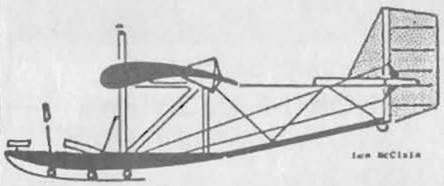


THE VINTAGE SAILPLANE ASSOCIATION

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

For more information write:

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

RC Soaring Digest
P.O. Box 1079
Payson, AZ 85547

Bulk Rate
Postage Paid
Permit # 17
Payson, AZ 85547

ADDRESS CORRECTION REQUESTED
FORWARDING POSTAGE GUARANTEED

3

© 1988 RC Soaring Digest printed monthly twelve issue per year. Edited and Published by James H. Gray, 210 East Chateau Circle, Payson, AZ 85541. Telephone number (602) 474-5015. Subscriptions $17 per year in the USA; $21 U.S. per year in Canada & Mexico; $26 US per year via Air Mail in Europe and U.K. ($18 US surface mail); and $28 US per year via Air Mail in Asia, Pacific and Middle East ($18 US surface mail). All rights reserved. Reproduction with permission of Publisher allowed. RC Soaring Digest, RCSD, Radio Control Soaring Digest and Soaring Digest are registered names. The right to use R/C in place of RC is reserved and registered for all above names.

Graphic Design and Production by Robert W. Rondeau Graphic Design, 73 Main Street, Brattleboro, VT 05301

R/C Soaring DIGEST

Vol. 5 No. 7 July 1988

HI START

"Good News -- Bad News" -- remember that phrase that used to go the rounds? Well, I guess maybe it's time to talk a bit about that. Do you want the Good News first? Okay: the Good News is that RCSD is growing very nicely and very steadily. We have had 1,400 subscribers since the beginning back in January 1984. Right now, we have 800 subscribers. You call that Good News? Yup, you bet I do -- and here's why: our renewal rate runs approximately 90%, and that means each year we have last-year's subscribers come back for another year. In addition to that, we have an influx of NEW subscribers, which helps make up for the few we lose each renewal period. Most magazines would feel good if their renewal rate was only 70%, so RCSD can proudly say that we're way above and beyond the performance expected of most magazines. What that means to me is that you readers are loyal; that you like what you read; and that you are willing to stick your necks out for another year. It also means that RCSD will continue to have the money to keep going. What about those 600 we've lost in the last 4½ years of publication? Okay, a fair question. Many of them just didn't feel that RCSD was their "cup of tea." Some dropped out of RC soaring, while still others wanted to go into other magazines. There are many reasons...but what makes me feel good about all of this is that I've only had return a subscription check to TWO persons in all these years! One told me that his eyes were so bad that he couldn't read the fine print in RCSD (a valid objection, and one that I hope to rectify someday) and the other told me that he didn't expect it to be about technical soaring...and it was too far beyond him. We gladly sent back the money...which, in case you didn't know it, is RCSD policy. RCSD will refund the un-fulfilled portion of your subscription should you really find you do not like the magazine. Naturally, we feel a bit hurt when someone wants his money back, or fails to renew -- BUT, many of you drop out for a year, and <u>then come back</u>! So, you see, it's really a Good News story I have to tell.

What about the Bad News, you ask? Well, the Bad News is Postage Costs. By the time you read this, you'll be paying 25¢ for a First Class stamp...but you will be receiving less for your money! Fewer operating hours by postal employees, fewer services, and fewer employees and buildings. As a business, RCSD depends upon the mail to survive. Our costs have gone up, too, especially for overseas mail. We normally send all copies to overseas subscribers by Air Mail. It costs $1.12 to Europe and $1.35 to Asia and the Pacific to send RCSD overseas. Add the cost of an envelope to put it in, and you have the dilemma in a nutshell. Postage costs almost twice as much as production cost per copy! WITH THE NEW RATE IN EFFECT, POSTAGE BY AIR OVERSEAS WILL COST MORE THAN TWICE MY PRODUCTION COST! What is the answer? Well, that's the Bad News: raise subscription rates. However, I am going to try to do it in a fair way, and in a manner that doesn't penalize anyone unduly. What I plan to do is to increase the U.S. subscription rate from $16 to $17 per year, and I am going to offer overseas subscribers two options: air mail and surface mail Surface mail rates will be <u>reduced</u> to overseas subscribers, but they will have to wait longer for their copies. Air mail rates will be <u>increased</u> to overseas subscribers. This leaves us with an unpopular and unhappy situation with regard to our good Canadian and Mexican friends. They have been hurt by currency exchange rates for some time now, and I don't really want to hurt them more by increasing subscription costs...but I am afraid that it will have to be done. Postal regs require that all copies of RCSD to Canada <u>must be sent</u> First Class, in envelopes! It used to cost 40¢ in postage...and now it costs more. What I will do is to increase the subscription rate <u>only enough</u> to exactly match the postal increase. None of this is intended to make anybody happy, and I know a lot of us -- me included -- will be very unhappy...but I hope to be able to minimize the impact.

There's no real solution for the postage problem...but there IS another thing I hope to be able to do: improve the quality and quantity of RCSD contents. It won't happen right away, but it will happen - I promise you. So far, you have seen RCSD more than double in size in four years, from 12 to 28 pages. I will increase it beyond that as soon as I can. The material is available, and your value per dollar spent will increase. Because it is possible to send RCSD in the U.S. by Third Class mail, pre-sorted and Zip-coded, we can increase the size a bit and not increase the postage beyond what it costs under the new increase.

So, good readers and friends, that's the Good News - Bad News story in a nutshell. I am sorry to have to take up your time with this dreary tale, but it's only fair to you that I do so. If any of you have other solutions or ideas, let me know, and I'll delay the increases until I've heard from you -- if I can! BUT WRITE!

Happy soaring,

Jim

THE SCHUEMANN WING PLANFORM......Spackman & Elliott*

22 Lynda Avenue, Paparangi, Wellington 4, New Zealand

The practical value of this wing planform is its improvement against tip stalling in slow landing approaches and slow tight thermal turning by dihedral-wing F3B gliders.

If you are currently considering a dihedral wing for your next F3B model, then the following will be of particular interest. A new wing plkanform was in evidence at the recent F3B World Champs in Germany. It featured a 'straight' trailing edge with multiple sweepback on the leading edge, and a very small wing tip.

Two examples of World Champ gliders using the Schuemann planform are shown in our three-views per the TARANTULA plus flown into 5th spot overall by Ammann Rainer of Switzerland, and the EPSILON by the winner, Reinhard Liese.

The wing planform that they have adopted is based on theoretical and practical work that goes back to the late 1970's when Wil Schuemann (USA) began working on performance problems he was having with his full-size ASW-12. From results of wind tunnel tests in 1980 he modified and flew his glider in 1982 and published a paper in "SOARING" magazine, February 1983. Klaus Holighaus, designer for Schempp-Hirth in Germany read that paper and went back to the wind tunnel. The resukt was his very successful full-size sailplane design: "DISCUS."

Space restrictions preclude publishing the full theoretical basis on which the planform was developed. We will give a short description and some references for those who wish to delve further.

If you carefully study the diagrams at A in the three-view, then note:

- Optimum planform (Figs. 1 & 8) is aimed at neutralizing effects of wing tip vortex and associated increase in drag and decrease in lift that can occur from airflow separation off the wing.

- Air molecules reacted to differences in pressure gradient on either side of them and acted at right angles to the fuselage and turned towards higher pressure due to the swept-forward trailing edge.

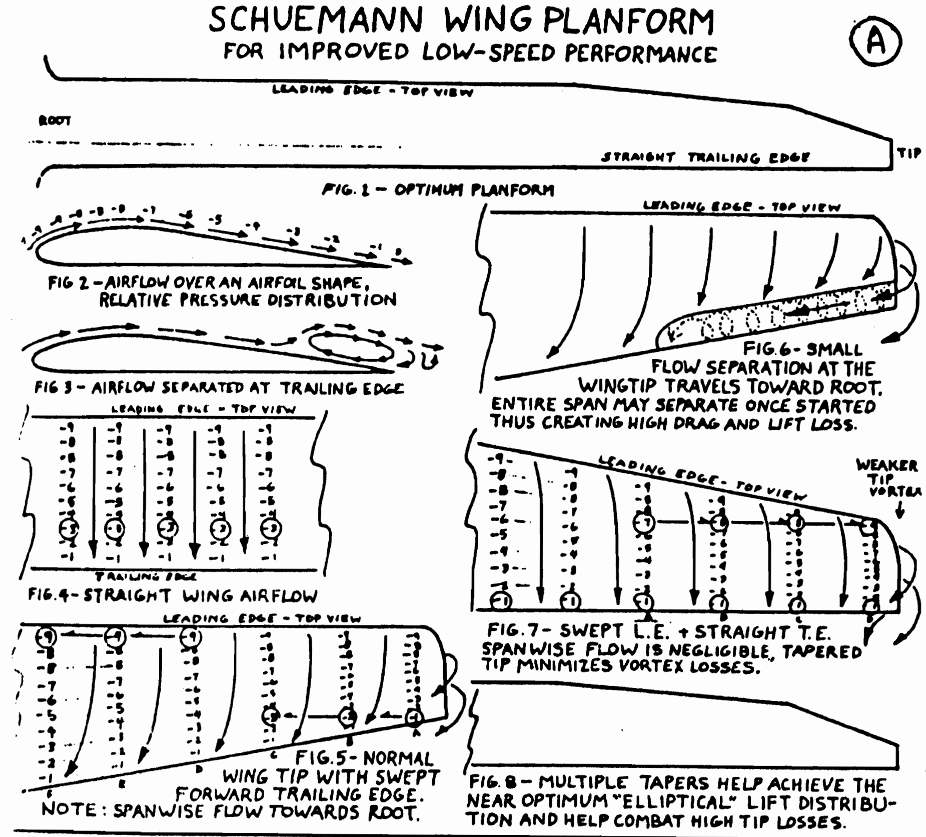
- In Figs. 5 & 6 it was proved that from an increase in pressure gradient at the trailing edge toward thewing root, a separation bubble developed to the point where the wing tip vortex was pumping air into a 'tube' along the trailing edge, and funnneling it to the root. This could cause separation over the whole wing, and therefore massive loss of lift.

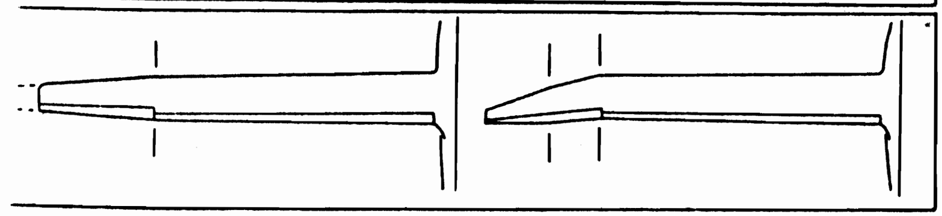
- With the straight trailing edge wing (Fig. 7), the air molecules at the trailing edge saw a constant pressure gradient (-1) from the tip to the root, and the inwards rush of air did not occur. Wing tip vortex was minimized by using a small wing tip, and the leading edge was shaped to give this.

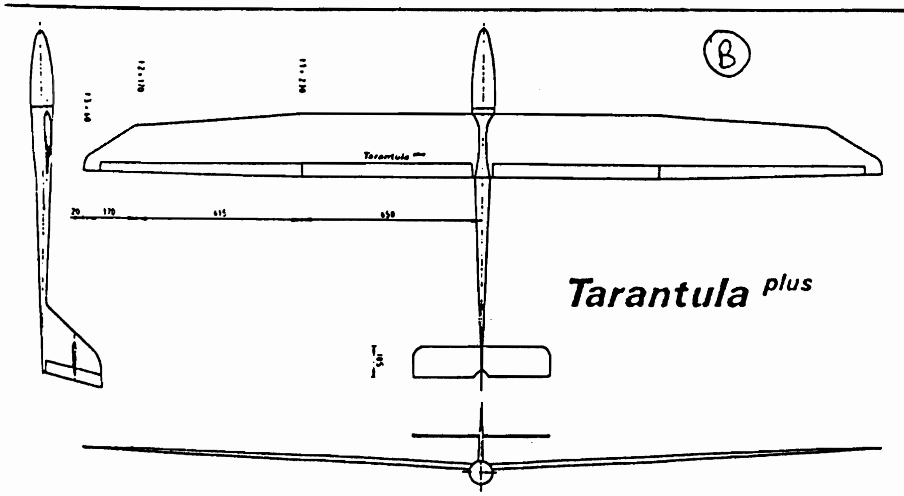
This description is very simplistic, but the theory apparently works in practice as the planform is now appearing on more full-size competetive sailplanes.

References: November and July 1987, and September 1986 Model Builder magazine; (Bill Forrey's Column); Scientific American.

Note: Keith and I have spent quite a bit of time searching for a Scientific American article by some NASA scientists. It is thought to have been published between 1984 and July 1987, and concerns an ideal wing planform. If anybody traces it, then we would appreciate being advised of its source, as it heplps to put the jigsaw together. Further References: February 1988 R/C Modeler; Society of Automotive Engineers paper by C.P. Van Dann entitled: "Swept Wing-tip Shapes for Low-speed Airplanes."







Footnote:

1. The multi-swept leading edge appears in nature; for example, a seagull's wing.

* From the New Zealand Soaring Society Newsletter #85 April/May 1988.

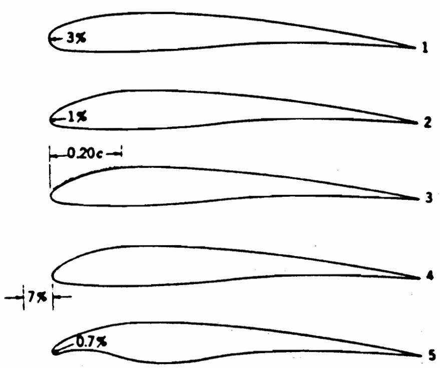
Editor's Notes: Apparently, Schuemann's ASW-12 was able to out-run ASW-15s, but suffered in climbing ability, partly because of the inertial moment of the long-span ASW-12 wings. Thinking to reduce this moment, Schuemann reduced the span of his ASW-12, but discovered that even at the reduced span it could not climb with the ASW-15s. Consequently, he undertook experiments, including tuft tests with bits of yarn and a camera, to determine that, in fact, there was a large separation bubble. He then empirically changed the tip shape in planform to reduce or eliminate the separation bubble. Successful in this effort, flight tests showed that the newly designed tip shape allowed the ASW-12 to stay with, or surpass, the ASW-15s in the climbing/thermalling mode, while not losing anything to them in the cruise mode. JHG.

Canopy Needed:
Mark Foster, (826 Oneonta Dr. Pasadena, Ca 91030) is looking for a canopy for his Graupner Cirrus 75. If anyone has a canopy available, please write Mark and indicate the price your asking.

INTERESTING AIRFOIL INFORMATION ....Jim Gray

Airfoil performance at low Reynolds Numbers (below about 50,000) is the subject of much research among free-flight enthusiasts, particularly the A-2 Nordic (FF sailplane) crew. In a recent issue of the Phoenix, AZ FF Club newsletter, reference was made to some interesting tests on five different airfoils.

The first two airfoils shown in the sketch below have the same profile except for the L.E. radius. The third airfoil has a roughened surface extending from the L.E. radius back to the .20c line on the upper surface. The 4th airfoil has a "trip" wire in front of the L.E., and the Fifth airfoil has a very small (0.7%c) L.E. radius. Note that all five airfoils appear to be identical from the thickest portion all the way back to the trailing edge. Now look at the drag curves in the graph below the profiles. Notice how the drag rise of airfoil #1 is very steep with increasing lift coefficient (Cl) hence angle of attack. Apparently a blunt L.E. radius is a "no-no" at low Reynolds Numbers. By decreasing the L.E. radius, as in airfoil #2, the drag performance is vastly improved. A slight additional improvement is made by roughening the upper surface as shown in airfoil #3. Still better performance is achieved with a turbulator "trip" wire, as in #4....while the best performance of all is obtained with airfoil #5.



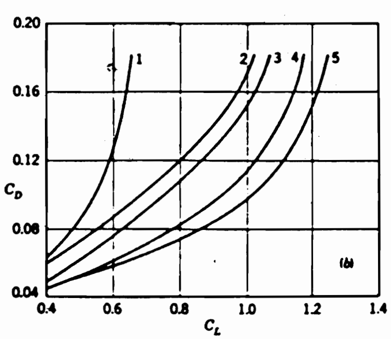


Fig. 8:4 Performance of the five profiles shown in Fig. 8:3 at Reynolds number 30,000 to 45,000; AR = 6.0. (From an unpublished paper by Seredensky.)

You may be interested to know that airfoil #5 is a very good simulation of a soaring bird profile, specifically a hawk profile! There is adequate spar depth, a very slim leading edge with small radius, and a nice blended curve from L.E. to T.E. on the bottom surface which blends the spar thickness into the remainder of the profile. Notice that at all anglkes of attack shown, the drag of airfoil #5 is significantly below that of the others. It is also apparent that as the Cl decreases (angle of attack reduces and speed increases) all of the airfoils tend toward a drag value between about 0.05 and 0.07...with 'foils #3 #4 and #5 approaching nearly identical minimum values.

The one area in which RC sailplanes could possibly benefit from the data is in hand launch where chords are typically small and Reynolds Numbers are low. One other possibility exists -- and that is for a wing tip on a larger sailplane where the R.N. could also be down in the 50,000 or below range.

My suggestion for experiment would be to build a hand launch glider with the airfoil #5. Interestingly, there is also the possibility of a "trapped vortex" forming under the leading edge of this 'foil at high angles of attack. We have the possibility here of excellent performance in the the thermal and minimum sink gliding modes, without any loss of performance at higher speeds. Try this one and let me know how it works for you. I visualize a sheet wing with blended-in spar - reminiscent of a Jedelsky type of construction.

One other point of interest: thin airfoils are okay, providing adequate depth is available for the spar to provide strength and stiffness to the wing. Airfoil #5 allows the same spar depth as any of the others shown...but look at the results! What have we b een missing all these years that the birds know?

SOURCES...................................... "EASTWIND"

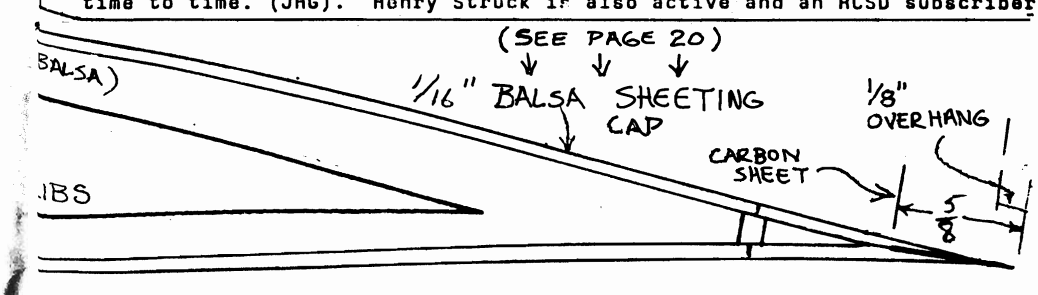
Remember the Eastwind design by Henry Struck, kitted by JETCO? It's a lovely sailplane, yet sadly out of production, or so I hear. Dale A. Hawley, PE, of 3223 N.E. 89th Street, Seattle, WA 98115 (telephone 206-526-5202) will provide plans for the EASTWIND for $10 to cpover shipping and handling. I believe he plans to build the sailplane and then send the plans to a worthy scratch builder.

The EASTWIND specs are: 76" span, 420 sq. in. wing area, 13.7:1 aspect ratio, and has a boom-mounted, retractable glo engine for pilots who prefer something other than a towline to launch. Yes, it's a free-flight, engine assisted sailplane, and does not have an RC radio.

If I'm not mistaken, the EASTWIND is all-balsa construction with hardwood spars and a slightly under-cambered airfoil. The fuselage is a boxy structure with rounded corners and sheet covering, and features a sailplane-style canopy.

Dale plans to mount an electric motor on his, and keep it free-flight before trying RC sometime in the future. Of course this ship is almost ideal for small RC gear.

Incidentally, JETCO was owned and operated by C.A. Zaic; i.e., Carl, who is Frank Zaic's brother. The Zaic boys were almost the founders of the model airplane/sailplane kit business in the 30's, and I still hear from Frank (who is still involved and active) from time to time. (JHG). Henry Struck is also active and an RCSD subscriber



Connecting Spoiler Cables..............Doug Horne*

*470 Buena Vista Road, Ottawa, Ontario, Canada K1M 0W3

Doug is Chairman, Glider Group, ORCC, The Ottawa Radio Control Club -- one of the largest clubs in Canada, consisting of special interest groups such as soaring, scale, helicopyers, jets, power and sail boats, old timers, etc.

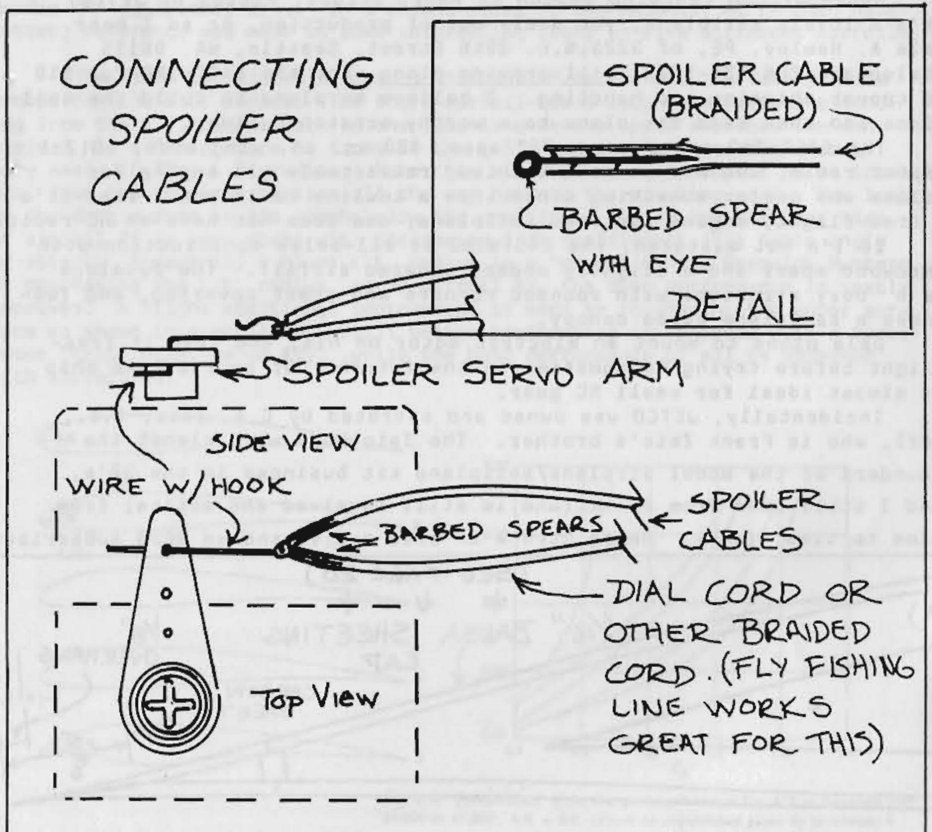
Members of the soaring group range from beginners to world class competitors, who collectively own 130 gliders!

Your local fly fishing shop carries a neat, simple and inexpensive gadget which makes connecting spoiler cables to the servo in your glider much easier.

The gadget is a barbed spear, with an eye, which is pushed down the centre of the spoiler cable. The best part of this set-up is that the eye on the spear is small enough to pass easily through the tubing which carries the spoiler cable to the spoilers, and stiff enough to assist in threading the cable through the holes in the wing root.

This works well when the spoiler cables are made from dial (or other types of braided) cord, but works even better when the cables are made from fly fishing line, which is substantially stiffer.

A drop of CA glue will keep the spoiler cables from unravelling at the barbed spear.

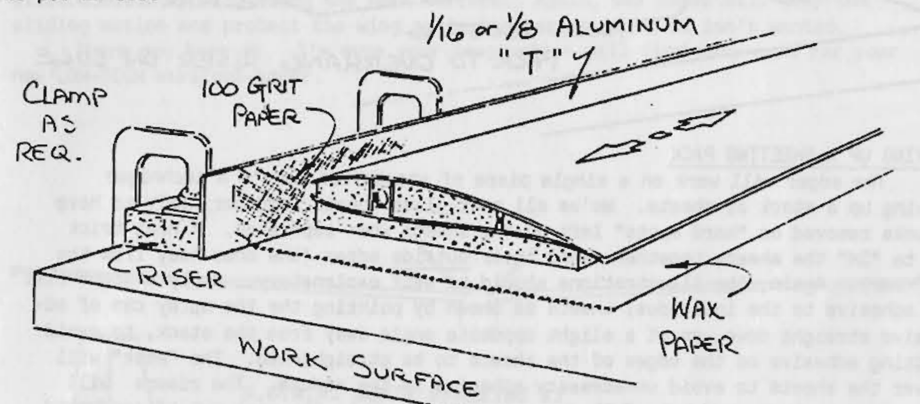


Low-tech Straight Edger..............................Asher Carmichael

There comes a time in every building project where long stock has to be straight-edged in order to achieve a good glue joint. A case in point is joining sheets of balsa to form wing skins. Or, how about truing up the leading or trailing edges of sheeted wings?

We've all used rulers and razor knives to splice sheeting, and long sanding blocks for truing other edges. Some modelers are fortunate enough to have access to a "jointer" -- a machine designed for flattening or straight-edging wood. They really make fast work of truing up stock, but besides being noisy and large, they are also expensive. If you don't have access to a jointer, here's an alternative jig that will do just as good a job with less wear on the bill-fold, but a little more on the muscles.

The outstanding builders and fliers from Pensacola, Florida -- Rusty Road and David Stone -- contributed the basic idea for the straight-edger. We developed and exchanged numerous techniques during an evening's conversation about the construction of our WINDSONGS. I've taken the liberty to modify the jig to make it easier to set up and take down...so that it doesn't occupy a lot of space when it is put in use.

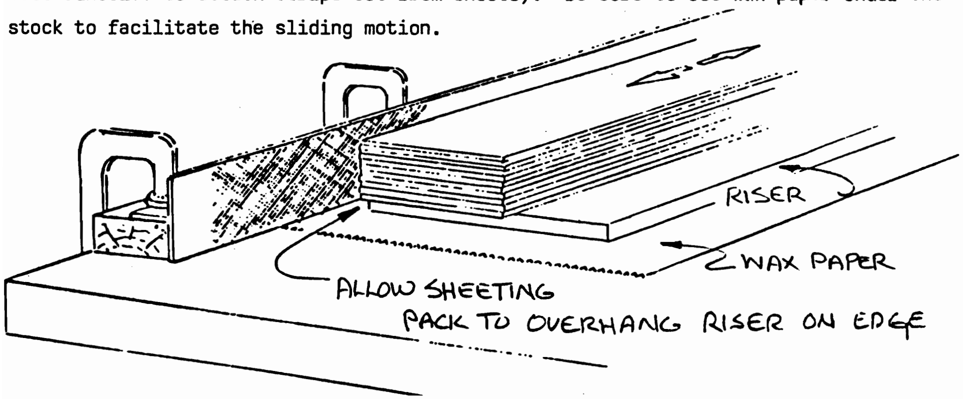


THE JIG

The illustration should be self-explanatory as to the construction of the jig. All that is needed is a suitable length of 1/16" or 1/8" aluminum "T" bar, a hardwood or ply riser, several clamps and some sticky-backed sandpaper or equivalent. Set up the jig as shown. You can use your reference straight-edge (ruler, ground bar stock, etc.) to check the straightness of the sanding face.

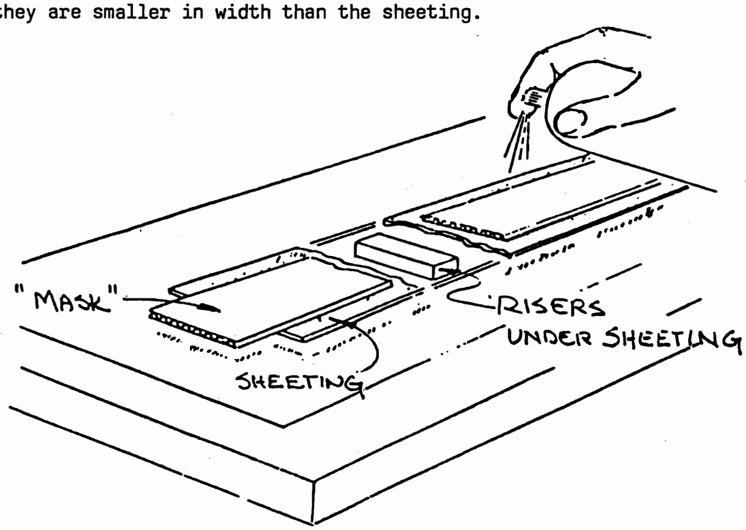
USING THE JIG

The straight-edger works by sliding the stock back and forth along the "T" bar. You must supply sufficient pressure against the jig as well as against the work surface. A little experimentation will disclose the best combination of pressure, speed and grit size. I have found that 100-grit paper is about right for most applications. (If you can't find continuous strip stick-back sand paper, use spray contact adhesive to attach strips cut from sheets). Be sure to use wax paper under the stock to facilitate the sliding motion.

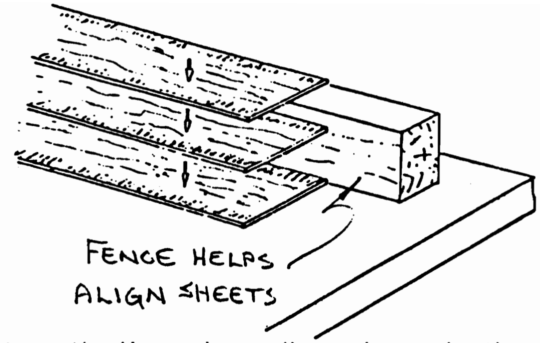


LAYING UP A SHEETING PACK

The edger will work on a single piece of stock, but here's a technique laying up a stack of sheets. We've all spot-glued sheets together, only to have chunks removed or "hard spots" left on the sheets when separated. A neat trick is to "3M" the sheets together along their outside edges (the ones away from the "T" bar). Again, the illustrations should be self explanatory. Apply a light mist of adhesive to the individual sheets as shown by pointing the the spray can of adhesive straight down, or at a slight opposite angle away from the stack, to avoid getting adhesive on the edges of the sheets to be straightened. The "mask" will cover the sheets to avoid unnecessary adhesive in the middle. The risers will hold the sheets up and out of the overspray area. Make the mask out of cardboard, ply or what have you. The risers, too, can be made from any material...just make sure they are smaller in width than the sheeting.



Spray the sheets as shown (on one side only) and assemble them in a stack. A straight board board is helpful in keeping the edges aligned when when pressing the sheets together.



Edge the sheets on the jig as shown. Use a riser under them to position the pack along the center of the jig face (vertically). When you are satisfied with the results, separate the sheets and proceed with your gluing. Spray adhesive may be reomoved from the sheets with a cloth dampened with mineral spirits.

Straigtening the leading and trailing edges of a sheeted wing is simpler. Place the wing in the upper or lower foam saddle if it is a foam core, or simply slide a built-up wing along the work surface. Again, wax paper will help the sliding motion and protect the wing against abrasion where it isn't wanted.

There you have it. I'm sure your imagination will find many uses for your new LOW-TECH straight-edger.

SCALE UPRISING -- 1988

NAME ____

ADDRESS ____

CITY ______________________ ***STATE*** ______ ***ZIP*** __________

PHONE (HOME) ________________ ***(WORK)*** ________________

AMA NUMBER ____________ ***LSF NUMBER*** ____________

CLASS OF ENTRY (CHECK ALL THAT APPLY)

[ ] SPORT PRE-1946   [ ] SPORT POST- 1946   [ ] MOTOR GLIDER

Enter as many classes as you wish, however, all your aircraft must be on the same frequency. Please indicate your choice below by writing in a "1" for you first choice, "2" for second, etc.

Channel	12	14	16	18	20	22	24	26	28	30	32	34	38	40	42	44	46	48	50
Choice	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]

Channel	52	54	56	00	02	04	06	08
Choice	[]	[]	[]	[]	[]	[]	[]	[]

Channel	53.60	53.70	53.80	53.10	53.20	53.30	53.40	53.50
Choice	[]	[]	[]	[]	[]	[]	[]	[]

Entry fee is $10.00. Make checks payable to S.O.A.R. and mail with this form to:

Jack Hiner
2213 Prentiss Creek
A104
Downers Grove, IL 60516

This form and check must be postmarked before July 1, 1988. Maps and hotel information will be sent after that date.

Dodgson's New Automatic Flap-Aileron Reflex Trim........Bob Rondeau

In the R/C soaring business, new companies come and go with alarming regularity. In order to suceed in this small, specialized market a product must gain wide acceptance, customer loyalty and it must stay ahead of the competition. Bob Dodgson has been doing just that for more than 15 years.

Bob's sailplane designs are carefully developed and engineered to perform reliably within their design parameters and he resists and discourages most of our attempts to redesign or modify his kits.

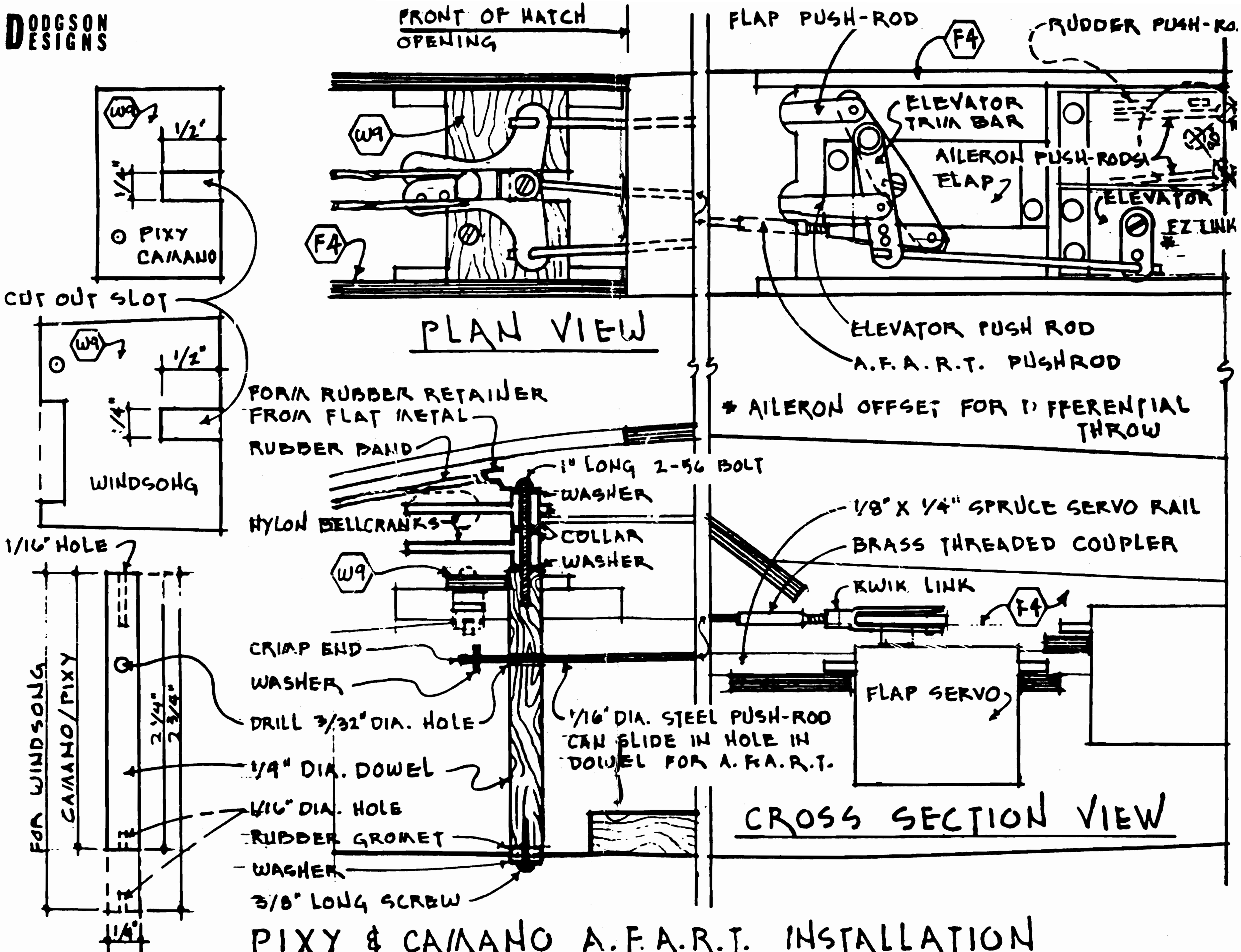
The automatic flap-aileron reflex trim (A.F.A.R.T.)was one innovation that Bob embraces as an improvement in the Pixy and Camano allowing full span camber reflex without the addition of another servo. The advantages of using A.F.A.R.T. in the Windsong Tie in eliminating one servo and mixing linkage to the benifit of aileron centering, more effective differential (a simple offset servo output arm can be used in place of the M-1 mixer) and the weight of one servo and it's attendant mixer can be saved. What follows is some excerpts from the official Dodgson A.F.A.R.T. flyer with Bob's excellent drawing of the system.

This amazing mixer was designed by Gary Brokaw of Spokane, WA, and consists of a simple 1/4" hardwood dowel that is cut 2-1/4" long for the Camano and Pixy and 2-3/4" long for the Windsong. A 3/32" hole is drilled through the dowel at 3/4"-1" from the top, A 1/16" dia. hole in the center of the top about 1/2" deep. A tiny pilot hole is punched in the bottom of the dowel for the 3/8" screw. This dowel becomes the support for the two fuse bellcranks normally used in our kits. The slot in W-9 should be cut so that when the dowel is all the way to the rear of the slot, the bellcranks are in the same location as the conventional installation. A razor saw can be used for this in a retro fit installation. The slot should be cut a hair undersized so that it can be filed to a no-slop fit, side to side for the dowel. Locate the hole for the bottom screw so that it goes through the center of the fuselage at the point where the dowel is verticle, in the fuse, when resting against the back of the slot. Make the hole just large enough so that you can install a very small rubber grommet in it.

Install the two bellcranks onto the top of the dowel, as shown on the plan, with the bearing flanges together in the center. Use a 2-56 flat washer both under the bottom bellcrank and on top of the top bellceank. Bend a strip of flat metal to the shape shown on the plans for the rubber band retainer and drill a 3/32" hole in the end for the 2-56 bolt to go through. Install the 1" long 2-56 bolt by screwing into the hole the dowel top. Make it snug (note: you will probably want to install the aileron pushrods into the bellcranks, as the regular plans show, before securing the bellcranks to the dowel).

Now put a washer on the 3/8" screw and put the screw through the grommet in the fuselage bottom and screw it up into the small hole in the dowel. Snug the screw up gently leaving enough play in the grommet so that the dowel can be pivoted forward in the slot about 1/4". Make the A.F.A.R.T. push rod out of 1/16" music wire and crimp one end of it so that when you put a small washer with a 1-16" hole on it won't slide off the end. This type of washer is supplied with sets of Du-Bro E-Z links which you will need anyway to secure the aileron servo arm. Cut the pushrod to length so that the end washer is agianst the dowel (with the dowel agianst the back of the slot) and the flap servo set at neutral flap. Solder the threaded coupler on to the servo end of the pushrod and screw on a metal kwick link. Put rubber bands as need (or a spring) from the brass wing alignment pin tube extending to the rubberband retainer on top of the A.F.A.R.T. Adjust the transmitter flap trim or put a metal or wood stop where needed so that when the trim is thrown down the flaps are in perfect neutral and when the trim is full up the flaps are in the 6 degree negative position. Adjust the A.F.A.R.T. pushrod so that the ailerons are not affected when positive

DODGSON DESIGNS



PIXY & CAMANO A.F.A.R.T. INSTALLATION

WINDSONG INSTALLATION IS SIMILAR

flaps are used and when the flaps are in neutral but so that when you move the trim lever up to reflex the flaps, A.F.A.R.T. is pulled forward just far enough to also reflex the ailerons 6 degrees like the flaps.

The tension on the rubberband or spring should be adjusted so that when you put reasonable pressure on the ailerons, A.F.A.R.T. does not shift forward at all. Yet you do not want so much pressure on the elastic device that the flap servo cannot readily move A.F.A.R.T. when told to do so. If the elastic tension is too slight high speed aileron flutter could occur. This could also occur as the result of a sloppy fit of the dowel in the slot. If the fit is too loose shim the inside of the slot with 1/64" plywood or coats of glue, Hot stuff etc. until the fit is snug. With a snug fit, A.F.A.R.T. produces no more slop than the bellcranks do without A.F.A.R.T.

Properly installed and adjusted, A.F.A.R.T. should require no further service and should give precise neutral and reflex flap positions. Since the 90 degree flaps, with built in elevator trim compensation are so effective for landing, speed and glide path control, Windsong flyers find that they rarely use the aileron spoiler function provided with the fourth servo. The good flyers do however, rely heavily on the performance edge they can get by reflexing the entire trailing edge of the wing. Now anyone can use even a cheap 4 channel radio and get full trailing edge reflex capability at one finger tip and with only three servos. All that is being given up is an extra servo and an additional trim lever to fool with, along with the aileron spoiler function that is not normally used anyway.

* Dodgson Designs 21230 Damson Road, Bothell, WA 98021 (206) 776-8067

In talking to Bob recently he mentioned that they are putting the A.F.A.R.T. instructions into the new kits and have another version for 4 servos. Bob is also bringing out another kit called the "Lovesong" and rumor has it that this Sailplane will incorporate some of the very innovations that he has discouraged when building Windsongs... I hope to have more about this soon.

Heavy Metal by Mike Hickman from the P.P.S.S. Newsletter "The Spoiler"

This is one of those articles that is sure to generate lots of mail and if there's one thing we love it's a good argument. The Spoiler is already printing letters and counter opinion so we'll join in the fun.

How many times have you heard "by using those little XYZ brand servos I saved 3 ounces" or "I didn't want to sheet the tops of the wings because it would have added too much weight"? If I had a dollar for each time I have heard something similar, I know that I could go out and buy that new set of heavier and more accurate servos that my "lead sleds" seem to thrive on.

After seven years at this hobby which we all tend to enjoy (at times), I have reached two conclusions, namely:

1. No matter how hard you try, it is almost impossible to build a kit sailplane as light as kit manufacturers claim is possible.
2. Who gives a damn!

To some folks these are fighting words, because they will go to unbelievable lengths to get a plane as light as it says on the box. Then these same folks can never figure out why their plane just doesn't seem to perform as well as the local club hotshot's seemingly identical plane. Unfortunately these poor souls have fallen prey to the magic of marketing. Once the manufacturer advertises that his "Super Killer 100" has a flying weight of 45 ounces then it becomes cast in stone that this is the proper weight to strive for.

At the risk of having some of these stones cast back at me, I would suggest that the kit manufacturers would better serve their customers if they would abandon the marketing of low advertised weights and suggest weights that would guarantee the plane a chance of flying as advertised or claimed (or close to how the club hotshot's same plane flies).

Before I proceed further, I should say that the type of plane I am talking about is a high performance sailplane with Eppler 205, Selig, or Quabeck type airfoils as opposed to the flat bottomed Oly type.

By now most of you are probably saying "get to the point Hickman", so without any further beating around the bush, I contend that attempting to extract maximum performance out of a plane as defined above with a wing loading less than 9 oz per sq ft is like trying to win a Formula One Gran Prix with a 55 Chev Bel Air. It will run, but it won,t get you anywhere.

A Sigitta 900 at 42 to 44 Oz results in a wing loading of 6.72 to 7.04 oz per sq ft. It will fly at this weight, but it has the mobility and performance of a hog wallowing in a mud hole. Increase the weight to 56 oz and it starts to come alive at 9 oz per sq ft. Increase the weight further to 75 oz and at 12 oz per sq ft it really comes into its element. At these higher weights the plane performs as its reputation would lead one to expect. Its too bad so many builders are mislead and don't realize how simple it is to extract maximum performance from it. Just build it a little heavier and put the extra weight to good use in areas such as sheeted wings and better servos.

My contention that a high performance sailplane, as I have defined it, needs a wing loading of at least 9 oz per sq ft and better still, 11 to 12 oz per sq ft to properly perform is not based on any great aeronautical analysis, just a good deal of observation and first hand experience. In looking back over the past six or seven years of flyiny with both the Pikes Peak Soaring Society and the Rocky Mountain Soaring Association, the club champion has almost always been won by someone flying a plane in the 11 to 12 oz per sq ft range. This is no accident!

Already I can hear the doubters out there. "The heavy plane won't launch as high" or "it won't work the light gopher belches we have for lift around here". Basically this is just hogwash. I will admit that in a downwind launch, my Heavy Metal lead sled is at a slight disadvantage, but with a even slight amount of wind down the line (as is usually the case) I have always been able to launch as high as just about anyone on the field. CG location, towhook placement, trim settings, and launch technique are the keys to a good consistent launch. As for not being able to work light lift, I am convinced this is more a case of learning how to properly fly the heavier plane. Granted, the heavy plane may not be able to work the tight little thermal near the ground that a Gentle Lady can, but many is the time that I have witnessed the "Heavy" efficient plane climb right up thru a thermal full of so called floaters.

Why is the heavier plane so successful you ask? From what I have observed the following would tend to apply:

1. At the higher weights the Eppler type airfoils tend to fly at higher speeds and lower angles of attack.
2. This resulting increase in efficiency results in much greater Lift to Drag ratios allowing the plane to cover much grater areas from a given height, greatly increasing the odds of finding lift.
3. The ability to cover greater areas seeking lift tends to make pilots more aggressive, because they know they can go look for lift and always make it back for a landing. Aggressive pilots win!
4. Heavy planes land more consistently as they are less disturbed by gusting winds.

Added together, this results in a decided advantage for the Heavy Metal pilot.

To give you a quick idea of the necessary weights required to achieve the wing loadings I'm suggesting, I have prepared the attached chart which shows the required weights for three sizes of wings. These three sizes come close to the average 2 meter, standard, and open planes.

THINK HEAVY METAL!!

Rebuttal to "Heavy Metal" by Ernie Currington,*

No sooner has Mike Hickman taken his seat and put his feet up than our old friend Ernie Currington, Editor of the newsletter of the Montreal Area Thermal Soarers jumps to the defense of building light.

May I object to the point of view of Mr. Hickman's article entitled "Heavy Metal"? May I say "Hogwash, Poppy-cock and Balderdash"?? Every airplane must be designed to minumun weight commensurate with strength.

Remember, please, that if you build to 7 oz./ft. you can always build <u>up</u> to 9 oz./ft., If you build to 9, you cannot build <u>down.</u> Again, building light ensures that the tips and feathers will be light. This gives minimum moments od inertia. These values determine turning performance i.e., roll and yaw. Also, adding ballast <u>on the C.G.</u> makes very little difference to the moment of inertia, hence, a light airplane and a ballasted airplane will have approxiametly the same turn rate and response.

I am biased, I know, having been a mass properties engineer for many years. Our motto was " No matter what it weighs, it's too heavy"

Practicing what I preach, my Mirage requires ballst to bring it up to the minimum FAI street legal wing loading.

The Effects of Weight on R/C Sailplanes by Wayne Angevine, P.P.S.S.

With the crowd getting rough and small fights breaking out in the back of the hall Wayne tries to calm things down with a discussion of the gray-areas of the "heavy VS light" argument and the trade-offs involved.

Have you ever wondered what effect the weight of a sailplane really has on its performance? It's a subject about which there is a good deal of speculation. Let's look at the aerodynamics of the situation and see if that helps.

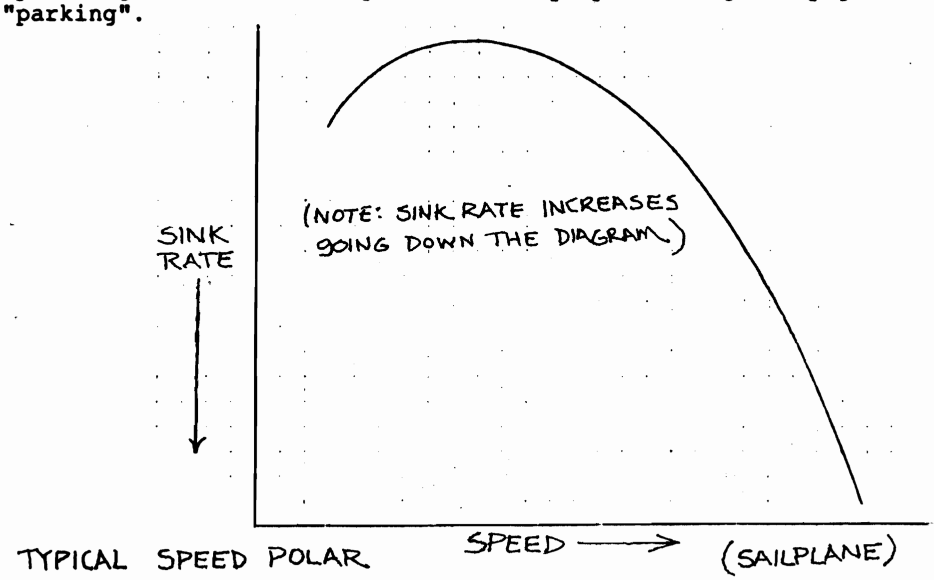
Figure 1 is a "Speed Polar" (or just a "polar") for a sailplane. This one is not for any sailplane in particular, but is representative of the features I want to discuss. You've seen these before for airfoils, but this is for the whole model. The most significant feature is the concave area, called the "drag bucket." The curve is shaped by the lift and drag characteristics of the airfoil and the parasite drag of the wing, fuselage, and tail surfaces. Note that the speed is relative to the air mass, not to the ground.

You can see that to buy any given speed, you must pay a certain amount of sink. That is, after all, what makes a sailplane go. You can also see that some sink rates can be achieved (if you want to put it that way) at more than one speed. Also notice that the sink rate goes up relatively slowly as speed rises above the minimum sink speed, and goes up relatively quickly as speed falls below it. This is because Reynolds number increases as speed increases.

You want to fly somewhere in the drag bucket to be reasonably efficient. However, there are other requirements to be met. You need to fly fast enough to get through sinking air or to stay in the area of wave lift on our windy days. You also need to fly slowly enough to turn reasonable tightly in small thermals.

How, then, does weight affect this curve? Increasing the weight of the sailplane while holding everything else constant shifts the curve to the right and slightly downward. In other words, for the same sink rate, you can fly faster. Your maximum speed capability is increased - but so is your minimum speed, and your maximum L/D goes down slightly. As the weight goes up, the angle of attack and lift coefficient required for a given speed go up, raising the induced drag, so to remain in the drag bucket you must fly faster. The parasite drag also goes up so you lose some overall efficiency.

So, do you want a heavier sailplane? It depends! It depends on the conditions, the task, and your own preferences. If the wind is strong and there is lift, a heavier plane will let you penetrate upwind and find it, or get back from downwind. Remember, though, that you are going to have a higher minimum sink rate and will have to make larger turns. If there is no wind, a light plane will stay up longer and work light lift better, but can't cover as much ground looking for lift. If there is no lift at all, the plane which has its minimum sink speed right at the wind speed will stay up the longest by just "parking".



TYPICAL SPEED POLAR

There are secondary effects of weight to consider also. Stall speed goes up with weight, making landings faster and increasing the probability of a stall/crash on final turn. Launches will definitely be lower. More weight will damp movement in turbulence, but will also damp the movement you want to help you see when you are in lift.

You don't have to build half a dozen sailplanes in order to have the right combination for every set of conditions, though. Some clever person invented ballast. If you want a heavier plane, add some. You can't, however, take any out once it's all out. Another way to beat the system is with full-span flaps. They have the effect of shifting the curve much like weight does, but can be controlled in the air. However, flaps add to the minimum unballasted weight of the sailplane. Its also worth noting that a thicker airfoil will broaden the drag bucket, at the cost of making it more shallow (raising the minimum sink).

THE EFFECTS OF WEIGHT

I haven't tried to address other issues such as what you may be buying besides performance with increased or decreased weight. Sheeted wings, better servos, and complex control functions have some theoretical advantages. So do easy, safe launches, forgiving behavior on landing, and fewer things to keep track of. The testing of differences of opinion is what makes a horse race, or a sailplane contest season.

For further exploration of these issues, refer to the San Fernando Valley Silent Fliers "Technical Journal", Martin Simons' excellent "Model Aircraft Aerodynamics", or any issue of Soaring containing a sailplane test.

The dust is settling, the hall is empty except for some overturned chairs and scattered bits of balsa...but the battle of "heavy Metal" will adjurn to to the flying field...the only place to settle it conclusively.

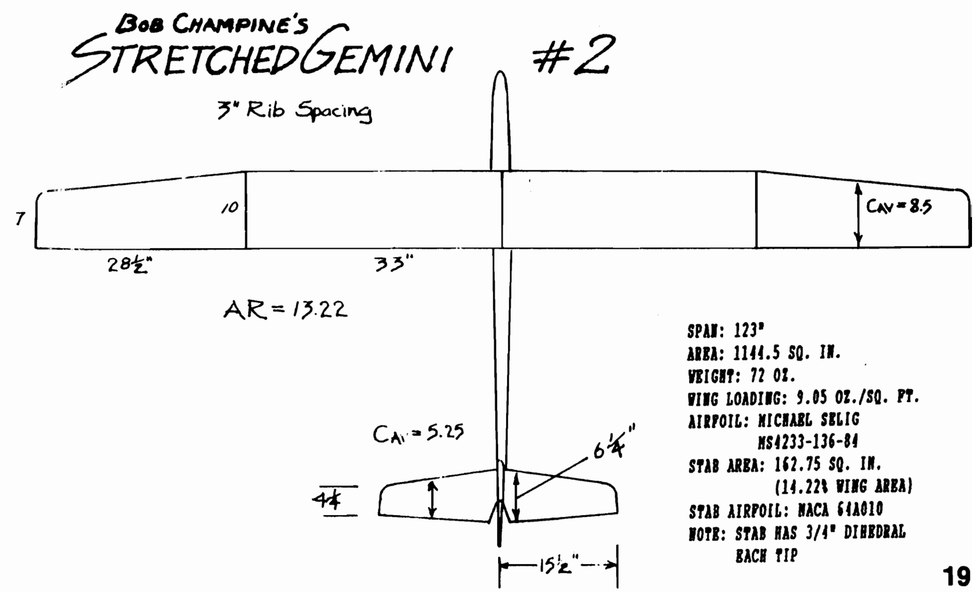
"The Spoiler" is the Journal of the Pikes Peak Soaring society and is edited by Randy Reynolds, 122 East Uintah, Colorado Springs, CO 80903.

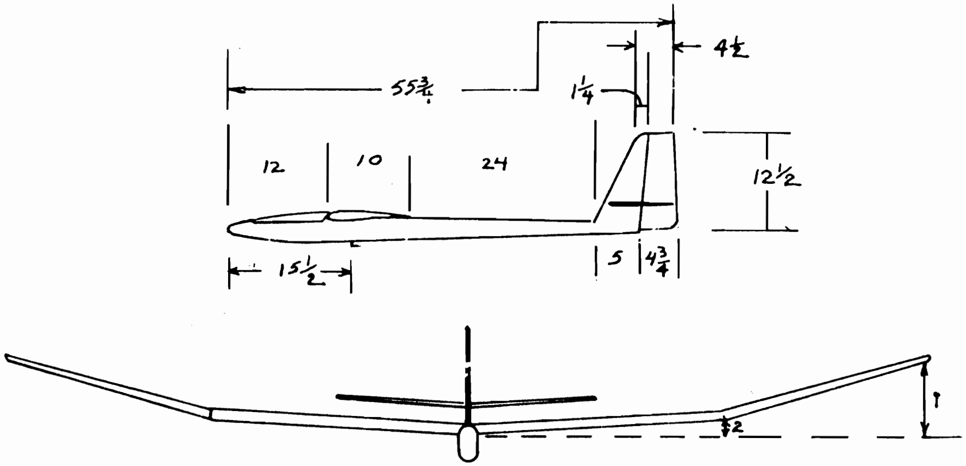
STRETCHED GEMINI...........Bob Champine*
*205 Tipton Road, Newport News, VA 23606.

"It has been some time since I wrote you last, and several things come to mind that might be of interest to other 'Glider Guiders.' Maybe I've mentioned that the Stretched Gemini has been flying real good for me. Last summer, I won 1st Place at the Canadian Nats in Unlimited, and I've done well in LSF Level V tasks with it. I've done the goal & return (6.3 miles) and 8-hour slope tasks with it...so it is becoming pretty well proven out.

"Besides the three-view, I'm enclosing the rib outlines and also various chords for the stab and fin. All of these have been computer generated and then copied for you.

"I completed LSF Level V a couple of years ago, but with LSF permission, I started all over again, and now all I've got left is the 2-hour thermal duration flight to complete. Several times this Spring I've been up for 1hr50 min, but the 2 hours has eluded me! The main point about the second trip to Level V is that it has all been done in the State of Virginia, except for a contest win or two.





"The airfoil (MS4233) has proven to be outstanding at a wing loading between 9 and 11 oz. per sq. ft. The other neat thing is that the 13.6% thickness makes the wing very strong, and it can be zoomed very hard. The other pages cover Reynolds Number and Cl vs. velocity. These are of interest in a discussion of wing chord size and wing loading. Look 'em over and see what you think.

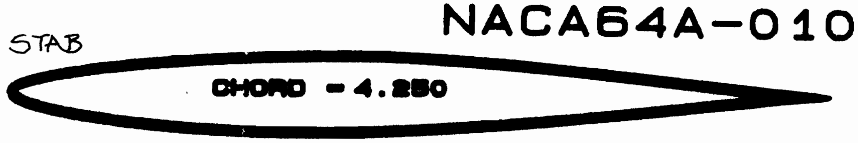
"I'm starting a new model design (Unlimited) and have decided on using the E392 airfoil because it is similar to the MS4233, only thinner. The wind tunnel data looks pretty good, too. I always say, though, that you have to build and fly it to prove that it works. Let me hear from you.

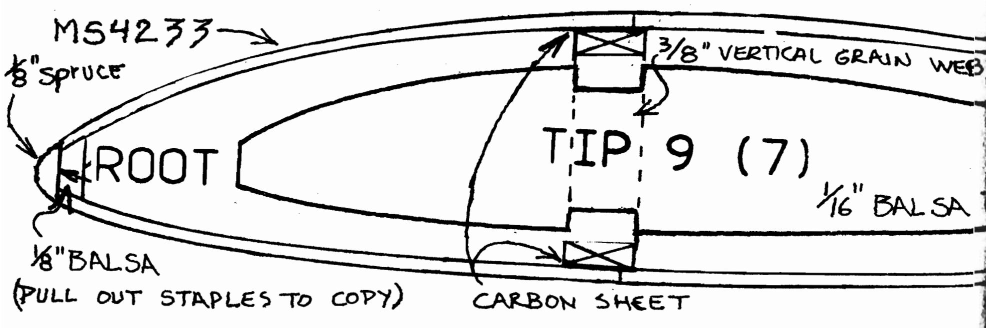
"Your friend, (signed) Bob Champine"

Bob, as always, it's great to hear from you. I wonder if two Level V's gives you a Level X? Our readers will probably want to talk with you about the Stretched Gemini after they read about it in RCSD. I will put the data -- or at least a part of it -- in this issue for those who might like to make various-sized photo copies for a wing, fin or stab. Space doesn't permit putting all of the full-size profies in this issue, although I'd like to.

We all know that a double Level V is more than a sailplane alone...and that the pilot is perhaps 70% of the combination; but then you have to consider that without a sailplane you can't do even Level I...so a good sailplane really helps. Thanks for the input, Bob, and standby for a ton of mail. JHG.

NACA64A-010





Decimal Equivalent Chart

1/64	.015625
1/32	.03125
3/64	.046875
1/16	.0625
5/64	.078125
3/32	.09375
7/64	.109375
1/8	.125
9/64	.140625
5/32	.15625
11/64	.171875
3/16	.1875
13/64	.203125
7/32	.21875
15/64	.234375
1/4	.25
17/64	.265625
9/32	.28125
19/64	.296875
5/16	.3125
21/64	.328125
11/32	.34375
23/64	.359375
3/8	.375
25/64	.390625
13/32	.40625
27/64	.421875
7/16	.4375
29/64	.453125
15/32	.46875
31/64	.484375
1/2	.5
33/64	.515625
17/32	.53125
35/64	.546875
9/16	.5625
37/64	.578125
19/32	.59375
39/64	.609375
5/8	.625
41/64	.640625
21/32	.65625
43/64	.671875
11/16	.6875
45/64	.703125
23/32	.71875
47/64	.734375
3/4	.75
49/64	.765625
25/32	.78125
51/64	.796875
13/16	.8125
53/64	.828125
27/32	.84375
55/64	.859375
7/8	.875
57/64	.890625
29/32	.90625
59/64	.921875
15/16	.9375
61/64	.953125
31/32	.96875
63/64	.984375
1	1.

STANDARD GAUGE WIRE CHART

(American Steel and Wire Gauge)

Actual Size of Wire	Gauge	Diameter	Pounds per foot
	000	.3625	.3505
	00	.3310	.2922
	0	.3065	.2506
	1	.2830	.2136
	2	.2625	.1838
	3	.2437	.1584
	4	.2253	.1354
	5	.2070	.1143
	6	.1920	.09832
	7	.1770	.08356
	8	.1620	.07000
	9	.1483	.05866
	10	.1350	.04861
	11	.1205	.03873
	12	.1055	.02969
	13	.0915	.02233
	14	.0800	.01707
	15	.0720	.01383
	16	.0625	.01042
	17	.0540	.007778
	18	.0475	.006018

The Wire Gauge Chart shown above is used as a standard by practically all the steel manufacturers in the United States, on recommendation of the Bureau of Standards at Washington, D. C. Gauges such as Browne & Sharpe and screw gauges do not apply.

Meteor Repairs: ....Roman Paryz*

Excerpted from the Clarence Silent Flyer, newsletter of the Clarence Sailplane Society/Roman Paryz Editor.

*59 Steinfeldt Road, Lancaster, NY 14086-2313

The Meteor repairs: Why should I be talking about Meteor repairs since I don't have one of these airplanes. Well, I do now thanks to John Grigg. The story is a familiar one. John was launching his Meteor at the Brockport contest when the wings failed in much the same way as the Sagitta-900. He asked if anybody wanted the pieces and I gladly accepted. If you may have forgotten, I acquired the S-900 from John about four years ago in exactly the same scenario. This is the airplane where I tryed some new repair methods......some worked and some didn't.

FUSELAGE: The fuselage is constructed from fiberglass. The crash broke the fuse in two places, just aft of the wing trailing edge to fuse fillet and forward of the wing in the radio compartment. Since I have never had to repair a fiberglass fuse before all that I tryed was new (to me at least). I decided to repair the aft break first. This was easier said than done since the diameter of the fuse in this section is approximately one inch. I now know what it must be to build a ship in a bottle. Initially repairs were only going to be done externally with some kevlar and epoxy but this seemed like it would only hide the real damage. What was needed was some type of insert to join the forward and aft fuse sections together. This insert was made from 1/64 ply soaked in ammonia and formed into a conical shape. To get the same (similar) taper as the fuselage, the ply was wrapped around the aft fuse section to let dry and take shape overnight. Although this didn't produce an exact fit for the interior dimensions of the fuse, it was close enough. After the ply was dry, it was test fit into the fuse parts. The fit was good in the aft section but the forward section was less than desirable. The fuse in the forward section blossoms out rather rapidly for the wing carry through so in order to have a good fit, the insert had to be a complex shape rather than just a simple cone. It turned out that the easiest fix was to cut 1/4 inch lengthwise slices out of both sides of the insert to get the required fit. Now that the insert fit a method was needed to hold it in place as the epoxy cured. Macro-balloons and reverse vaccuum bag techniques fit the bill nicely. That was not a typo, macro-balloons were used not micro-balloons. A macro-balloon is nothing more than a rubber balloon. Reverse vaccuum equates to pressure. A small balloon was attached to some plastic tubing with electrical tape. Epoxy was applied to the forward fuse and the insert and the two joined. To hold them in place, the balloon was positioned in the insert and inflated. The end of the plastic tube was clamped off to keep the balloon inflated overnight to let the epoxy cure. When the forward half was dry, the aft fuse was joined to the forward fuse using the same technique. To insure that the two halves were in proper alignment, the fuse was placed in a straight channel to let cure. Any kind of channel (positioning device) can be used just as long as it's straight. The spar notch of some old foam wing cores was the channel that was used for the above. The result was a good strong joint.

To make the repair area even stronger, Kevlar and epoxy was used externally over the joint. This turned out to be a mistake, that is using the Kevlar. Kevlar is a very strong material and therein lies the problem. When the epoxy was cured, it was attempted to sand the Kevlar to a nice smooth exterior finish. The more that was sanded, the more the edges of the Kevlar frayed and produced a fuzzy fuse. The sandpaper would just not cut the Kevlar flush with the surface no matter what was tryed. To end this frustration, the Kevlar was sanded completely off, right down to the original fuselage. Heavy weight fiberglass and epoxy was then substituted. Not quite as strong as the Kevlar but at least it sands to a nice finish. If you must use Kevlar, use it for interior repairs only where the surface quality of the finished product isn't that critical. For exterior repairs, make sure that the Kevlar will cure in it's final form requiring no sanding. Once the edges start fraying, it's next to impossible to get rid of them.

The forward fuse was much easier to repair since there was an abundance of room to work with. For this repair, Kevlar was layed up on the inside of the fuse over the break while the fuse was held in place in the aforementioned channel. To reinforce this joint, light weight glass cloth and epoxy was applied to the exterior of the fuse. After this repair, the fuse was finished structurally. All that had to be done was install the radio gear, releasable towhook and rudder.

WINGS: The wings are of standard built up construction and required no special rebuilding techniques. The right hand wing panel survived the crash without a scratch so no repairs were required here. The left, on the other hand, needed repairs on major structural components, namely the main spar in the root section. The rest of the left wing panel was in good shape from the inboard edge of the spoiler to the tip.

As much of the original construction as possible was attempted to be salvaged. This was easier said than done. The main spar was costructed from spruce cap strips supported by full depth / full width balsa shear webs. This assembly was then sided by full depth ply faces. One of these ply faces ended at the first spoiler bay which made it easy to replace. The other side continued on a couple of bays into the undamaged portion of the wing. To preserve all that could, the balsa shear web in the remaining root structure was removed by any means possible i.e. X-acto knife, gouge, Dremel tool, sharp rock, etc. This took some time to do. When it was done, however, enough room was available to put in the necesary doublers and reinforcements. After this, the rest of the root section was rebuilt in normal fashion. To make sure the wing joiner assembly wouldn't fail in the same way as it did, the spar in this area was wrapped with carbon fiber before the wing sheeting was installed.

In order to be safe rather than sorry, it was decided to tear into the undamaged wing and wrap its spar with carbon fiber also. The extra hour of work this involved can be considered cheap insurance. Only time and several launches will tell.

When all repairs were finished, all that had to be done was install the radio gear and balance (trim) the model to the proper center of gravity. The wings were supported at the proper balance point and then an ounce of lead at a time was added to the nose until the equilibrium was achieved. Well, needless to say, the plane finally balanced after adding ** gulp ** 14 ounces to the nose. Oh well, it won't be light weight but it should be stronger. The current wing loading of the reborn Meteor is approximately 11.5 ounces / square foot. The lead trim ballast was installed in a neat way. I always use lead shot mixed with epoxy to create a slurry. This mixture is then poured into the nose area to let cure. This does present a problem if you desire to remove some nose weight since epoxy has a rare tendency to adhere to wood and or fiberglass. For the Meteor, a plastic sandwich bag was put into the nose before pouring in the lead. When the epoxy was fully cured, a chunk of lead with the exact contour of the nose can be removed and adjusted to fine tune the c.g. location to the desired position.

With all these repairs done, the grand finale is the first test flight after the repairs. I won't say that I got a 30 minute flight in 3 minute air because I didn't. I can say, however, that this is the airplane that will make me forget about the XC rather quickly. Thanks John, you were right about this airplane. Enough said......I hope that some of the ideas presented here can help some of you out if you ever get in a similar rebuilding situation.

FOR SALE

Multiplex Flamingo, Almost ready to cover; Set up for five channels. $150. plus shipping, or $250. plus shipping with four JR Micro Servos installed in wings, Call or write George Voss, 1403 Lincolnshire Rd. Oaklahoma City, Oklahoma 73159; Tel. (405) 692-1200 after 5 pm.

Cover

Full scale French Fauvel AV-22SA No. 3; This 16.5 meter flying wing is owned by Ian Dunkley of the Vintage Glider Club and was photographed at their 1986 Lasham England Meet. Ship is a 2-seater!