed about the same. About the 10th launch, BOB cruised over a small part of the tarmac which was recently paved and a little darker. There was a clear sign of a weak bubble and 3 or 4 turns were made before giving up. A couple of more tries found the same effect, but the wind was too strong and blew whatever it was away once it got to the height of the burn at the edge of the parking lot. But 90 seconds or so on a day like this wasn't a bad start. Godzilla/Skeeter could never have done that!

A few weeks later we had a break in the weather with temperatures in the mid '50s and light breezes. The local soccer field beckoned and BOB got out another try. A couple of tosses to confirm the settings and it's trimmed out for hand toss and catch with 40 seconds or so in between. Now for a serious look around the field. On the north end there's a little hill with a bare patch on one side. A quick toss and a few wing waggles says there's something there. A few turns and the bubble breaks loose and we're off for a five minute ride After about three of those it's off to the south end of the field.

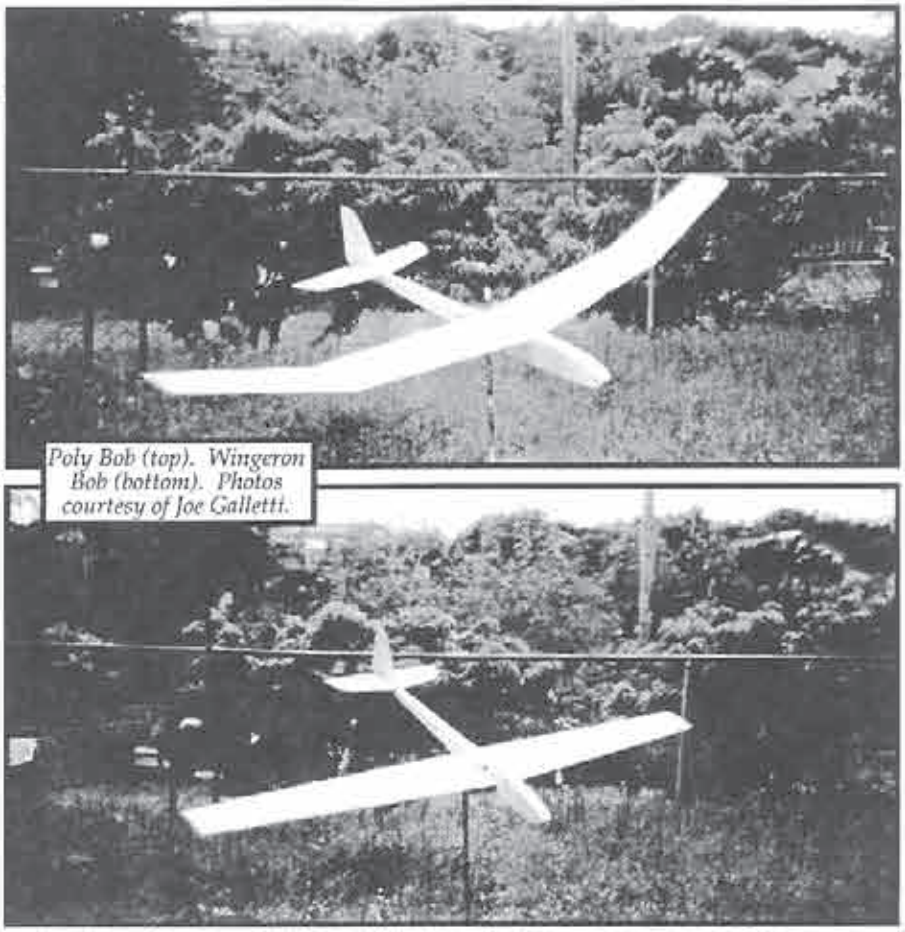
There's flat grass and a tree line but what the heck. First toss hits the mother of all winter thermals. BOB is specked out in about 2 minutes. Now when you speck out a blue foam wing against a robin's egg blue sky you're really in trouble! The most visible (and striking!) aspect of watching the ship is the translucence of the light coming through the thin trailing edge.

Without that I would've been in real trouble. So let's bring this puppy down some. Oops, there's another tree top thermal, so off she goes again. About this time a couple of local eagles spot the fun and join the thermal. This cycle repeats for another 5 or 6 thermals with the eagles along for the ride each time. When it all peters out, BOB has put in a 23 minute flight.

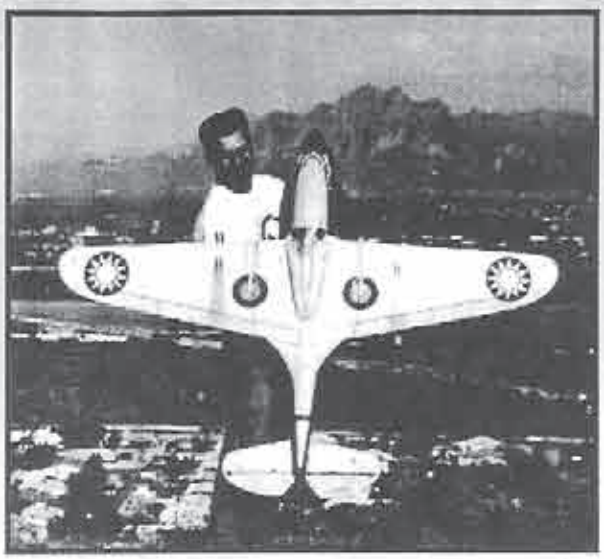
BOB and I have had some other adventures since that day. The picture session with my wife, Adele, netted a 15 minute flight which could easily have been much longer, but for the low battery warning on the Tx. That mid-winter thermal was the best ride so far, but finding 3 to 7 minute air with this ship just isn't that hard. What a difference a few ounces make! Well, maybe the design has something to add to the performance as well.

So there it is. A neat little plane at a great little price. Some very different ideas but they work well. If you want to give RCHLG a shot, this is as good an entry as you're going to get, and it can give the high priced guys a run for their money, too.

The Torque & Recoil Club
7004 Chinook, Austin, TX 78736
(512) 454-0061, foameron@aol.com



Poly Bob (top). Wingeron Bob (bottom). Photos courtesy of Joe Galletti.



(Top) Bottom view of Dave's P-40 (That's a top view of Dave.). Note airbrushed powder burns, oil stains and landing gear. Guns are EPP with soldering wire cores for stiffness. Here you can also see where the wing panels join the fixed center section. Hank Caple photo.

Dave Wenzlick's giant Curtiss P-40 Warhawk just before maiden voyage. Hank Caple photo.

Dave's P-40 in flight. Exact scale outline and section is very realistic in flight. Hank Caple photo.

FIGHTING FOAM & HEAVY IRON

VOLUME 2, NUMBER 6

By David M. Sanders
34455 Camino El Molino
Capistrano Beach, CA 92624
(949) 248-2773
davesaircraftworks@compuserve.com

Breaking It Down...

Foamies, being what they are, are ideal for traveling IF you can make 'em small enough. For some designs, it's no problem, but for others not so. Flying wing style ships with 48 inch spans can usually be stowed pretty easily in most modes of transport and a common method of taking them on airliners is to remove the vertical flying surfaces (winglets or fin) and stow them in the coat closet at the front of the plane; most flight attendants are happy to oblige. If you were to mail it ahead to your destination, that's also fairly simple as you can go get a box for it that fits inside the US Postal Service's 108 inch length-plus-girth limit. However, if you want to take along a 60 inch HLG or larger ship, that's a different matter. The box required to house a 60 inch wing and a little padding gets real large, and if you try to put the fuselage in with it, you'll likely exceed the size limit. Finally, boxes that length are a little hard to come by at your local shipping store. So, the next obvious solution is a two piece wing.

I've historically been dubious about the two-piece wing setup for foamies, as I've always felt having a huge stress riser in the middle of an otherwise resilient and monolithic structure sort of defeated its purpose. I'd also seen other attempts and wasless than thrilled about the result. Still, it sure would be nice to have a light 60 inch ship on my next trip.... Maybe even a bigger one! Gotta' solve this problem to full satisfaction somehow.

So mental examination of all the examples of two-piece wings I'd seen done led me to a few conclusions that have helped immeasurably in working out the details:

1.) Anywhere there's a need to have a hard angle keep its shape, you need to have material in the form of a plate or block with sufficient stiffness to resist deformation with the shrinkage of the covering material, as well as withstand shock loads.

2.) Anywhere a bolt or pin is placed for field assembly, the resulting point loads generated need to be distributed as evenly as possible into the volume of the foam or the part will fail.

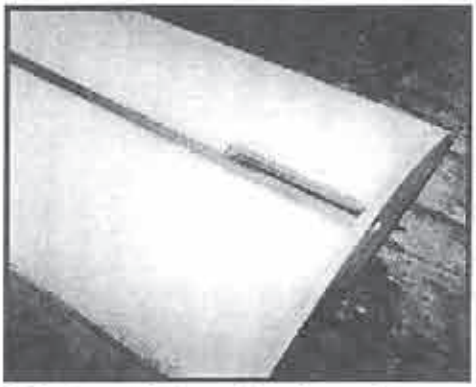
3.) Ya' don't want to add any more excess weight to an airplane that's already a lead sled by today's standards!

Armed with this meager amount of knowledge and a couple of belts of good wine, I endeavored to do a two-piece wing for a 1-26 foamie HLG I was building for a friend of mine.

I built the wing stock, aileron setup, up until joining the panels at the center. Here, I installed a joiner tube in each panel ahead of the spar. I also used a piece of 1/8 inch light-ply as a root rib for the ends of the panels. Well... This rig was far less than perfect. The joiner tubes worked fine, but the root ribs bent like crazy under the stress of the covering. I ended up shimming them out plumb again after finishing, and it looked like the devil. Ultimately, I did get it functional and looking decent and the plane flies (and travels) well to this very day.

Next try! This time, on a prototype for a really huge ship, my 1/5 scale foamie Ka6. This baby is 117 inches of pure foam terror... It weighs about 100 ounces and has a 16 ounce per square foot loading. There was no way on God's green earth I was going to do this one as a one-piecer, as it would be just about impossible to take anywhere, much less far.

A 1/2 inch diameter, 12 inch long joiner rod of 6061-T6 aluminum was hastily pulled forth from the magic box of bits and pressed into service. Brass joiner tubes were used in each panel, again placed ahead of the spar. A 1/8 inch thick, 18 inch



1-26 wing with joiner tube and root rib for two-piece wing setup. Inboard end of tube engages hole in 1/4 inch balsa root rib. Spar and trailing edge pieces butt glue to side of root rib giving strong joints and good load distribution.

long sub-spar was installed ahead of the joiner tubes and extends span-wise into the panels 12 inches past the end of the joiner tubes, as well as matching the depth of the spar. The joiner tubes are plugged on the outboard ends, placed in the notch in the panel, then flooded with epoxy to mate with the spars. Do this operation with the panels joined on the bench with the dihedral set and it comes out perfect.

After all that was installed, the rest of the notch above the joiner tubes was taken up with lightweight balsa and sanded flush to the wing's surface. Next came the root ribs...

The joiner tubes were installed so that the inboard ends fit well below the top surface of the wing, and projected about 3/16 inch past the end of the panels' span. This way, I could install a root rib that was nice and thick, and also picks up the inboard end of the tube with plenty of surrounding meat; giving another strong mounting point between tube and panel. So look what we've got so far; the joiner tubes are firmly attached to the spars which distribute the load all the way along their length. Also, the root ribs will take the ends of the joiner tubes and distribute their load across the entire surface area of the wing section at the roots, as well as transmitting it to the trailing edge stock.

The root ribs were fashioned from 1/4 inch hard balsa. Much better than the plywood, this time! The wing roots were firm and very resistant to deformation. All was well to this point, so now the problem of wing bolts. This ship has a high wing, so I needed to bolt the wing to the top of the fuselage, not just slide it through a hole. Hard points were installed in the fuselage in the form of plywood plates tapped for 1/4-20 bolts, two for each panel. The wing has the bolts passing through it directly behind the spar, and at the junction of the trailing edge material and the root rib. There's also a 1 inch square plate inlaid into the top of the panels for the bolts to bear on. There's no locator pin used; the wing saddle keeps them aligned just fine.

All of the above components were taped over with at least two layers of tape in the taping schedule, then covered as usual with Ultracote.

How'd it work? Works great! This wing is stiff and true and breaks down in minutes. It's stood up to stiff winch launches and the joiner rod has been bent on some, proving the effectiveness of the joiner tube installation. Also, the roots of the panels have maintained their shape and always look crisp and neat. Satisfaction at last!

Third time.... This time on another 1-26... For myself (finally). I used the same 3/16 diameter by 6 inch CF joiner as I used on my buddy's ship and brass joiner tubes. The tubes were notched into the panel ahead of the spars and flooded with epoxy, then capped with balsa as before; no need for the sub-spar on a 60 incher. This time, however, I went with the 1/4 inch balsa root ribs... Big improvement! As with the Ka6, this bird has great roots. Again, no locator pin as this plane's wing slides through the fuselage and is firmly held in alignment. I've a picture of the setup to give you an idea of how it looks assembled. With the above information to guide you, it should be pretty easy to do the same thing on just about any of the foamies on the market today of any size.

Reader's Ride

Yes! We have a fresh new Reader's Ride this month! Take a look at that picture.. What do think it's made of? Wood, glass? You'd be wrong! This excellent P-40 Warhawk by Dave Wenzlick of Mesa, Arizona is all EPP!! At 67 inches span, it's 1/6.6 exact scale, which is a pretty hefty ship by PSS standards; it weighs in at 6 pounds and has provision for 3 1/2 pounds of ballast.

Dave's construction is interesting, too. The fuselage is constructed in four sections; the joints between the sections cut the fuselage into quadrants as viewed from the front. All the radio equipment and wiring were installed with the fuselage in halves, then the whole thing sealed up. The battery can be accessed through the spinner, and there's a service panel for the receiver as well. The wing fillets were hot-wire cut in three sections each then applied to the permanently joined fuselage and wing center section. The outboard wing panels join to the center section and the aileron linkages automatically engage on assembly. Wing is constructed by conventional EPP methods and the tail is made of 1/4 inch balsa sheet.

What about that finish? It's 1.5 mil sign vinyl over packing tape over contact cement. The camouflage, panel lines and weathering were airbrushed over the vinyl; the canopy and decals were robbed from a power kit. After all this, the entire plane was shot with flat clear coat to de-gloss and unify the finish. The spinner is painted with dimensional T-shirt 'Puff Paint'.

It's controlled by six Futaba S148 servos; one for rudder, one in each wing panel and one for each half of the elevator. The sixth is a tow release! A 1500 mah battery provides balance weight and long flight times. Where'd Dave hide the switch? It's the gunsight... Push it down, and she's ready to rock!

This is certainly one fine piece of work... Certainly far beyond what anyone would have expected from an EPP foamie just a year ago. With scratch built planes like this, and production kits like the DAM Mustang, EPP is finding an interesting niche in giant scale PSS. It'll be fun to see what great craftsmen like Mr. Wenzlick bring us in the future! Thanks, Dave, for treating us to a fine model!

Combat Legal Warhawk...

Mark and Andre at MAD Aircraft have been hard at work and are now offering a 48 inch span, combat legal model of the Curtiss P-40. It's semi-scale and comes in at the high twenty to low thirty ounce weight range. Airfoil is an RG15, area 422 square inches. Construction methods are very conventional and should present no problems to the experienced EPP basher. I've seen the model and it's quite nice, with very convincing scale looks. Kit price is $59.99. Check in with them at MAD Aircraft Design, 15268 Rolling Ridge Drive, Chino Hills, CA 91709; (909) 606-0363. See their webpage at www.madaircraft.com.

MAD Aircraft Design combat legal semi-scale P-40. See text for details.

Epp Over Korea...

Merrill at MM Glidertech has also been burning a bit of the midnight oil to give us the second in his series of Korea era EPP foam ships; this time the mortal enemy of his F-86 - the MiG 15. This ship is 48 inch span and combat legal in all respects. Now there's some proper opposition to those Sabers! See MM Glidertech's ad in this issue for contact info, and Merrill's new webpage address. I didn't get much data from him on this kit, as he was in the middle of a move. By the time you see this, though, they should be all settled in and operating at full steam.

Peeling Off...

That's all for this installment.. I'll have some juicy stuff to share from the midwest in our next edition... I hear they're bashin' some foam at the Midwest Slope Challenge this year... Heh, heh! You sure this is Kansas, Dorothy? ..... Cute shoes. ■

MM Glidertech's new combat legal semi-scale MiG-15. See text for details.

A Brief Summary of the Development of R/C Thermal Soaring in the United States Up to 1977

by Chuck Anderson
AMA 371, NSS 72-361, LSF 586
Tullahoma, Tennessee

This is a summary of the early years of thermal soaring in the United States written in late 1977 at the request of Jim McNeil, AMA District V Vice President. Jim had appointed me as District V Soaring Advisory Committee representative in 1973, and I was the District V NSS Vice President at the time it was written. It reflects my views at that time. I would change little if I wrote it today, however progress has overcome some of the conclusions presented herein. Remember that this report was written to brief an AMA Vice President about soaring and to gain his support. It was not written as history.

The sport of R/C thermal soaring is as old as the sport of R/C model airplanes. In fact, one of the major problems of early R/C flyers was too many thermals after the radio quit working. Many early R/C pioneers build gliders for use as flying test beds in the 1930's in order to get their equipment working, before exposing it to the vibration and ignition noise of a power model.

Thermal soaring as we know it today didn't really get started until the development of light weight, transistorized receivers in the early 1960's. The appearance of these receivers lead to the development of numerous power pod gliders, many of which were published in the various model magazines. The lack of an easy, reliable launch system somewhat delayed the rise in popularity of the pure sailplane. The reason for this delay is obvious to those who have run full speed through deep grass with a 3 to 5 pound glider on the other end of the towline.

Most early sailplanes were developments of free flight models, and their performance at the increased wing loading imposed by the radio equipment available at that time frequently left much to be desired. Still, they were fun to fly and introduced a lot of modelers to the joys of R/C thermal soaring.

The activities of the power pod flyers did not discourage the purest who continued to refine their models and launch equipment. One of the first successful launching devices was a resurrection from the 1930's — the hi-start. Power winches were also under development, with most of the early successful ones being gasoline powered. Some were run by a winch operator, while others were rigged with a foot throttle to allow the flyer to operate the winch (and take the blame for folded wings). The big advantage of the gasoline winch was the ability to throttle the engine and vary the tow speed; however they were heavy, noisy, and frequently balky. Some flyers called them Cadillac winches because they were very big, very heavy, and very smooth.

Various electric winches were also used; however, flyer acceptance was slower because of the difficulty of controlling tow speeds. They rapidly displaced all other launching methods for contest work as flyers learned to pulse the winch. By 1972, the electric winch and been standardized into three basic designs: the LSF winch, the ECSS winch, and the Airfoiler winch. All three winches used a long shaft, 12 volt Ford starter motor and the principle differences were in battery voltage and drum diameter. The LSF winch used a 4 inch diameter drum with 6 volt batteries, while the ECSS settled on a 3.5 inch diameter drum with 6 volt batteries. The Airfoiler winch used the more readily available 12 volt battery and reduced the drum diameter to 2 inches to keep the tow speed roughly compatible with the LSF and ECSS winches.

Early R/C sailplanes evolved from free flight gliders with modifications to carry radio equipment. Frank Zaic's Thermic series were early favorites, and the Floater was still popular among novice flyers well into the 70's. The power winch led to the development of larger models with wing spans of 12 to 16 feet and, for a while, the "bigger is better" route seemed to be the way to go. Development of better models in the 8 to 10 ft. span range in the mid 70's showed that sailplane size had little to do with performance when properly designed and flown by an experienced pilot.

Early sailplanes were usually flown with one or two controls, however flyers were quick to explore and use the advantages of spoilers, ailerons, remote release tow hooks, and other options as soon as the development of small, light weight radio equipment made it possible. Telemetry in the form of thermal sensors were developed by several modelers and at least two were on the market by 1975.

The development of R/C sailplanes was evolutionary rather than revolutionary. This can be illustrated by two models that proved to be classic designs and set the standards by which all others were judged. The first was the Graupner Cirrus and was the first really high performance sailplane for many modelers. First introduced into the US in the early 70's, it was still very competitive until the late 70's, particularly when modified to include spoilers and flaps. The other classic sailplane proved for once and all that the standard class sailplane could perform at least as well as the unlimited sailplanes. I refer to the Aquila, introduced in 1975 and used by Skip Miller to win the first R/C World Soaring Championship. There were many other notable designs such as the Grande Esprit and the Kiwi along with the boxy Olympic, however none had the influence of the Cirrus and Aquila on soaring.

The availability of reliable radios combined with the solution of the launching problem led to the explosive growth of thermal soaring in the late 60's. Several groups were formed to promote R/C soaring, the most influential of which were the League of Silent Flight (LSF), the East Coast Soaring Society (ECSS), and the Silent Order of Aeromodeling by Radio (S.O.A.R.) club. There were many other clubs and regional groups who made significant contributions to R/C soaring, however these organizations were primarily responsible for the development of thermal soaring as we know it today.

LSF

The League of Silent Flight was founded in 1970 by a group of west coast modelers led by Lee Gray. The primary goal of the LSF is to promote R/C soaring throughout the world and to recognize individual proficiency and accomplishment. The LSF is unique in that it is a voluntary association that levies no membership dues or fees and assigns no responsibilities or obligations other than to promote R/C soaring. The LSF is supported entirely by voluntary contributions and by fees for specific services and goods. Finally, membership must be earned by attainment of Level I of the LSF Accomplishments Program.

The LSF is best known for its accomplishment program which is, in reality, an individual accomplishment program. The LSF has established five levels in its Soaring Accomplishment Program. Level I requires only the demonstration of basic soaring skill. Higher levels require more advanced flying accomplishments and demonstration of flying skill through points earned by competing in contests. Level V is the highest level and is extremely difficult to achieve. Only a very few dedicated modelers have achieved Level V. The LSF was also responsible for the development of the first set of R/C soaring rules to be accepted by the AMA as an official event.

The LSF began holding an annual R/C soaring tournament in 1970 with 85 members competing. Since entry in the LSF tournament was restricted to LSF members, it became the largest Class B contest in the United States. Tournament growth was limited by the number of available frequencies and by the fact that all contests were held in California until 1977. In 1977 the tournament was divided into 10 regional contests held at sites throughout the country. As a result, the 1977 tournament drew 487 contestants from almost every state in the union and several foreign countries.

S.O.A.R.

Many clubs have contributed to the advancement of R/C soaring, but none have done more than the Silent Order of Aeromodeling by Radio (S.O.A.R.). In particular, they established a truly national championship soaring contest that set the standards for all soaring contests. It all began when Dan Pruss, Dave Burt, and the S.O.A.R. club offered to help organize an unofficial R/C soaring event to be held in conjunction with the 1970 AMA Nats held at Chicago. The contest grew rapidly and became known as the SOAR Nats even though the S.O.A.R. club preferred the title "R/C Soaring Nationals". Dan Pruss and the S.O.A.R. club did such a good job that the SOAR Nats remained the acknowledged national championship soaring event even after AMA included R/C soaring in the AMA Nats. By 1976, the SOAR Nats had become so large that the S.O.A.R. club felt that they could no longer sponsor the event. The 7th and final R/C Soaring Championships held in 1976 drew 190 contestants competing in 3 classes and scale. The S.O.A.R. club also held a special Great Bicentennial R/C Sailplane Race held over a 76 kilometer cross country course as part of the Bicentennial celebration of the signing of the Declaration of Independence. The SOAR Nats are no more, but the Great Race lived on.

ECSS

In 1970, a group of soaring enthusiasts from the Northeast began thinking about an organization to coordinate soaring activities in the region. Thus the East Coast Soaring Society (ECSS) was born in

January, 1971. The founding members included such R/C pioneers as Dr. Walt Good, George Durney, Howard McEntee, and Don Clark. The stated objectives of the ECSS were to advance the art of design, construction, and flying of radio controlled soaring planes. Rules were formulated for contests and an ECSS Championship program was established. The most significant action by the founders was the recognition that an active board of directors was required in order to provide continuity of action and that a technical journal was required to keep members informed about the latest developments in soaring. This foresight provided the framework for what was to become the National Soaring Society.

One of the early problems addressed by the ECSS was that of adequate recognition of soaring by the AMA. The ECSS proposed its contest rules to the AMA, however the Contest Board voted to accept the more diverse set of proposals offered by the LSF.

SAC

The ECSS also proposed that the AMA establish a Soaring Advisory Committee (SAC) to be appointed by each AMA District Vice President. The purpose of the SAC was to advise the District VP and the District R/C contest board member on soaring problems and rules. The AMA accepted this proposal and the Soaring Advisory Committee was formed in 1973.

NSS

The success of the ECSS journal, *Sailplane*, brought in a large number of members from outside the area forming the original ECSS. Since the organization was now national in scope, the members voted to change the name to the National Soaring Society.

One of the pressing problems facing soaring in the early 70's was coordination with and representation by the AMA. Several abortive attempts to found a national organization for R/C soaring failed, mostly because of the vocal anti-AMA minority who seem to take the lead whenever new organizations are being formed. The SAC issued a call for proposals to form a National organization and scheduled an open meeting of the SAC to hear proposals at Lockport, Illinois on the day after the 1974 SOAR Nats was completed. All interested parties were invited to submit proposals, however only the NSS submitted a proposal.

The SAC meeting was chaired by Jim Simpson, District IX SAC representative. After NSS president George Durney presented the NSS proposal, the meeting was opened to questions from the floor. Several changes to the NSS constitution were suggested, however there were no objections to the NSS proposal. Therefore, the SAC voted to recommend that the AMA accept the NSS as the special interest group to represent R/C soaring. The AMA accepted the recommendation and a special meeting of the NSS Board of Directors was held at Silver Springs, Maryland on November 23 and 24, 1974 to accomplish the required revisions to the constitution and bylaws and to plan for future activities. The Soaring Advisory Committee was disbanded after the AMA recognized the NSS as the Special Interest Group representing soaring.

The NSS faced many problems during its first two years - opposition from some who felt that R/C soaring was being controlled by a regional group. Ironically, some members of the old ECSS felt that their organization had been taken away and its goals subverted. Fortunately, the NSS had several members who worked hard and managed to steer the NSS through this difficult period. Another very divisive issue was whether the standard class sailplane should be restricted to two channels as flown by the old ECSS, or should be limited only by wing span as flown at the SOAR Nats and most of the rest of the country. The issue was finally settled in a true diplomatic compromise. Two standard classes were established so everyone could win.

Two of the most outstanding NSS leaders during this period were Larry Fogel and Jim Simpson. By the end of 1977, the NSS had completed the FAI team selection under the able direction of Dan Pruss and Jim Simpson. This team won the first FAI Soaring World Championship and Skip Miller was the first World Champion. The NSS also ran the R/C soaring part of the 1977 AMA Nats and acquitted itself quite well under trying circumstances.

The sport of R/C soaring had overcome most of the political problems and continued to expand as more modelers discover the joys of chasing the elusive thermal. R/C thermal soaring is the fastest growing phase of the wonderful hobby of model airplanes, as evidenced by the fact that thermal soaring had the largest number of entries of any event at the 1977 AMA Nats. It can continue that way if we can prevent people from "improving" the sport. ■

The Condor is designed by Mark Allen, who is considered one of the best model sailplane designers in the United States, if not the world. Mark has taken all of his previous experience in competition thermal duration flying, plus all the knowledge he has gained from his earlier contest and sport designs, to design the Condor. Mark Allen's previous planes, to name only a few, are: Falcon 880 and 800, Falcon 600, Swift, Thermal Eagle, Vulcan, Night Hawk, Sky Hawk, Electric Hawk, Falcon 550E, Rocket, Pocket Rocket and, of course, the molded, world championship F3B Eagle. By taking the best of these designs and the new construction techniques available today, Mark has come up with, what we feel, is the absolute best open-class sailplane available.

The wings are made in America by Ron Vann, owner of Spectrum Enterprises. Ron is also an avid competition flier, and is considered to be one of the best wing manufacturers in the industry. Taking his years of experience in manufacturing wings, Ron has produced wings and stabs for the Condor that we feel are world class. Starting with the spar that Mark Allen designed, Ron uses only the best and most accurately cut foam cores available. He then uses hand picked obechi from Kennedy Composites, which is applied with West Systems epoxy.

CONDOR

Tomorrow's Sailplane, Technology Today

This is after he has first reinforced the wing with carbon fiber and fiberglass. The servo wells are routed out, as are the flaps and ailerons. What this means for the sailplane enthusiast is a minimum amount of work before getting the sailplane into the air. The wing is light but strong enough to take "pedal to the metal" launches. Also available as an option is Ron's unique internal capped hingeline. This means even less work for the modeler.

The fuselage is made by Steve Hug, owner of the Fuse Works. Steve is another master at what he does. Fuse Works makes what we consider to be the best fuselage in the business. Steve uses only the best fiberglass and Kevlar™ available. All fuselages are manufactured using the West Systems epoxy. Steve's fuselages have the least amount of pinholes, if any, that we have seen. In fact, the fuselage is so pretty that many people do not paint it. The fuselage is extremely light, and yet strong enough for very aggressive flying and landing. For those with very little building time, and those who don't like to paint, there is an optional pre-painted, in the mold, fuselage which includes a unique carbon fiber canopy.

All kitting is done at Slegers International's new and larger manufacturing facilities. We have spared no time or expense with supplying the modeler with the best materials available. The kit contains pre-sheeted wings and stabs by Ron Vann, fiberglass and Kevlar™ reinforced fuselage by Steve Hug, 3/8" diameter titanium wing rod from Kennedy Composites, optional 3/8" diameter steel wing rod by Squires Model Products, control horns and tow hook by Ziegelmeyer Enterprises, pushrods by Sullivan, or optional one piece steel rods. All wood is custom cut. Specially cut basswood of 60" is supplied to eliminate splices in leading edge, flaps and aileron capping. All balsa is hand picked, light to medium, to ensure light weight wing tips, stab tips, and rudder. Aircraft ply is used for the pre-fit servo tray and towhook block. A comprehensive instruction manual is included.

The Condor, designed by Mark Allen, wings by Ron Vann, fuselage by Steve Hug, and kitted by Slegers International, we feel, is the best open-class, thermal duration sailplane available, at an affordable price of $395.00 plus S&H.

★ VISA ★ MASTERCARD ★ DISCOVER ★

SLEGERS INTERNATIONAL

P.O. Box 364, Long Valley, NJ 07853
Shipping: 35 Hacklebarney Rd., Long Valley, NJ 07853

(908) 879-9964 - FAX (908) 879-8177
http://www.slegers.com

The French Jodel Robin, practically unknown in the U.S.A., is one of the most popular towplanes in Europe. Here, you can see no fewer than five beautiful, giant Robins, a Yak 112, and a Pilatus Turbo Porter ready for duty. More than thirty teams - thirty different scale towplanes and thirty scale sailplanes come to compete every year. Started more than 25 years ago, this scale airtow-sailplane team event is one of the longest running and best attended events in Germany. Usually, thirty to forty scale teams compete in this wonderful event. Hans Heli photo.

Robin Lehman
63 East 82nd St.
NYC, NY 10028
(212) 879-1634

Magic of Flight

The magic of flight has always fascinated me. I still remember the first time I saw a 747 takeoff and, to this day, it seems a miracle that such a huge thing can get off the ground, much less fly. To some extent, the same is true of our larger scale models – when you pick up a twenty pounder, it really IS amazing that such a beast will fly so amazingly well! Thanks to German technology, and the inventiveness of a few others here in the USA, we also now know that the bigger they are, the better they will fly.

Smaller or larger, one of the best things about scale models is that you can do so much with them! Physically they can be completely scaled out with all cockpit details. Add a realistic pilot and you are looking at a miniature replica of the real thing in every way. From totally scratch built to completely finished, a multitude of wonderful scale models are now readily available here in the USA. Almost all of these models fly extremely well ...So now what?

Competitions and Fun-flys

Taking a feather out of the German's cap, there are as many ways to fly these beautiful scale gliders as there are pilots. While it's true that the majority of pilots prefer the "fun fly" format, I am convinced that there are many potential, competitive pilots out there who are now flying thermal duration who would just love to test their skills flying a beautiful scale sailplane.

Those of you who have visited the http://www.sailplanes.com web site will have noticed a lot of new activity for the scale enthusiast. There will be several cross-country scale competitions held in California and elsewhere this year. The first aerobatic event is to be held in North Carolina in October. You will also notice the multitude of varied competitive events offered in Germany, Switzerland, France and Italy. Indeed, from fun-flys to more serious competition, there is something for everyone!

The Seglerschlepp or Glider-towplane Team Event

New to us, but one of the oldest and most enjoyable events, is the Seglerschlepp or glider and towplane team event. Every year some 40 or so beautifully scaled out sailplanes and towplane teams (I mean 40 + different towplanes and an equal number of sailplanes, 80 + scale airplanes in all!!!!) gather for what must surely be a most enjoyable test of skills. Right now, we would be hard pressed to gather 10 scale towplanes in one place, but all that is rapidly changing - just wait a couple of years as different groups spring up around the country. While it's true that we have a ways to go, it's also true that the scale sailplane movement is now growing in leaps and bounds.

Seglerschlepp event, as I said, is a team event. The sailplanes must be at least 4 meters span and although they are not judged for scale fidelity on the ground, both models must physically resemble and fly like real aircraft. The flights of both aircraft are scored and added together.

In brief, the towplane must taxi out, stop and attach the towline, then takeoff, do three 90-degree turns, then tow to height. When the sailplane releases, the tug must descend, drop the towline and do an approach and landing.

The sailplane must take off (on tow), follow all the 90-degree turns, get towed to height and, after release, the glider must land in exactly 200 seconds. What counts is scale-like flight and precision of all the maneuvers.

One if the longest-running scale event in Germany, this event has been going for well over 20 years. All of the towplanes and sailplanes are large and tend to be completely scaled out (although this is not judged or required). Many are 1/3 size and all are a matched pair - meaning you might see a Tiger Moth towing up a

A very large Tiger Moth and a Minimoa can be seen. The scale teams can be vintage or modern. There are more modern towplanes, like a Jodel Robin, a Moraine Raylle, or a Wilga teamed with an LS6, a Nimbus 4, or a Fox. Nowhere in the world are there gathered in one place more different scale towplanes and sailplanes. Hans Heli photo.

Minimoa or a Wilga teamed with an LS6. If you want to see the largest concentration of scale towplanes and sailplanes in the world, the Seglerschlepp event is the one to see!

The Akro-Cup or
The Scale Sailplane Aerobatic Event

A relative newcomer to the scale competitive scene, the aerobatic airtow competition was held a couple of times some ten years ago, but because of its popularity, will most certainly become an annual tradition in Switzerland and Germany. Perhaps the introduction of the Swift and the Fox a couple of years ago has given adventurous pilots the ability to push the limits, but whatever the reason, the aerobatic scale sailplane competition is now here to stay. Modeled after the European format, we will try out a similar acrobatic competition held in Fayetteville, North Carolina this fall.

The Germans take their competitions very seriously and, in this case, the judges will meet in advance to be "schooled" in the basics of judging the maneuvers.

Although not scored on the ground, the aerobatic sailplanes must resemble their full-sized counterparts. The cockpits need not be scaled out. It's the flight scores which count. The gliders are towed to height – high enough to complete the required aerobatic routine, but low enough so that the judges can see. This means that larger sailplanes are towed higher, while the smaller ones don't have to go so high. The aerobatic routine is published in the German model magazines well in advance, so that all pilots have a chance to practice as much as they want before the contest.

Last year, although over thirty pilots were pre-registered, 19 brave souls showed up to compete in spite of the awful weather predicted for that weekend. There were at least three 1/3 Wilgas and a couple of other towplanes on hand to get the competitors to height. The smallest glider was a 1/8, 3.5 lb. LO-100, while the largest, a .5 Fox weighing 29 lbs., with a span of 5.6m (218"). Interestingly, the top three gliders were two 1/3.5 Swifts and a Fox weighing in with ballast a hefty 24, 18, and 16 lbs. In order of placement, are these statistics telling us something? I rather think so. When it comes to aerobatics, it would seem that added weight makes for a better aerobatic sailplane. A heavier glider will take a longer time to slow down and so it will be able to perform better aerobatics than an identical, lightly loaded aerobatic sailplane. Energy management is what it's all about.

The Scale Sailplane Competition

For those interested in sweating the details, do the Germans ever have an event for you! Every detail of the scale sailplane is measured and scored and then these masterpieces are towed to altitude and flown. The scores for scale fidelity and flying both count. This event more closely resembles the AMA sailplane scale format, the biggest difference being the addition of the towplane as a means of launch. Perhaps if towplanes were used as a means of launch rather than winch, the Nationals might have more than one competitor flying the event. But that's another story.

Cross Country

As mentioned earlier, there will be several cross country events held here this year. The cross country venue is unique to the USA, but if they prove to be very successful and popular, I wouldn't be surprised to see them popping up across the pond in a year or two.

Slope Events

Sailplane racing is what the big birds do most of the time. Racing on a slope could be a lot of fun. Racing could be safely done against the clock in order to avoid midairs. A decent slope also lends itself to eye-level aerobatics with each competitor taking turns. Although the slope has traditionally been a fun-fly meeting place, there is no reason not to hold competitive events there. Indeed, one could argue that the slope might be the best for some types of competition.

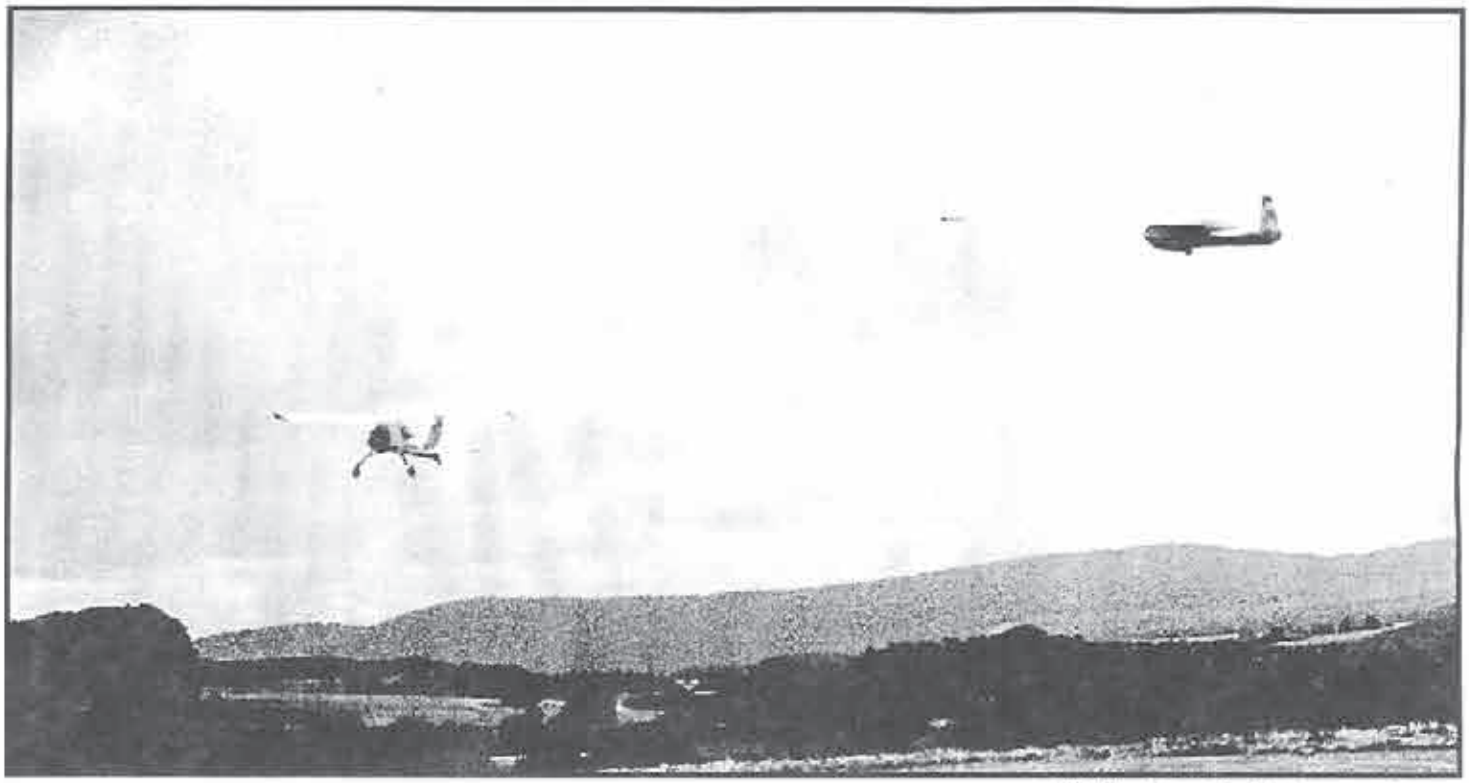
Thermal Duration

Thermal duration also lends itself to winching, although the larger sailplanes might be at some disadvantage getting high enough to be competitive. There's no doubt that airtowing DOES allow any sized glider to be easily and safely launched to altitude. This is why you will rarely see winching at a European scale sailplane event. Are they telling us something?

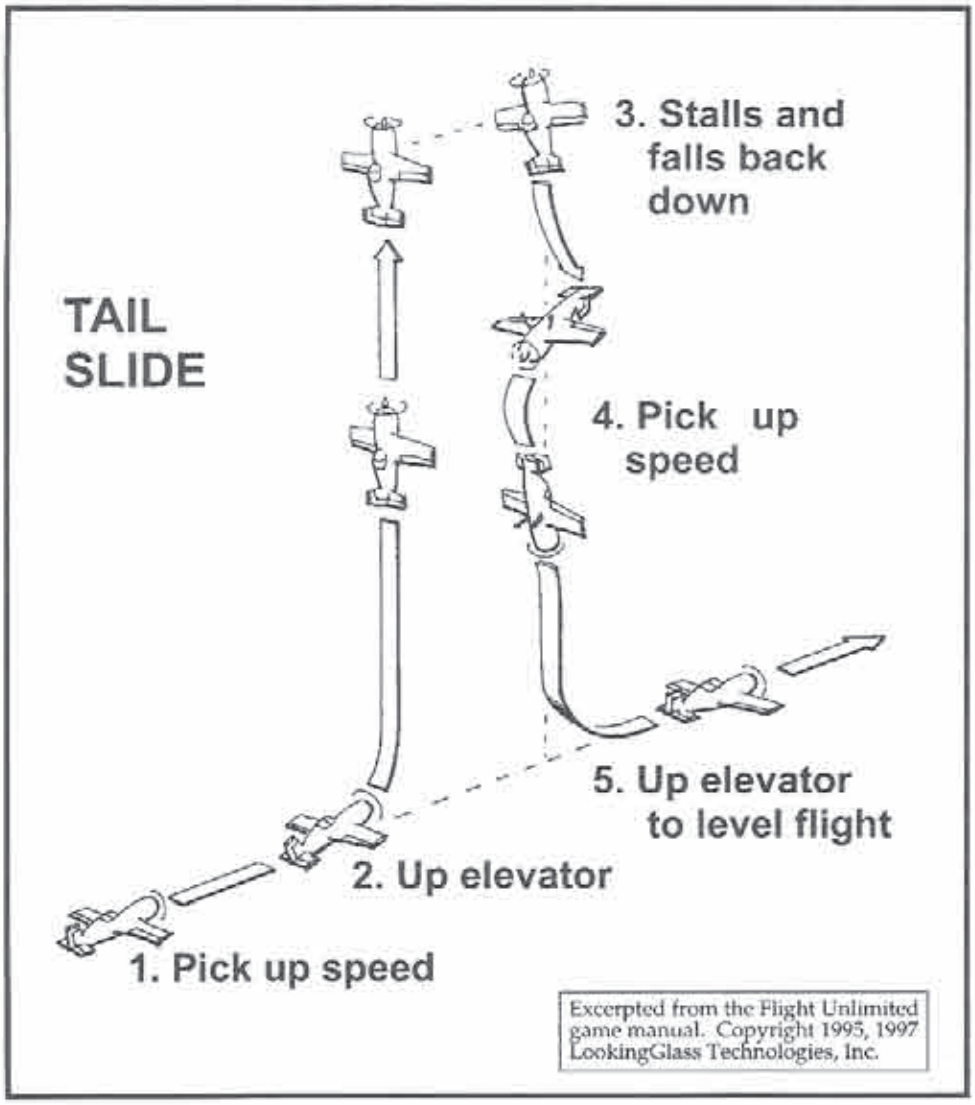
Last year in Pensacola, Florida, a thermal duration event was held, and judging from the reactions of those who participated, these guys had a ball. In this case, the scale sailplanes were towed as high as the pilots wanted, so catching a thermal was not all that difficult (although some of us didn't find lift). Several flights were scored. The emphasis was on HAVING A GOOD TIME!

Enjoying Yourself

Competition is only worthwhile if participants are having a good time. From what I have heard of the scale sailplane events in Europe, these guys "get



1/3 Wilga takes off with its team mate. The quality of flying is very important. Everything must be precise and very scale-like! Hans Heli photo.



together to meet old friends, test their skills and, above all to have a good time." This is exactly why we so enjoy our non-competitive events: make it so with any competition as well! As long as the competition is rewarding, friendly and fun, competitive scale activities will thrive wherever and whenever they are held. Let's make certain that we don't lose sight of the fact that the whole purpose of all this is to ENJOY!

Aerobatics

The Tail Slide
(easy for most sailplanes)
It can be a turnaround maneuver

Let me introduce you to another good friend, the Tail Slide. If any of you have tried the loop without enough airspeed, gone straight up and fallen back down, you have already gotten a taste of what this maneuver is all about. This stunt is simple but, at the same time, very versatile. First, let's run through the Tail Slide as illustrated.

Here's how to do it. Pick up speed, and with the wings level, give up elevator and go exactly vertical; let the glider run out of airspeed until falls back down, rotates and points the nose at the ground; pick up speed and ease in up elevator to level flight. This is not a difficult maneuver, but if you do not enter it with the wings exactly level, when you go vertical the glider will be off center and it will be difficult to keep the wings from turning one way or the other.

Remember to keep the wings exactly level throughout this maneuver and you will have no problem with the Tail Slide.

Acrobatic Flight Plan

October 1997
- Uncouple your rudder & ailerons.
- Practice flying Straight & Level.
- Master airspeed.
- Practice the Inside Loop.
- Determine what rudder & aileron adjustments are required to fly a perfect loop.
- Tackle Inverted Flight.

November 1997
- Practice the Split-S or Wing-over.
- Practice gaining sufficient airspeed to be able to complete a 360° Roll.
- Practice The Roll.
- Combine maneuvers to develop your personal, custom, aerobatic sequence.

December 1997
- Practice 1/2 Cuban 8.
- Practice the Cuban 8.

January 1998
- Practice the Outside Loop.

February 1998
- Practice the Immelmann and Reverse Immelmann.

March 1998
- Practice the Hammerhead, Reverse Cuban 8, and Reverse Half Cuban 8.

April 1998
- Practice the Spin.

May 1998
- Practice the Tail Slide.

Notes:
- Establish and maintain a "Sailplane Diary" for each plane.
- Review monthly progress.
- Practice flying with a knowledgeable friend or expert, and remember that safety comes first.
- Practice with a flight simulator program such as Flight Unlimited (April, 1997 *RCSD*).
- Definition of "One Mistake High": Be darn sure you're high enough to complete the maneuver and make one mistake, before hitting the ground.

Variations on a Theme

There are other ways to enter, execute and exit a Tail Slide, which makes it one of the handiest of all maneuvers. If you fly it as illustrated, the Tail Slide is not a turnaround maneuver, but with a different exit, it will get you going in the opposite direction.

Here's how. Now let's fly through it... Up we go (2); at the top we fall back down (3,4); the nose snaps around and we are heading straight at the ground; now, instead of up elevator to level flight (5), we give down elevator and head in the opposite direction, now in inverted flight.

Another Variation

Enter the Tail Slide inverted (1), come back down (3,4), give up elevator (5), and now we exit flying in the opposite direction flying right side up!

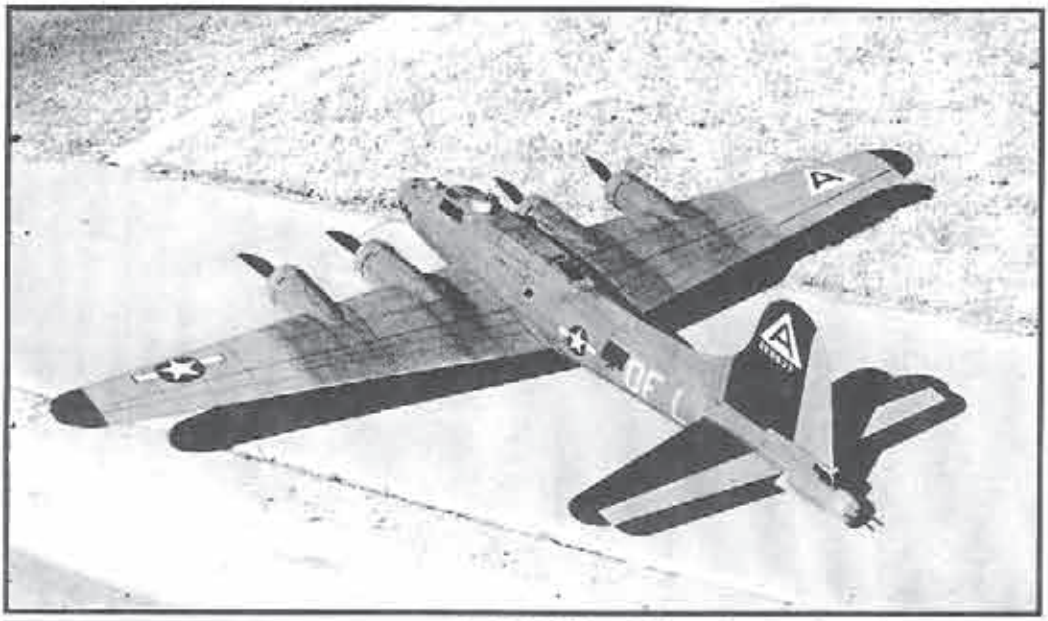
Still Other Variations

When at the very top of the Tail Slide (3) you can fly it as illustrated where the airplane "slides" back down and flops onto its back, or you can "flop" in the opposite direction, "flopping" forward rather than as illustrated. Either of these can be done (3), entering the Tail Slide inverted or right side up.

You can also enter the Tail Slide inverted, and exit inverted (not a turnaround).

As you can see, the Tail Slide can be performed in many different ways, making it one of the most useful of all aerobatic maneuvers. It puts little strain on the airframe and when properly done, you will lose very little height from start to finish. Best of all, it's one of the easiest but most spectacular maneuvers you can perform.

Happy landings! ■



B-17 Flying Fortress -
Wonderful model with a 74.5" wingspan and a wing area of 722 sq. in. All up weight is 4 lbs. when using 8 - 2000 mah Sanyo cells. Each motor is a Speed 400 6V motor on a Mini Olympus 2.33:1 gearbox driving a Graupner 9"x5" Slim Prop. The total combination draws just 29 amps and allows for 7 minutes of flight time at cruise power. Finish is clear Mica Film painted with Testors Model Master Paints.

Fairchild 24 -
43" span / 280 sq. in. area
18.6 ounces AUW
Speed 400 6V motor w/ 2.33:1 Mini Olympus gear drive, JETI 10 speed controller, 6 - 600AE Sanyo cells and Graupner 9"x5" Slim Prop

The Electric Connection

Mark Nankivil
7411 Canterbury Ave.
St. Louis, Missouri 63143
(314) 781-9175
nankmc@ibm.net

It's been awhile since I last put something on paper, as life has been a rather full and busy event as of late. Luckily, I have been putting together a few models and have also come across a number of new models and items that will keep my "must have" list long!

A Visit with Hobbies 'N Stuff

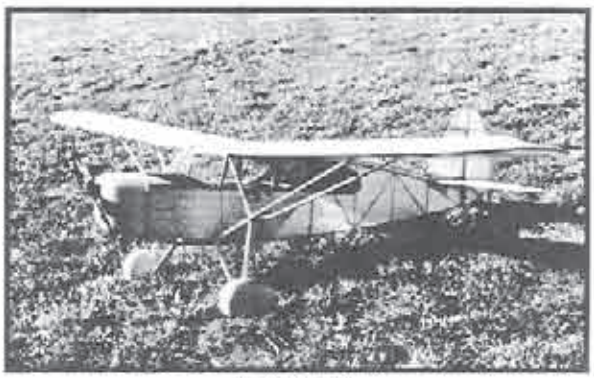
I recently made a trip to Albuquerque, New Mexico due to some business commitments and, while there, I made the usual search of the yellow pages for hobby shops in the area. There was one in particular that caught my eye, and when the opportunity presented itself, it was off to the hobby shop to check it out.

I've been to a lot of hobby shops (Ask my wife!), and this one rates near the top of those I have visited. Hobbies 'N Stuff is located in the northeast corner of Albuquerque and, when you walk in, you'll notice a large, well laid out shop with plenty of models and kits on hand, including quite a few electric and sailplane kits, in fact, the most I've seen in any one hobby shop. They also have a very good selection of books and model magazines (including *RCSD*!) and the owners, Stan and Helen Johnson, are friendly people that will make you feel right at home. Gary Kyle is their able assistant and is heavy into electrics and sailplanes. You won't go wrong gathering advice on electrics from Gary! While there, Gary pulled out some videos that showed the electric models built by one of the local modelers, Pat Tritle, and the videos definitely caught my interest. One video showed a scale Boeing B-17 Flying Fortress powered by 4 geared Speed 400 motors and the performance was exceptional. Other videos showed Pat's Speed 400 powered Farman, Stinson, and Fairchild models and, again, the level of performance was tremendous and the models simply looked great. Gary told me that I should see Pat before leaving, so Gary gave him a call and sent me on my way with directions, and I was off to see someone else who was obviously heavy into electrics.

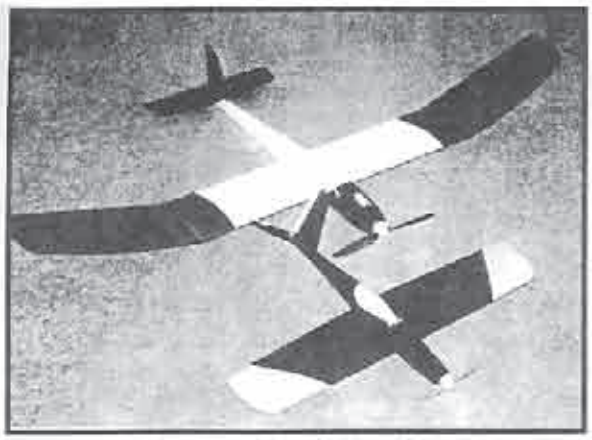
Pat's Custom Models

Pat is one of those modelers who makes you feel right at home, too; his home/workshop is loaded with all sorts of goodies from plastic models to flying models of all types. Pat actually builds and designs models for a living and obviously enjoys it, too! For those of you who receive the Hobby Lobby catalog or have seen their recent ads, the Farman and Piper Super Cub kits are Pat's designs kitted by Aerocraft. He has a number of other designs too that are to the same quality and flight performance, as evidenced by the videos. The B-17 is a real beaut, and reminds me of an enlarged Guillow's kit. It is definitely a builder's model, and the structure is strong where it needs to be, yet very light overall. As I understood it, the B-17 may be the basis of a construction article in one of the other model magazines in the near future. If so, keep an eye out for it! He also has a Speed 400 powered 1911 Eastbourne Monoplane that will be the

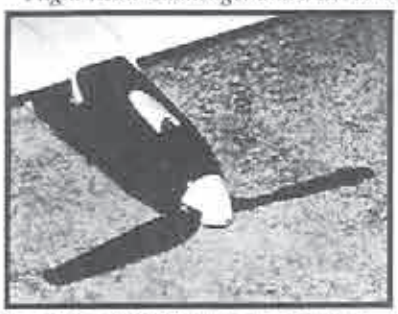
Farman 400 -
This is an enlarged version of the Aerocraft/Hobby Lobby kit
60" span/508 sq. in. area.
22 ounces AUW
Speed 400 6V motor w/ 2.33:1 Mini Olympus gear drive, Sprite 20 speed controller, 7 - 600AE Sanyo cells and Graupner 9"x5" Slim Prop



Fairchild 24 -
Enlarged version at 60" span/515 sq. in. area.
23 ounces AUW
Speed 400 6V motor w/ 2.33:1 Mini Olympus gear drive, Sprite 20 speed controller, 7 - 600AE Sanyo cells and Graupner 9"x5" Slim Prop



Gene Trevino's stable of Speed 400 models - an Astro Flight Mini-Challenger and a Levoe Varmint.



Close Up of Mini-Challenger - Gene placed the cooling inlet in the removable nose hatch as shown. This works well in keeping the motor and batteries cool and the air exits at the rear of the fuselage.

subject of a construction article in *R/C Modeler* that's worth looking for. Pat has a long list of ideas for future projects and also sells his existing plans, as well as short kits of some of those plans. You can receive one of his price lists by contact him at:

Pat's Custom Models
10313 Snow Heights Blvd. NE
Albuquerque, NM 87111

Or you can reach him at his web site:

www.thuntek.net/pcmodels

Should your travels ever take you near Albuquerque, be sure to stop in at:

Hobbies 'N Stuff
9577-L Osuna Road NE
Albuquerque, NM 87111
505/293-1217

Be sure to say you saw it here in *R/C Soaring Digest*!

Mini-Challenger

One of my closest friends, Gene Trevino, left the St. Louis area a couple of years ago and headed to San Antonio, Texas when his job lead him to new challenges there. We've partnered on a number of projects in the past, such as a cross country sailplane for the Great Race, and we've stayed in constant contact since he headed south. Gene recently sent along a couple of photos showing two of his newer models. The Mini-Challenger is from the old Astro-Flight kit and was originally designed for the Astro 035 cobalt motor. When Speed 400 first started to show up in the U.S., my first 400 powered model was a Mini-Challenger with a Climmax HLG wing using a Speedgear 400 6V motor and 11x8 folder. The performance was excellent and Gene's model continues that trend besides looking far better than mine did! Gene has a Graupner Speedgear 400 6V motor with an 11x8 prop motivating it and uses 7-500AR Sanyos to power it up. All up weight is 24 ounces.

Spirit of Yesteryear is now kitting most of the old Astro Flight line of models and the Mini-Challenger is available as well as a number of other well made kits such as a beautifully made Foote Westerner Old Timer. Locally, you can also purchase their kits from Cal Ettel. You can reach Cal at 314/831-5031 and he'll be glad to ship one your way.

Spirit of Yesteryear can be reached at:

Spirit of Yesteryear
Model Aircraft Company
40 Holgate Street
Barrie
Ontario L4N 2T7
CANADA

Varmint

The other model is one that will keep your reflexes and eyes sharp. It's a Levoe (as in Super V) Varmint Speed 400 pylon racer/sport aerobatic model. Mark Levoe makes a nice kit with a light fiberglass fuselage, spyder foam cores and 1/32" balsa sheeting for the wing. The kit allows for you to choose between a V-tail or a conventional set up and your choice of one or two ailerons. If you choose to use both ailerons, the roll rate will be tremendous! This is a fast, small model and you'll need to be sure to keep it in fairly close unless you have eagle eyes. Gene did a great job finishing this one; all up weight is 18.5 ounces, and the model uses a 7.2V motor powered by 6-600AE Sanyos. If you're looking for something to increase your adrenaline flow, give Mark Levoe a call! ■

Editorial Note

With the usual rumors floating around, we had heard that there might be a problem getting a Super-V, and were curious about Varmint availability, so we checked out the Levoe's web page and found Mark's announcement dated April 2, 1998.

Mark says, "I have recently taken on composite work for a local aerospace company. This job should last for the next three to four months. Regrettably, this leaves little time for SuperV production. I am temporarily postponing taking new orders for all sailplanes. The current plan is to fill outstanding orders as time permits. As soon as the backlog is completed, I will begin taking new orders.

"Replacement parts such as fuselages, wing rods, and most small parts are currently available. Please e-mail or call for pricing and delivery.

"The electric kits are available and we are currently taking orders."

For additional information, the Levoe Design Sailplanes web page is accessible through web site:

http://www.planes-wings-things.com

Mark's price list says to call (626) 355-2992 for availability of aircraft. ■

'TECH TOPICS'

Sailplane Stability

by Dave Register
Bartlesville, Oklahoma

This hobby/sport is pretty entertaining. Covers a lot of bases and can handle a whole bunch of attitudes with equanimity. Some of us like to compete with the latest, greatest design. Some of us like to loll around in a heavenly thermal all day. Some enjoy the challenge of teaching new people to fly. And some of us are just stupid enough to think we can come up with a better design.

I'm kind of in the latter category. Not too successful at it either - for any of you who had the experience of seeing my 'Wild Thing' in action last year. That's OK. A truly spectacular crash has its entertaining side and provides a great opportunity for corrective action!

Several questions have been posted on *RCSE* in the past few months on moment arms, areas, etc., for a good stable design. That, coupled with an interest in comparing design guidelines from a few years back with those in use today, prompted a look at tailplane design. The results of that survey and analysis are pretty consistent, so I thought it might be worthwhile sharing the information with the rest of the community.

These two articles (Part I & Part II) constitute a 'Tech Topics' discussion on the rear end of your sailplane. If you haven't experienced any problems back there, you've probably got a pretty good tail group design going for you. My question has always been, "Just how good is good enough?" And, "How do good designers get to that point (other than copying what's out there already)?" There are several programs on the market that do this for you (notably PC-SOAR and PLANE GEOMETRY). Buried in the guts of these things is the designer's statement, "This is what makes a plane stable for me." The RC soaring literature tries to answer that question with several different gauges. We'll be discussing several of them in these articles.

So, here's what we're going to do. This month we'll cover some thoughts on stability in an RC sailplane. We'll look in detail at how several folks have approached this question. We'll then review design ranges for a number of successful ships. Next month we'll put it to work with a couple of examples, winding up with a discussion on V-tails.

Several worthwhile references are out there on stability effects in sailplane design. Of course, Frank Zaic's[1] book covers a lot of ideas from the free flight era, but the first serious look I recall was from Eric Lister[2] back around 1973. Eric's book is no longer available, but Martin Simon[3] discusses many of the same concepts in his publication (Chapter 10 in particular). Lister presents specific design guidelines to work from based on his 'Instability Factor' (ISF). Simons discusses contributions to stability and then sets some general targets, based on an understanding of 'static margin'. Another useful, but out of publication guideline, was in Hi Johnson's SuperWings catalog[4]. Hi uses a simpler concept that seems to work based on what he called 'planform angle'. Hi's table is reproduced in this article since that's no longer available either.

In considering the stability of a sailplane in normal flight, three factors provide the major contributions:

1) Fuselage
2) Wing
3) Tail group

Hi Johnson's Table
(SuperWings Catalog , Page 32)

Planform Angle	Hor.Stab Area	Ver.Stab Area
25	20-22%	11%
26	18-20%	10%
27	17-18%	9%
28	16-17%	8½%
29	15-16%	8%
30	14-15%	7½%

The fuselage is always a de-stabilizing force. We don't think of it that way, but consider what happens if you try and toss a stick or arrow (or launch a model rocket!) without axial spin and with no stabilizing fins. First thing it does is flop over sideways and start to tumble. Not a stable configuration in general. The length and side area of the fuselage will have a lot to do with the forces required to stabilize this term.

The wing is generally unstable in the absence of a restoring force. Don't go out and toss your wing around to prove this. Simply pick up a sheet of balsa sideways and then drop it from a height above your head. If you're VERY careful, it may scoot along for a few feet in that orientation. More likely it will begin to tumble around the long axis and then fall off to one side. Don't do this with the cat around as you may ruin a good piece of balsa!

The wing may be neutrally stable if the center of gravity (CG) is carefully aligned with the center of lift (usually called center of pressure - CP). However, that will occur only at a single angle of attack and any upset to the wing will change things very quickly. Flying wings are the exception since they usually have sweep back and reflex to simulate the effect of a stabilizer at the trailing edge of the wing.

Finally, the tail group must ALWAYS be a stabilizing force. For most RC sailplanes, the tail group does not supply corrective forces in its true neutral position. However, as soon as an upset occurs, the stabs provide a corrective force to fight the upset. The design problem is how to provide enough correction to maintain smooth flight without providing too much compensation which may make the design sluggish in control.

Of course there are exceptions to this approach, especially if the horizontal stab has been designed to actually provide a lifting load. Free flight has used this technique for years. This generally requires a large horizontal stab and the drag penalty may work against us. This approach hasn't really been seen in RC soaring in quite some time.

Canards are another case in which the horizontal stabilizer is designed to produce lift. In this case, a key to the design is having the stab stall before the wing, thus producing good stall recovery. Another potential advantage to the canard design is that the control surfaces are always flying in 'clean' air undisturbed by the turbulence and down wash from the wing. The downside is that the wing is flying in the airflow from the stab. We don't see too many canards in this sport, but it looks to be an interesting area for development.

Although the wing is generally a destabilizing component in the design, a question is, "Just how destabilizing?" A good indication of the strength of this effect is found in the pitching moment for the wing/airfoil. This is a measure of the distance between the 1/4 chord point and the center of pressure (CP) of the wing. The 1/4 chord is a convenient reference, since that's the (theoretical) CP for a symmetrical airfoil (0% camber) as well as being the aerodynamic center for cambered sections (furthest forward point of CP travel). The CP is the center for all of the lifting forces on the wing. At a given angle of attack and airspeed, this is where the lifting forces would all balance. If the CG were here, the airfoil wouldn't pitch. If the CG is ahead of the CP, the airfoil will pitch down. If the CG is behind the CP, the airfoil will pitch up.

So, why not spot the CG at the CP and just leave it alone? Because the CP moves around as you change the angle of attack. Let's put the CG at the CP for a given angle. Now a gust pitches the nose up. The CP moves forward a bit, which tends to pitch the nose up some more, which moves the CP forward, which makes the nose pitch up some more, etc. Positive feedback! Same goes for a nose down pitch.

Generally, the CG is spotted at the CP for a pilot's preferred flying condition. This may be minimum sink for some. It may be max L/D for others. It may be just about anything depending on the style and flying ability of the pilot. The key is that any upset away from this condition will drive the plane back into CG=CP alignment at the pilot's chosen flying attitude - without the pilot doing anything about it. At the preferred flying attitude, the tail group does not provide any restoring force until an upset in this attitude is encountered.

Up to this point, everything sounds fine. If you have good stability, a change in angle of attack will be balanced by a restoring force which puts things right. Here's the problem - for even relatively large pitch changes, the relative restoring force of the tail group is almost linear with change in angle of attack (up to within a few degrees of stall). However, the CP movement is not linear with angle of attack. If the pitch change moves the CP too far, it may fall outside the restoring force range of the tail group.

In the 'dive test' you can sometimes see this. For a too rearward CG, there will be a dive angle beyond which the plane will tuck (increase dive angle as speed in-

creases). In this case, the CP has moved so far behind the CG that the stab cannot restore balance. As the plane 'tucks, the CP moves farther back and we're again in the positive feedback mode (with VERY negative consequences in this case!). In older polyhedral designs with open bay construction, this downward pitch at high speeds could often twist the wing to even lower angles of attack. In the limiting case, wingtips could break off or get into a critical chord-wise flutter with very nasty consequences.

When considering the contributions from all of these effects (fuse, wing, stab), Lister, Simons and most anyone you talk with will state that a good tail group design should be based on experience since Reynolds number, aspect ratio (wings and stabs), airfoil design (especially camber and pitching moment), down wash and blanking effects are all too unpredictable. What that means is you find something that works well and copy it. Then tune it in size and shape to fit your needs. Question is, what has worked well in the past and how can you capture that in a few simple rules for starting out on your own?

The two critical components for stability / control that we'll discuss are pitch (horizontal stab) and yaw (vertical stab). The discussion applies to standard configurations (not canards!) with cruciform or V tails.

Consider the tail group as the controlling influence on pitch and yaw motion of an aircraft. In a very simple sense we can look at these surfaces as one end of a lever. For the yaw direction, the other end of the lever lies along the wingspan. In the pitch direction, the other lever arm is along the wing chord direction.

For a given air speed and angle of attack, the force generated by the stabilizer (horizontal or vertical) scales with its area. The lever arm for the application of the force is the distance from that area to a reference point. The lever arm is typically taken as the distance between the 1/4 chord locations on the wing and the stab. Therefore, the area of the stab multiplied by the length of that reference line (sometimes called the tail moment) will be proportional to the torque generated by that side of the lever.

For the vertical stab, what you're trying to move (yaw) is the wing. So a measure of its response (inertia) is something like the wing area (force scaling term) multiplied by the wing span (yaw response lever arm). So we're led to a number that tries to capture the relative leverage of the vertical stab over the wing yaw inertia:

RVC = Rudder Volume Coefficient = Ver. Stab. Area X Tail Moment / (Wing Area X Wing Span/2)

In a similar manner, we can argue that the pitch response of an RC sailplane is determined by the leverage of the horizontal stab relative to the pitch axis of the wing. Since that axis is along the chord, we have:

TVC = Tail Volume Coefficient = Hor. Stab Area X Tail Moment / (Wing Area X Wing Avg Chord)

Now, if these volume coefficients make any sense at all, we should be able to evaluate them either from first principles or from experience. The first principles approach is what the guys in grad school try and do. Instead, we'll look at a number of designs that are actually flying successfully and see if these moments have a characteristic value that makes sense.

Before looking at numbers, there are a few more approaches that can be used. I mentioned that Hi Johnson used a related idea based on his experience with the 'Eagle' series of sailplanes. Hi set up the problem a little differently. He defined what he called a 'planform angle'. That's the angle measured at the wingtip between the span direction and a line drawn to the 1/4 chord of the tailgroup. With this angle defined, Hi then used a table to suggest the area of the horizontal stab as a percent of the wing area. The vertical stab was then taken as 50% of the horizontal area.

If you look at this in a little more detail, you find that the tangent of the planform angle is simply the tail moment divided by 1/2 the wingspan. Also, the product of the tangent of the planform angle and the suggested area ratios is almost a constant in Hi's table. It's interesting to note that this exactly defines the RVC as given a little earlier:

RVC = tan(Planform Angle) X Area ratio

(Hi's table, gives a value for RVC of 0.0464.)

Another approach that's been used

STABILITY CALCULATIONS FOR VARIOUS SAILPLANES

Ship	Angle	H% Wing	V% Wing	TVC	RVC	StMg	dCm/dCl	ISF
Little Eagle	25.0	20.7%	10.2%	0.765	0.0434	0.551	-0.101	-0.350
2m Floater	29.0	18.8%	8.0%	0.477	0.0412	0.319	-0.086	-0.190
American Eagle	27.0	18.8%	9.4%	0.842	0.0465	0.626	-0.087	-0.465
Golden Eagle	26.5	19.8%	10.0%	0.877	0.0500	0.649	-0.092	-0.455
Albatross	27.6	13.2%	7.7%	0.437	0.0403	0.303	-0.041	-0.170
SkeeterV	33.2	9.9%	6.3%	0.333	0.0415	0.220	-0.014	-0.030
Gentle Lady	34.6	15.6%	8.1%	0.519	0.0560	0.366	-0.063	-0.205
Spirit 100	29.6	15.3%	7.7%	0.444	0.0436	0.302	-0.059	-0.175
Wild Thing	34.9	7.6%	6.8%	0.290	0.0476	0.186	0.008	-0.050
Romulan	35.0	12.1%	7.8%	0.446	0.0547	0.314	-0.032	-0.120
2m Spectrum	34.7	13.2%	9.0%	0.466	0.0627	0.329	-0.042	-0.150
2m SuperV	35.6	11.9%	5.9%	0.407	0.0423	0.280	-0.030	-0.120
2m Duck	37.8	11.4%	7.6%	0.351	0.0590	0.231	-0.042	-0.135
Duck	30.0	13.1%	6.7%	0.426	0.0386	0.294	-0.040	-0.200
Peregrine	29.8	10.1%	7.0%	0.401	0.0400	0.281	-0.014	-0.170
Skyhawk	31.3	12.8%	6.1%	0.523	0.0370	0.380	-0.038	-0.225
Pelikan	29.9	10.1%	6.9%	0.464	0.0395	0.338	-0.015	-0.230
Average	33.3	12.1%	7.2%	0.438	0.0459	0.352	-0.048	-0.201

1) Frank Zaic, "Model Glider Desin", Model Aeronautic Publications, New York (1944). This book has been available from AMA publications

2) Eric Lister, "Sailplane Designer's Handbook", Trenton, NJ (1974) Library of Congress Card No. 74-79870

3) Martin Simons, "Model Aircraft Aerodynamics", Argus Books Limited, England (1985) ISBN 0-85242-441-8

4) Hi Johnson, SuperWings Catalog #4 (1980)

in the past is to try and account for instability introduced by pitching moments, aspect ratios, fuselage cross sections, etc. Two earlier attempts to do this are in Eric Lister's Instability Factor calculation and David Fraser's dCm/dCl evaluation in "Sailplane Design". Both of these systems require more information than simple areas and moments. I've run the analysis for both and have included it in the table. Fraser suggests dCm/dCl should lie between -.03 and -.07. Lister suggests a good value for ISF is -0.21

Finally, Martin Simons uses a term he calls static margin to estimate pitch stability of sailplanes. This is a measure of the distance between the CG and the neutral point of the design expressed as a percent of the average chord. The neutral point is the geometric center of the sailplane - the point between the wing and the tail where the wing area times its distance to the NP just equals the horizontal stab area times its distance to the NP. Simons suggests that the static margin should be ~ 1/2 the wing average chord.

With all of that behind us (at last!), let's see what the data tells us. In the accompanying table, I've listed the Planform Angles. Tail Moment, Area ratios, RVC, TVC, Static Margin, ISF and dCm/dCl data calculated for a number of sailplanes. I've used values from Hi's Eagle series, since I flew them and they were all very predictable aircraft. The rest are either from having my way with your plane at the field (with a tape measure!), from stuff in the basement, or what I could deduce from some 3-views in magazines.

The first thing you notice is that the TVC for some of the Eagle series is pretty large. This is because Hi used very high cambered airfoils (6% or greater), which gives high pitching moments. That requires a higher margin of stability be built into the design. The RVC values don't have to respond to the high pitching moment, so they work out OK. The next thing to point out is that there are several V-tails in the list. The equivalent areas for the horizontal and vertical stabs have been projected in a manner described next month to arrive at the RVC, TVC and other calculations.

Averages for these values are given in the final row of the table. The Eagle series is excluded from the TVC result. All of the planes in this table have pretty good flying characteristics and control response as reported by their pilots or from direct experience at our flying field. The spread in the data for RVC and TVC appears to be pretty small. The dCm/dCl values suggest that several planes may have marginal stability. However, that is not observed for those aircraft. Simons suggestion of a value for static margin of 0.5 also seems to be an over design for the current crop of planes. The ISF values also suggest several planes are outside a 'safe' value for this parameter, which again does not seem justified on the basis of the performance of the planes.

In all cases, however, the average value for the planes surveyed lands smack in the middle of the suggested stability range by the respective authors (excepting the static margin). The range of these values appears to be tightest for the TVC and RVC calculations and they only reflect one plane with a pitch sensitivity. That appears to match up best with real world experience.

My conclusion is that the TVC and RVC values represent one of the better simple metrics for designing the tail group of your sailplane. In addition, using this in conjunction with a good value for the planform angle will result in an aesthetically pleasing layout. That goes along with the old 'if it looks right, it's gonna fly right' approach.

Interestingly, the plane with the lowest TVC value (Wild Thing) is the one I've had trouble with for pitch stability. The modified tail for this (Romulan), which moves it into the range seen for other planes, has eliminated the problem, so I think there's some compelling evidence to believe all these numbers.

Finally (for this month), note that the RVC value suggested by Hi (0.0464) is essentially identical to the average obtained for the planes in this survey. Nice to know the old boy knew what he was talking about! Next month we'll look at designing with these values and then close with a discussion of V tails.

■

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.

1/7th Semi-Scale P-51 D Mustang
...from Durable Aircraft Models

Durable Aircraft Models (DAM) manufactures a 1/7th semi-scale P-51 D Mustang slope glider. This PSS glider is big, tough and a very scale looking warbird. Made of dent-resistant expanded polypropylene (EPP) foam, this kit is built to last despite the inevitable hard landings and mid-air collisions. You can literally punch this plane and the foam just rebounds back to shape. The simple assembly process takes about 20-25 hours to complete and the EPP is covered with iron-on film that makes the finished product indistinguishable from balsa or fiberglass models. The P-51 will fly in 7-10 mph winds and can be ballasted with up to four pounds of weight in the fuselage for needed penetration in high lift conditions. The solid foam structure makes conversion to electric power easy. The kit can be ordered with an optional clear, vacuum formed canopy ($10.00). Specifications: 65.5" wing span, 692 sq. in., 70-74 ounce weight, S3021 airfoil.

Introductory price $119.99. In May, DAM will release an Me 109 and a T-33/P-80 kit. Contact DAM at (714) 362-9222, 59 Matisse Circle, Aliso Viejo, CA 92656, or visit web page: www.globalpac.com/damkits ■

Stardust Micro Hand Launch Glider
...from Performance Composites

The Stardust with 30" span 170 in^2 double taper wing comes bagged with fiberglass skins over 1 lb. white foam. The color (white, yellow, red, or blue) is pigment added to the resin. The wing is bagged in one piece with the center dihedral bagged in. For aileron use, slice the ailerons out. For polyhedral use, slice a thin wedge out of the top at the taper break and bend the tip up.

The wing mounts to a molded pylon which in turn slides onto a 1/4" diameter spiral wound glass tube for a fuse. The tube looks like carbon, but is actually glass. One can use any kind of stab configuration, such as a standard cruciform shape and a V-tail. There is enough 3/32 balsa provided for several tails.

The receiver and servos go in the wing; the batteries are taped to the nose. One could shape a bit of foam around the nose to aid in catching, but for the expense of some needless weight. The wing weighs 1.6 or 2 oz., pylon .25 oz., tube fuse .2 oz., tails .2 oz.

Add a tiny bit or a few drops of 5 min. epoxy to attach the tube to the pylon and the balsa stabs to the tube. The wing can either be taped onto the pylon (it has a large fillet) or there is a center balsa hardpoint in the wing for a nylon bolt to run down into the pylon to a threaded balsa plate; or, the wing can be glued to the pylon with say silicone, which could be sawn off with dental floss.

Hardware is not included, except for thin piano wires for pushrods and as the antenna.

Airfoil choice is either RG-15 or 4083. RG-15 is recommended for backyard aerobatics, small slope, and long distance cruising; 4083 for maximum hang time and floating ability.

There is a choice of wing weight; Performance Composites prefers using 1.4 oz. cloth as the skin, to resist finger dents (There is also a center doubler and carbon strips top and bottom for the structural strength.). With 1.4 oz. cloth the wing weighs 2 oz. With .75 oz. cloth for the skin it saves about .4 oz.

Price is $80 plus ten dollars for shipping. CA residents please add 7.25% tax. Performance Composites, P.O. Box 6843, Napa, CA 94581; (707) 253-8029, perfcomp@community.net ■

Electronic Airfoil Handbooks
...from Hanley Innovations

VisualFoil and WingSections are complete reference guides to airfoil data. The programs predict the aerodynamic performance of general airfoil sections and contain a library of built in airfoils. Used with AirfoilBrowser and a free airfoil library program, VisualFoil and WingSections provide access to the aerodynamic performance of thousands of airfoils, even allowing you to obtain valuable aerodynamic data for custom airfoils. They produce accurate lift and drag polars when compared to established reference sources and data can instantly be compared for a number of airfoils at any Reynolds number. The programs are intended to save time when searching for hard-to-find aerodynamic information for general airfoil sections.

VisualFoil and WingSections use advanced numerical aerodynamic techniques that will allow the aircraft designer to accurately determine the performance characteristics of general airfoil sections on their personal computer. No computer programming is necessary. This means that you will not have to interpolate between graphs as you would with a paper based handbook. Further, you can obtain accurate information about your airfoil at any angle of attack and Reynolds number.

VisualFoil and WingSections allow for export of airfoils to DXF files and can even plot accurate templates for constructing model airplane wings. VisualFoil even allows for the creation of an O-mesh for further CFD or finite element analysis.

VisualFoil and WingSection require a personal computer running Windows 95, 16MB or RAM and an Intel 80486 (66mhz) or better.

VisualFoil is $229.00 US; WingSections if $95.00 US, AirfoilBrowser is Free and can be downloaded from http://www.hanleyinnovations.com

The programs can be ordered from Hanley Innovations, P.O. Box 870, Storrs, CT 06268.

■

Original Can-Winch
...from Buzz Waltz R/C Designs

The Can-Winch is 50' of 1/4" diameter black surgical tubing, 250 feet of line, parachute, and a ground stake. The black tubing provides more than enough lifting power to launch a 100" sailplane. Tubing is stored inside the can, as it lasts longer than if wound around a reel.

Cost is $45 + $5 shipping. Buzz Waltz R/C Designs, 68-320 Concepcion Rd., Cathedral City, CA 92234; (760) 327-1775. ■

SCHEDULE OF SPECIAL EVENTS

Fayetteville '96, Lehman photo.

May 30-31
SVSS Spring Fling '98 Sacramento, CA
Jim Thomas, (916) 984-5123
http://www.SVSS.org

May 30-31
CSS Spring Intergalactic Cincinnati, OH
HL Series Event
Paul Siegel, (513) 561-6872, psiegel@fuse.net

May 30-31
Sailplane Weekend Addison Oaks Park, MI
Ray Hayes, (810) 781-7018, skybench@teleweb.net

June 5-7
SBSS Golden State XCountry Race California Valley, CA
Mike Gervais, (408) 683-4140

June 6-7
IHLGF Poway, CA
Ron Scharck, (619) 454-4900, scharck@aol.com

June 11-14
Elmira Aerotow '98 Elmira, NY
John Derstine, (717) 596-2392
johnders@postoffice.ptd.net

June 13-14
Cross Country & Pig Roast Mead, NE
Christopher Knowles, (402) 330-5335
CrsKnowles@aol.com

June 13-14
Baltimore Area HL/2M Walkersville, MD
Al DeRenzis, (410) 448-0808

June 13-14
Land of Lincoln E-Fly Springfield, IL
Tim McDonough, (217) 523-8625, tpm@mw.net
http://www.mw.net/~tpm

June 26-28
MSSC '98 Louisville, KY
Ed Wilson, (502) 239-3150
ewilson1@bellsouth.net

July 19
HL Series Event Dayton, Ohio
David Rice, David_Rice@reyrey.com

Los Banos, Lehman photo.

Elmira '96, Lehman photo.

July 25 - August 1
LSF/AMA NATS Muncie, IN
Cal Posthuma, CALPLSF@aol.com
Aldin Shipp, alden@bcl.net

August 22-23
SBSS Summer Classic/AMA EXPO 98 Gilroy, CA
Mike Gervais, (408) 683-4140
Scott Meader, (408) 244-2368

August 29
HL Series Event Columbus, OH
Paul Wiese, pwiese@avcomsmt.com

August 29-30
Cape Blanco Inagual Slope Fly-In Port Orford, OR
Larry Broman, (541) 751-8847

September 5-7
Soar Utah '98 Salt Lake City, UT
Kent Petersen, (801) 254-5018, petersek@wipd.com
http://www.wordplace.com/soaring

September 12-13
Sailaire One Design Contest Cincinnati, OH
Ed Franz, (606) 586-0177, ejfranz@fuse.net

September 19-20
442-444 Tullahoma, TN
Herb Rindfleisch, (931) 455-1836

October 2-4
Airtow Aerobatic Sailplane Contest Fayetteville, NC
Wayne Parrish, (919) 362-7150

October 3-4
25th CVRC Fall Soaring Festival Visalia, CA
Phil Hill, (209) 686-8867

October 3-4
CSS Fall Intergalactic Cincinnati, OH
HL Series Event
Paul Siegel, (513) 561-6872, psiegel@fuse.net

October 17-18
Pumpkin Fly Cincinnati, OH
Ed Franz, (606) 586-0177, ejfranz@fuse.net

November 7
Turkey Fly (Winch & HL) Cincinnati, OH
Ed Franz, (606) 586-0177, ejfranz@fuse.net

1999 - June 25-27
MSSC '99 Memphis, TN
Bob Sowder, (901) 751-7252

Outside U.S.A.

May 1-3 or May 16-18
Coupe du Quebec Slope Race Leclercville, Qc, Canada
Jacques Blain, (514) 652-6167

July 11-19
Canadian Soaring Nationals St. Jean, Qc, Canada
Jacques Blain, (514) 652-6167 eve.
http://www.riq.qc.ca/users/pthiou/c2vm/index.htm

Aug. 1998
F3J World Championships, organized by BARCS

August 14-16
GNATS Scale Fun Fly Niagara Peninsula, Canada
Gerry Knight, (905) 934-7451
Don Smith, (905) 934-3815
mistral@niagara.com, linden@niagara.com

Pensacola, Lehman photo.

Classified Advertising Policy

Classified ads are free of charge to subscribers provided the ad is personal in nature and does not refer to a business enterprise. Classified ads that refer to a business enterprise are charged $5.00 per month and are limited to a maximum of 40 words. The deadline for receiving advertising material is the 15th day of the month. (Example: If you wish to place an ad in the March issue, it must be received by February 15.) *RCSD* has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs. Market Place Listings are $5 a month. Personal ads are run for one month and are then deleted automatically. However, if you have items that might be hard to sell, you may run the ad for two months consecutively.

For Sale - Business

PC-Soar Version 3.5 Sailplane Performance Evaluation Program Optional Sailplane Library now expanded to 54 models including: Alcyone, Anthem, Genesis, Mako, Probe, Thermal Eagle, and Synergy 91. Free Library Upgrades. PC-Soar Upgrade to Ver. 3.5 $10, PC-Soar New Purchase $40. New Libraries of Sailplanes and Airfoil Polars $30. Please include $3 P&H for all purchases & upgrades. Also available: Laser cut airfoil templates. LJM Associates, 1300 Bay Ridge Rd., Appleton, WI 54915; ph: (920) 731-4848 after 5:30 pm weekdays or on weekends; <http://www.athenet.net/~atkron95/pcsoar.htm>.

PRECISION AMAP WING CUTTER, replacement parts, and service. AMAP Model Products, 2943 Broadway, Oakland, CA 94611. Butch Hollidge, (510) 451-6129, or fax (510) 834-0349.

A.M.P. Aerial Model Products, sport, slope, race prototypes - all airfoils. 60" Del Valle Snake, 94" H&K Cobra, AMAP Flair, Kevin Cutler's full house Davenport Monitor. All race tested. Butch Hollidge, (510) 680-0589; eve, California.

PARACHUTES: $10. Dale King, 1111 Highridge Drive, Wylie, TX 75098; (972) 475-8093.

PLANS - R/C Sailplanes - Scale, Sport & Electric, Old Timer & Nostalgia - powered, rubber, and towline. Scale - rubber. All models illustrated. Catalog: $2.00. Cirrus Aviation, P.O. Box 7093 Depot 4, Victoria, BC V9B 4Z2, Canada.

FOR SALE - PERSONAL

RTF Northeast Sailplanes Bird of Prey, 120" wingspan, flown one season. Airtronics 94141 servos for flaps, Futaba 9601 servos for ailerons, white Ultracote on top/red tips, red Ultracote on bottom... $325.00 with wing servos, $225.00 without servos, plus shipping. Bob Sterett, (503) 364-5915, Oregon.

1/4 Roedel Super Cub (towplane), 2.687 meter span, wing profile Clark Y mod. (suitable motors are 160 T, 300 T, OS BGX-1, Brison 3.2 or similar), NIB... $385.00. Contact Robin Lehman, 63 E. 82nd St., New York, NY 10028; (212) 879-1634.

RnR Synergy III SE all-molded, white w/black bottoms, pristine condition, no hangar rash or crashes... $490.00 obo. Rob, (760) 930-0616, California.

Wanted

Legionaire 140 kit, plans, parts. Chuck Hathaway, 10759 O'Brien Rd., Atascosa, TX 78002; (210) 622-3658.

Sailplane Homebuilders Association (SHA)

A Division of the Soaring Society of America

The purpose of the Sailplane Homebuilders Association is to stimulate interest in full-size sailplane design and construction by homebuilders. To establish classes, standards, categories, where applicable. To desiminate information relating to construction techniques, materials, theory and related topics. To give recognition for noteworthy designs and accomplishments.

SHA publishes the monthly ***Sailplane Builder*** newsletter. Membership cost: $15 U.S. Student (3rd Class Mail), $21 U.S. Regular Membership (3rd Class Mail), $30 U.S. Regular Membership (1st Class Mail), $29 for All Other Countries (Surface Mail).

Sailplane Homebuilders Association
Dan Armstrong, Sec./Treas.
21100 Angel Street
Tehachapi, CA 93561 U.S.A.

Closet Scale Stuff
At Sailplanes Unlimited, Ltd.

1/3 Pribek ASW 27 - 5 meter span (196"), wing profile HQ 2.5/12, ca. 20 lbs.

1/3 Müller Discus - 5 meter span (196"), wing profile HQ 2/12, ca. 20 lbs.

1/4.2 FiberClassics Nimbus 4 - 6.28 meter span (246"), wing profile E 68-66, ca. 18 lbs.

1/3.6 Roedelmodell DG 800 - 4.15 meter span (163"), wing profile E 207, ca. 11 lbs.

1/3.75 Roedelmodell Fox MDM-1 - 3.8 meter span (149"), wing profile RC 12, ca. 15 lbs.

1/2.77 PriBek ASW 19 - 5.4 meter span (212"), wing profile Ritz 3 mod., ca. 20 lbs.

Roedelmodell Ka6E, NIB, slight imperfection, $495.

Roedelmodell ASK 21, slight shipping damage, NIB, $395.

Please call for additional info: (212) 879-1634.

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finneys@mindspring.com
http://www.mindspring/~finneys

VACUUM FORMED PRODUCTS, CANOPIES
Viking Models, U.S.A.
2 Broadmoor Way
Wylie, TX 75098
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RCSDigest@aol.com

ELMIRA AEROTOW "98" AT HARRIS HILL

COME FLY WITH US AND SOAR TO NEW HEIGHTS!

June 12-13-14 1998
HELD IN ELMIRA, NY
SOARING CAPITAL OF THE U.S.
HOSTED BY: HARRIS HILL L/D R/C
co-sponsored by:
The National Soaring Muscum
The Harris Hill Soaring Corp.

Our event this year will again be at Harris Hill. There are some new developments to report. This year we will be given exclusive use of the Harris Hill Soaring Corporation's airfield on Thursday and Friday the 11-12. Thursday will be open flying (aerotow or slope) for early arrivals. Friday will be the start of the official event with radio impound. The field will be shared with full scale sailplanes, including ASK-21's, and Schweizer Trainers on Saturday and Sunday 13-14. Rides will be available during these days. Factory demos are scheduled for Saturday afternoon. National and international vendors will be showing their wares. The emphasis will be on fun and aerotowing, as well as some fantastic slope soaring, if conditions dictate. Tow planes and experienced pilots will be there to tow you to altitude. Bring your 3 meter (118") or larger aileron sailplane with nose release and join the growing aerotow movement. Scale gliders are recommended, but not required. We will have a few scale sailplanes available on site for those who can't bring their own. This year we are going to have pilots choice awards and a special award for the best Schweizer scale sailplane. Other prizes to be announced. On Friday evening there will be a picnic at the Harris Hill Youth Camp adjacent to the flying field. We will have an evening banquet Saturday night at the National Soaring Museum. Guest speakers to be announced.

More exciting plans are in the works, so keep an eye out for further developments as they become available. Current AMA membership is required. There will be a $25.00 pilot registration fee. For details & info. (including shipping your sailplane to Elmira), contact:

John Derstine
717-596-2392
johnders@postoffice.ptd.net
http://www.Geocities.com/CapeCanaveral/Lab/5739

R/C Soaring Resources

These contacts have volunteered to answer questions on soaring sites or contests in their area.

Contacts & Soaring Groups - U.S.A.

Alabama - North Alabama Silent Flyers (NASF), Ron Swinehart, (205) 722-4311, <ron.swinehart@svl.lmco.com>, or Rob Glover at AMA3655@aol.com, http://shl.ro.com/~samfara/

Alabama - Central Alabama Soaring Society, Ron Richardson (Tres.), 141 Broadmoor Ln., Alabaster, AL 35007, <ron_mail@bellsouth.net>.

Alabama - Southern Alabama & NW Florida Aerotow, Asher Carmichael, (334) 626-9141, or Rusty Rood, (904) 432-3743.

Arizona - Central Arizona Soaring League, Iain Glithero, (602) 839-1733.

Arizona - Southern Arizona Glider Enthusiasts, Bill Melcher (contact), 14260 N. Silwind Way, Tucson, AZ 85737; (520) 825-2729. SAGE welcomes all level of flyers!

Arkansas - Northwest Arkansas Soaring Society, Tom Tapp (President), RT 2 Box 306, Huntsville, AR 72740; (501) 665-2201, eve.

California - California Slope Racers, John Dvorak, 1063 Glen Echo Ave., San Jose, CA 95125; (408) 287-0375.

California - DUST, Buzz Waltz, 68-320 Concepcion, Cathedral City, CA 92234, (760) 327-1775.

California - High Desert Dust Devils, Stan Sadorf, 14483 Camrose Ct., Victorville, CA 92392; (760) 245-6630, <Soareyes@aol.com>.

California - Inland Soaring Society, Robert Cavazos, 12901 Forman Ave., Moreno Valley, CA 92553, RCAV@aol.com.

California - Northern California Soaring League, Mike Clancy, 2018 El Dorado Ct, Novato, CA 94947; (415) 897-2917.

California - Sacramento Valley Soaring Society, Lee Cooper, 4856 Rockland Way, Fair Oaks, CA 95628, (916) 966-2672.

California - South Bay Soaring Society, A.J. Angelo, P.O. Box 2012, Sunnyvale, CA 94087; (415) 321-8583, fax (415) 853-6064.

California - Southern Calif. Electric Flyers, John Raley (President), 1375 Logan Ave., Costa Mesa, CA 92626; (714) 641-1776 (D), (714) 962-4961 (E), e-mail: E-Flyer@ix.netcom.com.

California - Torrey Pines Gulls, Ron Scharck, 7319 Olivetas Ave., La Jolla, CA 92037; (619) 454-4900.

Colorado - Rocky Mountain Soaring Assn., Phil Weigle, 1290 Salem St., Aurora, CO 80011; (303) 341-9256 eve.

Eastern Soaring League (VA, MD, DE, PA, NJ, NY, CT, RI, MA), Jack Cash (Pres.), (301) 898-3297, e-mail BadIdeas@aol.com; Bill Miller (Sec./Tres.), (609) 989-7991, e-mail JerseyBill@aol.com; Michael Lachowski (Editor), 448 County Rt 579, Milford, NJ 08848, e-mail mikel@aurage.com, <http://www.eclipse.net/~mikel/esl/officers.htm>.

Florida - Florida Soaring Society, Mark Atzel (President), 1810 SW Terrace, Ft. Lauderdale, FL 33312, (954) 792-4918.

Florida (Central) - Orlando Buzzards Soaring Society (www.specs-usa.com/~ingo/OrlandoBuzzards), Jerre K. Ferguson (Pres.), 4511 Pageant Way, Orlando, FL 32808, (407) 295-0956, <jerre@bellsouth.net>.

Georgia - North Atlanta Soaring Association, Tim Foster, (770) 446-5938 or Tom Long, (770) 449-1968 (anytime).

Hawaii - Maui Island Slope Soaring Operation (MISO), Duane A.K. Asami, 262 Kamila St., Kula, HI 96790, pgr. (888) 932-6247, <dasami@maui.gateway.com>.

Illinois (Chicago Area) - Silent Order of Aeromodeling by Radio (S.O.A.R.), Jim McIntyre (contact), 23546 W. Fern St., Plainfield, IL 60544-2324; (815) 436-2744. Bill Christian (contact), 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (847) 259-4617.

Illinois (Northwest) - Valley Hawks R/C Soaring Club, Jeff Kennedy (President), 414 Webster St., Algonquin, IL 60102, (708) 658-0755, eve. or msg.

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

Indiana - Bob Steele, 10173 ST Joe Rd., Fort Wayne, IN 46835; (219) 485-1145.

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

Kansas - Aerotowing, Jim Frickey, (913) 585-3714.

Kentucky - Bluegrass Soaring Society, Frank Foster (President), 4939 Hartland Pkwy., Lexington, KY 40515; (606) 273-1817.

Kentucky - Louisville Area Soaring Society, Ed Wilson (Contact), 5308 Sprucewood Dr., Louisville, KY 40291; (502) 239-3150 (eve), e-mail <ewilson1@bellsouth.net>.

Louisiana - Capitol of Louisiana Soaring Society (CLASS), Leonard Guthrie (contact), 12464 Fair Hope Way, Baton Rouge, LA 70816, (504) 275-2122.

Maine - DownEast Soaring Club (New England area), <Jim.Armstrong@juno.com>.

Maryland - Baltimore Area Soaring Society, Erich Schlitzkus (President), 52 North Main St., Stewartstown, PA 17363; (717) 993-3950.

Maryland & Northern Virginia - Capital Area Soaring Association (MD, DC, & Northern VA), Chris Bovais (Coordinator), 12504 Circle Drive, Rockville, MD 20850; (703) 643-5513.

Michigan - Greater Detroit Soaring & Hiking Society, Greg Nilsen (Sec.), 2163 Highsplint Dr., Rochester Hills, MI 48307; (810) 651-8598, GNilsen624@aol.com.

Michigan - Great Lakes 1.5m R/C Soaring League & "Wings" Flight Achievement Program & Instruction. Ray Hayes, 58030 Cyrenus Lane, Washington, MI 48094; (810) 781-7018.

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

Missouri - Independence Soaring Club (Kansas City area, Western Missouri), Edwin Ley (Contact), 12904 E 36 Terrace, Independence, MO 64055, (816) 833-1553, eve.

Missouri - Mississippi Valley Soaring Assoc. (St. Louis area), Peter George, 2127 Arsenal St., St. Louis, MO 63118; (314) 664-6613.

Nebraska - B.F.P.L. Slopers, Steve Loudon (contact), RR2 Box 149 E1, Lexington, NE 68850, (308) 324-3451/5139.

Nebraska - SWIFT, Christopher Knowles (Contact), 12821 Jackson St., Omaha, NE 68154-2934, (402) 330-5335.

Nebraska - Ken Bergstrom, R.R. #1, Box 69 B, Merna, NE 68856; (308) 643-2524, <abergst@neb-sandhills.net>.

Nevada - Las Vegas Soaring Club, Jim Allen (President), 7117 Caprock Cir., Las Vegas, NV 89129; ph (702) 658-2363, fax (702) 658-1996.

New Jersey - Vintage Sailplane R/C Association, Richard G. Tanis (President/Founder), 391 Central Ave., Hawthorne, NJ 07506; (201) 427-4773.

New York, aerotowing Rochester area, Jim Blum and Robin Lehman, (716) 367-2911.

New York - Elmira - Harris Hill L/D R/C, aerotowing & slope, John Derstine, (717) 596-2392, e-mail 2076482@mcimail.com.

New York, aerotowing Long Island Area, Robin Lehman, (212) 744-0405.

New York - (Buffalo/Niagara Falls area) - Clarence Sailplane Society, Lyn Perry (President), (716)655-0775; e-mail perryl@sstaff.sunyerie.edu; Jim Roller (Competition Coordinator), (716) 937-6427.

New York - Long Island Silent Flyers, Stillwell Nature Preserve, Syosset, NY, Ze'ev Alabaster (President), (718) 224-0585, or Peter DeStefano (VP), (516) 586-1731.

New York - Syracuse area, Central NY Sailplane Group, Dave Zinteck, Minoa, NY, (315) 656-7103, e-mail Zinteck@aol.com.

North Carolina - Aerotowing, Wayne Parrish, (919) 362-7150.

Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Sandie Pugh (Editor - NWSS Eagle), 1119 SW 333rd St., Federal Way, WA 98023, e-mail: parrot2luv@aol.com, (253) 874-2429 (H), (206) 655-1167 (W).

Ohio - Cincinnati Soaring Society, Ed Franz, 7362 Ironwood Way, Burlington, KY 41005; (606) 586-0177, <ejfranz@fuse.net>.

Ohio - Dayton Area Thermal Soarers (D.A.R.T.S.), Walt Schmoll, 3513 Pobst Dr., Kettering, OH 45420, (513) 299-1758.

Ohio - Mid Ohio Soaring Society (MOSS), Hugh Rogers, 888 Kennet Ct., Columbus, OH 43220; (614) 451-5189, e-mail tomnagel@freenet.columbus.oh.us.

Oklahoma - Central Oklahoma Soaring, George Voss, (405) 692-1122.

Oklahoma - Tulsa R/C Soaring Club (TULSOAR), http://www.mccserv.com/tulsoar

Oregon - Portland Area Soaring Society (PASS), Pat Chewning (Secretary), 16766 NW Yorktown Dr., Beaverton, OR 97006, (503) 645-0323, e-mail: patch@sequent.com, www.europa.com/~patch/

Oregon - Salem Soaring Society, Al Szymanski, CD, (503) 585-0461, http://home.att.net/~aszy/sss/> for club's home page.

Oregon - Southern Oregon Soaring Society, Jerry Miller, 3431 S. Pacific Hwy. TRLR 64, Medford, OR 97501, e-mail Milljer@aol.com, ph/fax (541) 535-4410.

Tennessee - Memphis Area Soaring Society, Bob Sowder, 1610 Saddle Glen Cove, Cordova, TN 38018, (901) 751-7252, FAX (901) 758-1842.

Tennessee - Tullahoma (Southern Middle Area), Coffee Airfoilers, Herb Rindfleisch, 106 Inglewood Circle, Tullahoma, TN 37388, (931) 455-1836, <herb@cafes.net>.

Tennessee - Soaring Union of Nashville, Terry Silberman, PO Box 17946, Nashville, TN 37217-0946, (615) 399-0846.

Texas - aerotowing, Dallas area, Andrew Jamieson, 9426 Hillview, Dallas, TX 75231, (214) 349-9346, e-mail ajsleep@aol.com. Larry Sengbush, (972) 291-4840.

Utah - Intermountain Silent Flyers, Tom Hoopes, (801) 571-3702 (eve). "Come Fly With Us!"

Vermont - Steve Savoie, 926 Gage St., Bennington, VT 05201, (802) 442-6959.

Virginia - Tidewater Model Soaring Society, Herk Stokely, (757) 428-8064, herkstok@aol.com.

Virginia - Appalachian Soaring Association, Virginia's Southwest (Bristol area), Greg Finney, 106 Oakcrest Circle #5, Bristol, VA 24201; (540) 645-5772, e-mail <gfinney@naxs.com>.

West Virginia - Chip Vignolini, 1305 Perry Ave., Morgantown, WV 26505; (304) 598-9506, <vdne30a@prodigy.com>.

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

Wisconsin - Valley Aero Modelers, Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (920) 731-4848, <74724.65@compuserve.com>.

Outside U.S.A.

Australia - Southern Soaring League, Inc., Mike O'Reilly, Model Flight, 42 Maple Ave., Keswick SA 5035, Australia. Phones ISD+(08) 8 293-3674, ISD+(08) 8 297-7349, ISD+(018) 8 082-156 (Mobile). FAX: ISD+(08) 8 371-0659.

Canada - Montreal Area - C2VM Glider Club, Jacques Blum (President), days (514) 443-5335, eve. (514) 652-6167.

Canada - Greater Niagara Area Thermal Soarers (GNATS), Flat Field Soaring & Aerotowing, Gerry Knight, (905) 934-7451 or Don Smith, (905)934-3815.

Canada - MAAC Men Gliding Club, Jim Holland, 168 Verona Dr., Winnipeg, Manitoba, Canada R2P 2R8, (204) 697-1297.

Canada - Southern Ontario Glider Group, "Wings" Programme, dedicated instructors, Fred Freeman, (905) 627-9090, or Bill Woodward, (516) 653-4251.

England (CIAM Flyer), Jack Sile (Editor), 21 Bures Close, Stowmarket, Suffolk, IP14 2PL, England, Tele. #0449-675190.

England (southwest) - Sean Walbank, Woolcombe Hays, Melbury Bubb, Dorchester, Dorset, DT2 0NJ, phone 01935-83316.

Hong Kong - Robert Yan, 90 Robinson Road, 4th Floor, Hong Kong, (852) 25228083, fax (852) 28450497, yanr@asiaonline.net.

Japan - Dr. Paul "Sky Pilot" Clark, 2 - 35 Suikoen Cho, Hirakata Shi 573, Osaka Fu, Japan; IAC+(81) 720-41-2934, <pclark@osk3.3web.ne.jp> http://www3.osk.3web.ne.jp/~pclark/skypilot/

Scotland - Ron Russell, 25 Napier Place, South Parks, Glenrothes, Fife, Scotland KY6 1DX, ph: 01592 753689.

Seminars & Workshops

Free instruction for beginners on construction & flight techniques, week-ends (excl. contest days), "AJ" Angelo, South Bay Soaring Society (San Jose area), (415) 321-8583.

RCSD Index/Database

Available from: <<http://www.athenet.net/~atkron95/pcsoar.htm>>. Or: <<http://www.halcyon.com/bsquared/RCSD.html<<. Or, send 3.5" high density disks and SASE with stamps for 2 oz. Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (920) 731-4848 after 5:30 pm weekdays or on weekends, 74724.65@compuserve.com.

Reference Material

"Summary of Low-Speed Airfoil Data - Volume 1" & "Volume 2", Michael Selig wind tunnel testing results. Cost for each: $25 USA (includes postage), $29 surface outside USA, $31 air Western Hemisphere, $38 air Europe, $42 air all other countries. Computer disk, ascii text files (no narrative or illustrations), is $15 in USA; $16 outside USA. Source for all "SoarTech" publications, also. Contact Herk Stokely, 1504 N. Horseshoe Cir., Virginia Beach, VA 23451. Phone (757) 428-8064, email: herkstok@aol.com.

"Elmira Aerotow 96 Video" taken at the First Annual Northeast Aerotowing Fly-in, New York. Over 40 minutes of flying, interviews, and a special preview of the National Soaring Museum with Paul Schweizer. Check or money order, $19.95 plus $3.00 S&H (U.S.), payable to Harris Hill L/D R/C, c/o John Derstine, RD 3# Box 336, Gillett, PA 16925; (717) 596-2392. S&H foreign: $6 Canada/Mexico, $7 Europe, $8 Asia/Africa, $8.50 Pacific Rim. VHS format, NTSC standard.

BBS/Internet

Internet - Email list/resource of RC soaring related folks, including US and international club contacts, vendors, kit manufacturers/distributors, software, equipment and supplies. Check out the web site: www.ocpapsych.com/yellow.htm, or contact Manny Tau at taucom@kaiwan.com.

Internet soaring mailing listserve linking hundreds of soaring pilots worldwide. Send msg. containing the word "subscribe" to soaring-request@airage.com. The "digestified" version that combines all msgs. each day into one msg. is recommended for dial-up users on the Internet, AOL, CIS, etc. Subscribe using soaring-digest-request@airage.com. Post msgs. to soaring@airage.com. For more info., contact Michael Lachowski at mikel@airage.com.

Clubs, events, major contest scores, pilot chat board, classifieds, picture gallery: <http://www.rcsoaring.com>.

Advertising Note

Please note that the cut-off date for classified & display ads is the 15th of the month.

Hobby Shops that Carry RCSD

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Laguna Hills, CA
(714) 583-1775

Gyro Hobbies 2
17431 Brookhurst Unit H
Fountain Valley, CA 92708
(714) 378-8924

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Hebron, KY 41048
(606) 334-4331

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La Vista, NE 68128
(402) 597-1888

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Lakewood, CA 90712
(310) 531-8383

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Five Forks Village
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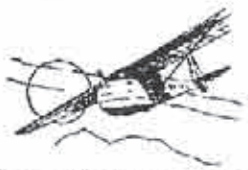
Advertiser Index

THANK-YOU FOR KEEPING YOUR LISTINGS UP TO DATE!!



The Vintage Sailplane Association

Soaring from the past and into the future!

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

Vintage Sailplane Association
Route 1, Box 239
Lovettsville, VA 22080
http://www.iac.net/~feguy/VSA

Subscription Costs

USA: $30 First Class
(Texas res., please add $1.52 tax.)
Canada & Mexico: $30 Air
Europe/U.K.: $45 Air
Asia/Pacific/Middle East: $52 Air

Back Issue Cost

Back issues are available for 1996 -1998. All are mailed via first class or airmail.
U.S.A., Canada, Mexico: $2.50 Per Issue + Tax (Texas Only: 7.25%)
United Kingdom/Europe: $3.75 Per Issue
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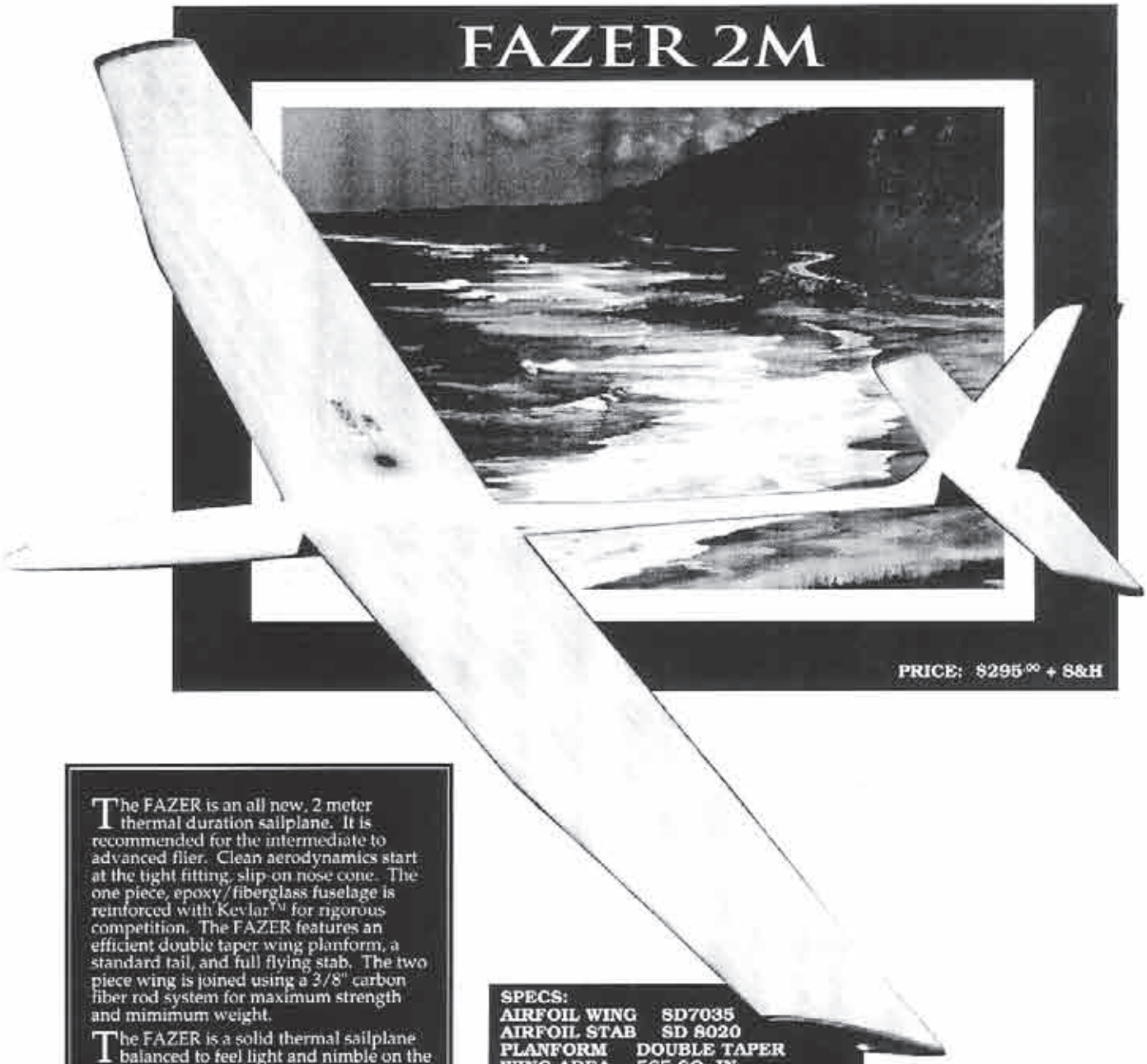
Please return to R/C Soaring Digest,
P.O. Box 2108, Wylie, TX 75098-2108

FAZER 2M



PRICE: $295.00 + S&H

The FAZER is an all new, 2 meter thermal duration sailplane. It is recommended for the intermediate to advanced flier. Clean aerodynamics start at the tight fitting, slip-on nose cone. The one piece, epoxy/fiberglass fuselage is reinforced with Kevlar™ for rigorous competition. The FAZER features an efficient double taper wing planform, a standard tail, and full flying stab. The two piece wing is joined using a 3/8" carbon fiber rod system for maximum strength and mimimum weight.

The FAZER is a solid thermal sailplane balanced to feel light and nimble on the sticks. Thermals and light lift are easy prey for this SD7035 airfoil/planform combination, which delivers especially high zoom launches and slower than usual landing speeds. Large 2.125" chord flaps, coupled with generous aileron and rudder area, make landings a dream. The full flying stabilizer is used to extract a super positive pitch response at all flying speeds.

SPECS:

AIRFOIL WING	**SD7035**
AIRFOIL STAB	**SD 8020**
PLANFORM	**DOUBLE TAPER**
WING AREA	**565 SQ. IN.**
STAB AREA	**70.6 SQ. IN.**
WING LOADING	**8.8 - 9.8 OZ./SQ. FT.**

The kit features include:
- Sleek new design with plug-on wings, standard tail, and full flying stab.
- Pre-sheeted and finish sanded wings & stab. Construction is obechi over foam.
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