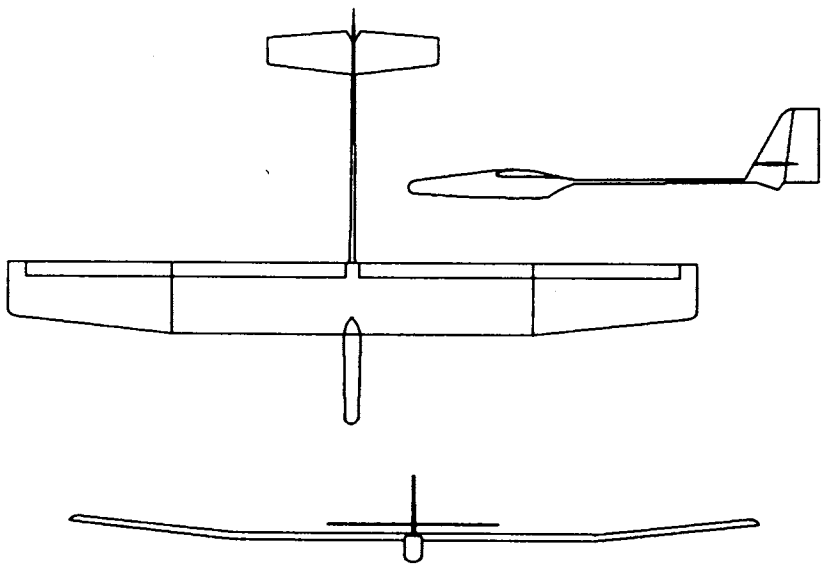
R/C Soaring DIGEST

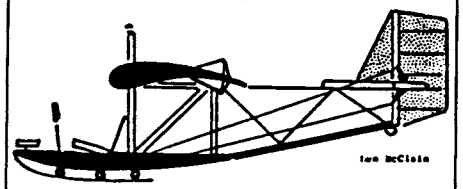
Vol 6. No. 2 February 1989

MARIAH — A TWO METER BIRD THAT FLIES LIKE THE WIND



Span	78.5 inches
Area	590 sq. in.
Airfoil	S4061
Weight	34 to 37 oz.
Length	45.6 inches
Controls	Rud., Elev., Ail., Flaps
Wing Loading	8.75 oz./sq. ft.

Featured on pages 12-14



Ian McClain

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.

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Bulk Rate
Postage Paid
Permit # 17
Payson, AZ 85547

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High Start

If the response to the RCSD Challenge in December's issue is any indication, an entry-level or "sportsman" class F3B program would be well received by the R/C soaring community. In particular, great interest has been shown in a total SYSTEM of sailplane design, tasks and rules...rather than merely a sailplane design per se. Apparently, a unified and coherent program is desired to acquaint today's soaring pilots with the fun and challenge of distance-speed-duration tasks, and to promote a program whereby a substantial percentage of these pilots will participate without feeling inadequate or overwhelmed. Frankly, I'm encouraged by the letters I've received which incorporate suggestions and ideas toward this goal.

Originally, my concept was a one-design sailplane that could be flown by average pilots and entered in various types of competition where the outcome would be based on individual skills rather than out-and-out sailplane performance. The Schweizer 1-26 one-design class is an excellent example of the success such a concept can achieve. The mail I've received seems to be divided into two main groups: persons who propose to use existing sailplanes such as the Airtronics **Adante**, Dodgson **Camano**, and Santa Monica Sailplanes **Flair F3B**, as examples of "off-the-shelf" designs now available for the purpose. Another group seems to favor an original designed-for-the-purpose sailplane that would meet the following "Challenge" criteria: modern materials and construction techniques, reasonable price, availability of kits and plans (for the scratch builder), ease of flying, and good performance. In fact, the second group has asked RCSD to provide a set of specifications to be used as a guideline for the development of such a machine.

Frankly, there's nothing wrong with either approach as far as the sailplane itself goes. If someone wants to enter an already-available kit into the judging, that's fine — and we'll take a look at it as well.

GUIDELINES FOR CONSIDERATION

1. **A one-design sailplane "Challenger"**
2. **A set of rules for "Sportsman Class F3B"**
3. **A set of tasks commensurate with the goal**

THE ONE-DESIGN SAILPLANE DESCRIBED

Should be capable of near-F3B level performance in the hands of a good pilot, yet easy to fly. Sale price of a kit should not exceed $150. Plans and a list of materials for the "scratch" builder should not exceed $15. In the kit, as much pre-fabrication as possible; balsa-skinned, foam-core wings and fiberglass fuselage to be considered. Include means of increasing/decreasing lift plus control of roll, pitch and yaw axis. Contemplates use of modern materials where possible, such as carbon fiber, aramid fiber, fiberglass and adhesives.

1. **Wingspan: 120" maximum**
2. **Wing loading (ballasted): 12 oz./sq.ft. max; wing loading (no ballast): 9.5 oz./sq.ft.**
3. **Unballasted weight, ready to fly with radio: 48 oz. minimum; Ballasted weight, ready to fly with radio: 70 oz. maximum.**
4. **Control functions: Aileron, Elevator, Flaps, Rudder**

A sailplane that would meet the specifications might look something like the following:

Span: 100"; Weight: 48 oz. (ready to fly with radio); Wing area: 800 sq.in.; Wing loading (unballasted): 9.35 oz./sq.ft.; (ballasted): 12.5 oz./sq.ft.; Aspect ratio: 12.5; Root chord: 10"; Mean chord: 8"; Tip chord: 6". Controls: elevator, aileron, flaps, rudder. (Rudder-aileron coupling, flap elevator-coupling, and flap-aileron coupling permissible by external or internal means...but not required.) Airfoil: Selig

High Start ...continued

4062; Other: nose cone removable (sliding fit); Flaps: reflexable 10°; Ballast loadable into tubular spars: 21 oz.; Maximum all-up flying weight with ballast: 69 oz.

The described sailplane ought to be able to be built at a ready-to-fly weight of between 48 and 56 ounces, depending on materials selected, with a target weight of about 52 ounces, which would allow an additional 17 ounces of ballast to be added without exceeding the allowable wing loading of 12.5 oz. per sq. ft. The climb on launch would be good (flaps allowed) and penetration without ballast (but reflexed flaps) would be excellent for light air conditions. With full ballast and reflexed flaps, the performance would be formidable. Slope, thermal, speed, distance, and duration tasks would be within the capability of this sailplane. It could be flown competitively in the proposed "Sportsman F3B" or as a fun-fly and "Weekend Flier". With ballast, it is expected that a good pilot could achieve a speed run of 20 seconds over the full F3B course. A twelve to fifteen lap distance should be possible, and a duration to meet requirements easily obtained.

TASKS AND RULES TO MEET THE RCSD CHALLENGE: To be determined

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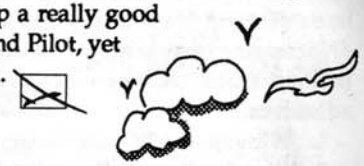
One possibility would be to use rules and tasks similar to those developed by the San Fernando Valley Silent Flyers for their 1980 and 1981 **Two Meter World Cup R/C Soaring Championship**. This was, indeed, a relaxing and fun-type contest with quasi-F3B rules and tasks. There was not a "working time" as such, but there was a man-on-man system of launching in flight groups of five, with five winches, allowing 25 sailplanes to be launched within a reasonable time...five simultaneously on the five winches. Perhaps this contest could form a model for the proposed new contest.

I am not convinced that the "working time" rule is a good one, yet if we are going to fly FAI tasks, then I suppose one must get used to the idea. If our entry-level pilot doesn't learn to use the system, then he or she will be at a disadvantage going into full-blown F3B competition. I think rules and tasks ought to be settled by consensus when we have them to look at.

Our aim in proposing the F3B Challenge is to encourage intermediate-level pilots to feel comfortable about entering F3B type competition, and to offer them a sailplane that is capable of augmenting their skills while having sufficient performance to be really competitive. It is also the aim of our proposal to develop a really good sailplane that will be fun to fly for the average Weekend Pilot, yet offer those with a competitive instinct the tool to excel.

Happy Soaring,
Jim Gray



Pilot Error

It was stated erroneously that Mal Pring (Australia) was the first LSF Level V outside the U.S. While he did, indeed, achieve Level V, the honor of being the FIRST Level V outside the U.S. goes to a Canadian: John MacMillan, from Toronto, Ontario—a Canadian resident in California. He received his Level V in 1986. Another Canadian, Joe Bedford, received his in 1987. RCSD apologizes for not checking these facts more thoroughly. Instead, we took the easy way out and reported something that appeared elsewhere, assuming it to be correct. Our good friends to the North have reason to be a bit miffed. Sorry, gang; and thanks to Ernie Currington of the Montreal club who set things straight.

On the Wing

...by B^2

There are three general types of tailless sailplane: 1) the "plank", usually with leading and trailing edges parallel, or nearly so, and including a central vertical fin, 2) the swept wing, with either a single fin centrally located on a boom or one fin at the end of each wing, and 3) the true "flying wing" which is a swept wing but has no vertical surface at all.

We've been flying planks for several years, and most people are shocked to find that there is no twist in the wings to provide stability. The airfoils used on planks are self stabilizing and accomplish this through a reflexed trailing edge. Simply put, the CG is located more forward than on a conventional design, and the upturned trailing edge applies the down force normally exerted by the horizontal stabilizer. The flying plank, then, is nothing more than a conventional sailplane with the stabilizer built into the wing itself rather than hanging on a boom. Dave Jones' "Raven" design (Western Plan Service, 5621 Michelle Drive, Torrance, CA 90503), which we've been flying, will actually be DEstabilized if twist is incorporated into the wing.

Swept wings and flying wings, however, use twist to achieve stability. Sometimes this is accomplished with an actual physical twist being built into the structure. Other times, if the airfoils are chosen carefully, the twist can be accomplished aerodynamically, and the wing built with no geometric twist at all.

The amount of twist required is based on four things: 1) the moment coefficients of the root and tip airfoils, 2) the zero lift angles of the two sections, 3) the degree of sweep, and 4) the amount of stability desired. The obvious question is "If I know these four things, can I calculate the geometrical twist required for my design?" As a matter of fact, yes, you can. You can even do something a little different, too. If you know how much geometrical twist you want to use, you can calculate how much sweep your design will need! How about that!

The formulae for these routines were found in two different places: in an article entitled "Pfeilung - ja - aber wie gross" by the late Werner Thies and published in Flug + Modelltechnik (FMT) in the February, 1984, issue, and in the book Nurflugelmodelle authored by Martin Lichte and published by Verlag fur Technik und Handwerk GMBH, F.R. Gemany. The equations are different in appearance but are mathematically equivalent. The routines printed here are derived from the FMT article and assume swept wings with no taper and either foam core wings or stack sanded ribs for construction.

There are a few generalizations that may help you better understand the routines. First, an undercambered root will need more wing twist than a semisymmetrical root when using the same tip section. Second, the higher the sweep ratio the less twist is required. Third, more twist equates with greater stability because the CG must be moved forward to trim. Fourth, the twist itself can come from either geometric twist (physical warping) or aerodynamic twist (difference in zero lift angles of the sections).

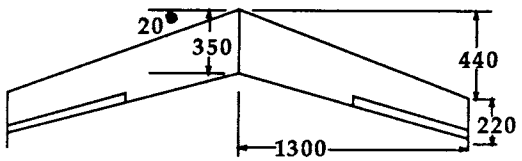
Two terms need further explanation. The sweep ratio (SWEEPRAT) is defined as the number of chord lengths from the leading edge of the root to the leading edge of the wing tip (see diagram). The stability factor (STABFAC) is a number usually in the range of 0.02 to 0.04, the larger number correlating to greater stability; you'd probably want 0.04 for a stable floater or trainer, and 0.02 for a highly aerobatic sloper or very sensitive F3B ship.

These routines can be added to very easily with a little knowledge of BASIC. Placing the airfoil data in random access text files on disk or in DATA statements is a good start, and sailplane design programs using high resolution graphics are also a possibility.

Don't be afraid to experiment! Using the same airfoils and sweep ratio, manipulate the stability factor and watch the required geometric twist change. When the result is positive the tip is set to a lower angle of attack than the root. You would usually not want to see a negative number here if using sweep back. Or use a different root section and see how much more or less sweep is required to remain at a particular level of stability. A positive number here means sweepback. Try to keep the sweep ratio not too much bigger than two, otherwise severe tip stalling may result from cross span flow. Watch for "DIVISION BY ZERO ERROR" messages.

Just to get you started, we figured the twist required for Curt Weller's Elfe 2 (see the diagram again). This 'wing has a sweep ratio of 1.54 based on the mean (average) chord length, with an Eppler 180 at the root and Eppler 184 at the tip. The computer tells us that for a stability factor of 0.02 the wing twist should be at about zero degrees; with a stability factor of 0.03 the twist should be about 1.2 degrees. The Elfe 2 uses one degree of twist to compensate for wing taper and inhibit the tips from stalling before the root. As Curt is a former F3B champion in Austria and has used the Elfe 2 in competition, you now have a little better idea as to the meaning and use of the stability factor.

To find sweep ratio:
Mean chord = (350 + 220)/2
= 285
SWEEPRAT = 440/285 = 1.54



We hope you find these routines useful when designing your own tailless creations. And if you don't have a computer, a calculator works just fine, too.

Bill & Bunny Kuhlman
P.O. Box 975
Olalla, WA 98359
-0975

Section	Moment Coefficient	Zero Lift Angle
Eppler 174	-0.083	-3.6
Eppler 176	-0.06	-2.79
Eppler 178	-0.038	-1.97
Eppler 180	-0.016	-1.12
Eppler 182	0.007	0.3
Eppler 184	0.03	0.52
Eppler 186	0.05	1.14

Zero Lift Angles	= ZROOT, ZTIP
Moment Coefficients	= MROOT, MTIP
Stability Factor, usually 0.02< > 0.04	= STABFAC
Sweep Ratio	=SWEEPRAT
Aerodynamic Twist	= AEROTWIST
Geometric Twist	= GEOTWIST
Total Twist	=TWIST

```
10000 REM ** TWIST ROUTINE **
10010 CM = (MROOT + MTIP) / 2 : REM * AVERAGE MOMENT COEFFICIENT
10020 TWIST = (190 * (STABFAC - CM)) / SWEEPRAT: REM * TOTAL TWIST
10030 AEROTWIST = ZTIP - ZROOT : REM * AERODYNAMIC TWIST
10040 GEOTWIST = TWIST - AEROTWIST : REM * GEOMETRIC TWIST REQ'D
10050 REM ** BUILD WITH GEOTWIST **
```

```
20000 REM ** SWEEP ROUTINE **
20010 CM = (MROOT + MTIP) / 2 : REM * AVERAGE MOMENT COEFFICIENT
20020 AEROTWIST = ZTIP - ZROOT : REM * AERODYNAMIC TWIST
20030 TWIST = GEOTWIST + AEROTWIST : REM * TOTAL TWIST
20040 SWEEPRAT = (190 * (STABFAC - CM)) / TWIST : REM * SWEEP RATIO
20050 REM ** BUILD WITH SWEEPRAT **
```

Gapless Hinges...by Bill & Bunny Kuhlman

...Enclosed is some material on silicone hinges. We had requested the information after seeing a captioned photo in the 1986 MARCS Symposium Proceedings, and he was kind enough to do the write up. The plan at the time was to get a 'slick' to publish the article, but as far as we know this has not occurred, even though we had offered some very positive feedback regarding its publication. This is the sort of thing we'd like to see in RCSD. By the way, we used this hinge method on David's WINDSONG and can vouch for its effectiveness. We even used it for the flap hinges which have a range of -6 to +85°.

Enclosed you'll find the mockup of the gapless hinge (I did, and I'm impressed! JHG). We wish we could take the credit for this ingenious device, but sorry to say we can't. When we first joined TWITT (The Wing Is The Thing - JHG) we purchased all of the back newsletter issues. At one of the TWITT meetings Harold Blettner brought a model of his hinge system and explained its use in full-size aircraft. The information in the newsletter was sufficient to build our mockup.

Our mockup uses 2-oz. fiberglass cloth and epoxy resin. Builders of full-size wings may want to use 6-oz. cloth. Certainly, they will want to sand down the 1/64" plywood to a sharp trailing edge. Not much flexibility is needed, and stiffer material would prevent the surface from bulging.

We wrote to Mr. Blettner several months ago, and he gave us permission to use his 'variable camber system' and to publish it in the model press; his only stipulation being that proper credit be given him.

If our mockup is of interest to you/RCSD, we'll write an article with drawings. Please keep the mockup, as it's served its purpose for us!

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Here, it's time to say that the promised article will be on its way soon, we hope, as the mockup is most impressive. Meanwhile, RCSD is publishing the MARCS Symposium article by **Kevin Collins, 2509 Fallbrook Drive, N.E., Cedar Rapids, IA 52403.** RCSD also wished to comment that Harley Michaelis at one time described a similar "gapless" hinge system. Then, way back in the late 50's and early 60's, Len Niemi, designer of the famous SISU full-size sailplane used a gapless hinge system for the flaps, whereby one piece of metal actually deformed in bending, sliding past another piece of metal, to allow flap deflection. This was described in an early SAILPLANE article about the SISU. Incidentally, SISU hangs in the National Air and Space Museum. JHG

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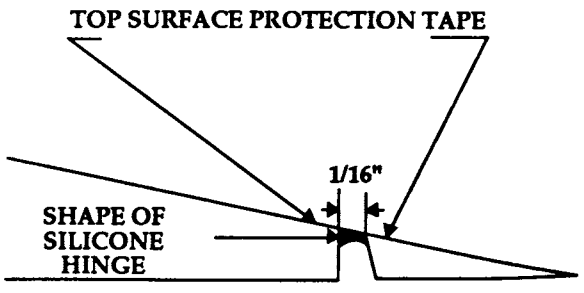
After first seeing this type of hinge at MARCS Sailplane Symposium, a friend and I decided to give it a try. The following steps were derived from doing test samples with various types of silicone and applications. Please experiment as we did, maybe you'll find another easier and/or better method of producing this hinge. I think that once you "see" what this hinge has to offer, you'll like it. I use silicone to hinge my spoilers and ailerons, and find them to be strong enough to survive towline crashes! Should the silicone come loose in a small area, CA will do a nice job of repair.

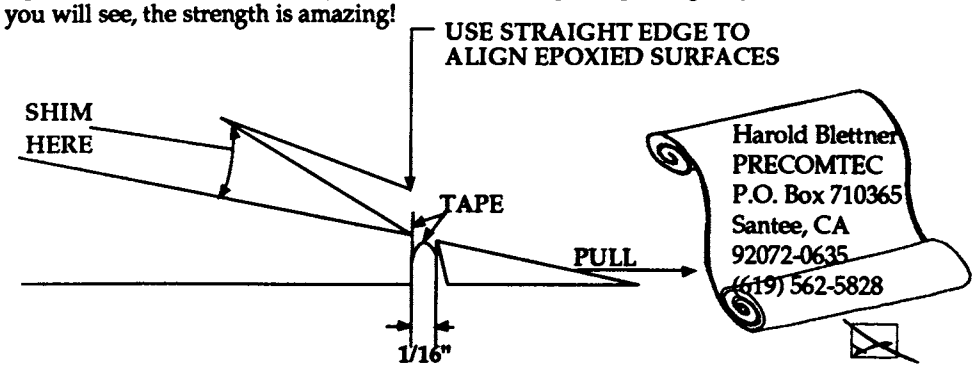


1. Prepare aileron as you would for a Monocote hinge, except: leave a 1/16" gap between the T.E. of the wing and the L.E. of the aileron when the aileron is aligned with the T.E. of the wing.

Silicone Live Hinge

...by Harold Blettner

2. The silicone that I use is regular old tub and tile sealer purchased at K-Mart. The properties of this silicone allows it to adhere well to smooth surfaces. Since epoxy cures to a smooth glass-like surface, I put a very thin film of 5 min. epoxy on the surfaces of wing and aileron inside the 1/16" gap.
3. After the epoxy is cured out, clean epoxied surfaces with alcohol to remove any epoxy residue, dust, or oil from your hands.
4. This next step requires that you find a low tack tape. One that can be removed without leaving the glue behind. I use a 1/2" wide paper tape used to repair paper insulated pulp telephone cable. This product can be found at any major telecommunication supply outlet. Rip off a piece of tape generous in length, for easy handling. Stick it to the epoxied surface of the aileron longitudinally, leaving 1/4" of it protruding above the top surface of the aileron. Cut excess tape even with aileron ends. Next, fold the aileron over onto the wing, top surface to top surface. Shim up aileron to provide a gapless contact between the T.E. of the wing and the L.E. of the aileron on their top surfaces. Adhere remaining 1/4" of tape to epoxied T.E. of the wing. Now, carefully fold aileron back over top side up. Slowly ease aileron backward until aligned with T.E. of wing. Check airfoil shape to make sure that the top surface of the wing follows the contour of the airfoil over the hinge area. Tape aileron in place or otherwise hold it securely until the silicone is cured.
5. Next, check the tape in the hinge area to make sure that it is shaped correctly. If needed, carefully pull tape away from surface with a #11 blade. After shaping hinge tape, place 2 more strips of tape along top of the hinge area. There should be only a 1/16" gap between the pieces of tape. These tape pieces should extend well past the aileron opening onto the wing to help hold the aileron in place while applying silicone.
6. You are now ready for the silicone, so grasp the tube and squeeze. Make sure the tube is touching protective tape on top surfaces, forcing silicone into the gap, leaving as little as possible above hinge line. Using an artist's paint spatula or equivalent, squeegee off excess silicone. This also forces the silicone deeper into the gap. When you squeegee, do so in long strokes over the entire length of the hinge to leave a smooth continuous surface. After the hinge is as smooth as you can get it, carefully remove protective top surface tape along the hinge area.
7. Silicone, like the brand I use, is fully cured overnight. Last thing to do is remove hinge tape from the bottom of the hinge. Proceed carefully! pulling it off gently! Give it a test. As you will see, the strength is amazing!



This information was gleaned from the newsletter of the New Zealand Soaring Society and edited by Colin Stace. However, Colin says it came from the Tidewater Model Soaring Society in the USA. Their newsletter was originally edited by Herk Stokely, but may now be edited by Gene Dees. In any case, the article appears to have been published by the TMSS newsletter and was written by Colin Brichter who says that his friend (a German mathematician, who can be "bribed with beer") translated the information from a German book MTB 1&2 airfoil data book, with text in German. Dr. Reiner Rebstock is the gentleman who provided the English translation. So RCSD wishes to thank all and sundry for their efforts to bring you this information. It is also living proof that this kind of information belongs to everyone and that soaring and sailplanes are truly international in every sense of the word...and that good information will "out" no matter how faint and far away.

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PROFILES FOR R/C SOARING: All Eppler airfoils have been designed primarily for sailplane models although that doesn't mean that they can't be used for other purposes. Profiles E178, E180, E205, E211, E224, E374, E387, and E392 are applicable for somewhat faster models, e.g. in slope soaring. With regard to thermalling, the profiles E64, E174, E210, E214, E216, and E385 are appropriate. For larger models with wingspans of at least 4 meters (which result in somewhat thicker wings), three profile 'Straks' (families of profiles) have been calculated. The first consists of E197 at the root, followed by E195 for the inboard quarter and E193 for the largest part of the wing. The second concept uses E203 at the root, followed by E201 and E193. This design favors profiles with a little more camber and therefore larger moment coefficients. Consequently, slightly larger horizontal tails should be provided. The latest family consists of E66 at the wing tip followed by E62 and E68 for the inner part of a double trapezium wing. In all three cases, airfoil chord at the root should not be too small and should typically exceed 250mm. At the tip, the chord can be reduced to about 150mm, depending on wing loading.

PROFILE CHARACTERISTICS: The E193 profile is very well suited to all-round application. The critical Reynolds Number is 100,000 for this approximately 10% thick airfoil. Originally designed for larger models with wingspans of more than 3 meters, it also proved useful for the F3B class, until it became possible to build wings sufficiently solid and still with thinner profiles. A combination of the profiles E197 and E195 (or E203 and E201 for even larger models) at the root, with the E193 for the outboard part, permits construction of competitive wings for sailplanes with wingspans of about 4 meters. The necessary Reynolds Number is obtained, provided the airfoil chord is not less than 150mm at the tip and 300mm at the root.

For R/C sailplane models, the E205 was devised. Initially, it was well suited to models of the F3B class, but now profiles with cambered flaps have become the norm, and these, due to decreased thickness, may create less drag. However, this easy-to-build airfoil with its straight lower surface can be used for general purposes or for the on-and-off F3B flyer. It's useful for slope soaring as it has low drag at high flight speeds.

The E207 and E209, with their somewhat increased thickness, can be considered a continuation of the E205, although they're slightly less suitable for the higher speed regime. All three profiles are suitable for larger models. The E209 or the E207 would normally be used for the root profile, with the E205 for the outboard part. Since the zero-lift lines of all three profiles are about the same, no wing twist is necessary.

The E211 and E212 are designed for Reynolds Numbers of 100,000 or more, and they can therefore also be used as outboard profiles for smaller wings (about 150mm chord). The 10.6% thick E212 has a higher camber that results in a higher maximum lift coefficient. Both airfoils generate a relatively large pitching moment and therefore require larger horizontal tails. Both profiles are good for all-round purposes; the E211 is particularly suitable for high speeds, whereas the E212 is more suited to thermalling.

The E214 has been developed by Professor Eppler as a profile to be used with camber changing flaps. The flap depth should be 25% of the chord. Only an upward deflection for high speed flights was initially intended, but experience has shown that positive deflections can also produce good results. The critical Reynolds Number is about 100,000 due to the relatively high thickness of 11%. The wing chord should be at least 180mm if the calculated performance is to be obtained. The flap deflection should be -5 degrees upward and no more than 10 degrees downward. Its high maximum lift coefficient makes this profile well suited to powered sailplanes or larger thermalling gliders.

Since the canard configuration has been resurrected over the last few years in full scale aircraft, the model builders have expressed interest in this exotic design approach. This has led Professor Eppler to devise the profiles E210 and E216. The E216 is designed for the forward wing. It's distinguished by a particularly high lift-maximum coefficient (over 1.5), so it can also be used with certain large thermalling gliders. However, this high lift is paid for by a high pitching moment coefficient of about -21 which requires somewhat larger horizontal tails when used with 'normal' layouts. The 13.6% thick E210 is designed for the main wing (of a canard). Due to its gentle stall characteristics, it also is suitable for powered models.

The two profiles - E220 and E221 - were specially designed for Pylon-race models. Their S-shape type leads to a pitching moment coefficient near zero (as with a symmetrical profile) and therefore, smaller tail forces are required to fly around the turn points. These airfoils aren't designed for low Reynolds Numbers. In practice, a Reynolds Number of at least 500,000 should be reached. To obtain the calculated performance with these profiles, a smooth surface is particularly important.

The profiles E222 to E230 form a new flying wing family that offers better performance with smaller Reynolds Numbers than the older family (E174 to E182). If the complete family is used in a flying-wing configuration, no twist is necessary, as long as the sweep is at least 1.5 times the chord for a rectangular wing. If the profiles beginning with E224 at the root are used, the sweep can be reduced to 1.1 times the chord. The slightly lower Reynolds Number sensitivity of this design has subsequently been confirmed in practice, although these profiles still require a Reynolds Number of at least 150,000. This is especially true of outboards, where the minimum Reynolds Number should not be smaller than this.

The E222 has polars and a zero lift line similar to the profiles E211 and E212, which show very good performance in practice. Its pitching moment coefficient is slightly smaller than theirs, and has a value of .097. On the one hand, this airfoil is suitable for thermalling with its maximum lift coefficient of 1.2; on the other hand, its drag is also less at lower lift coefficients, so it can be used for slope soaring and with motor gliders as well.

Its lower camber and lower moment coefficient allow the E224 to be used more like an all-round profile, but because of its lower maximum lift coefficient, it's possibly more useful in slope soaring. The profile drag of this 10.7% thick airfoil is still very small at zero lift. This tendency is carried over to the E226; this profile is almost symmetrical and therefore well suited to faster models of all kinds, except flying-wing configurations. Due to the small pitching moment coefficient, relatively small horizontal tails are required to stabilize the model.

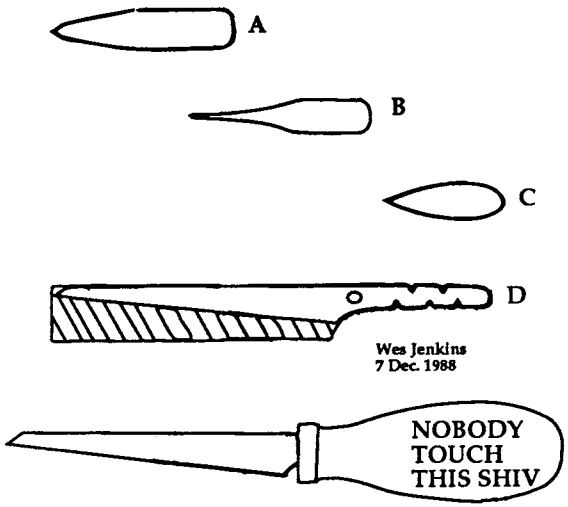
...continued on page 10

Balsa Knife

...by Wes Jenkins

In carving balsa, one wants to be able to remove anything from large chunks at the roughing stage to very thin shavings as finished dimensions are being approached. Ordinary knives are less than ideal for this, as they tend to dig in. Figure A shows a cross-section of a conventional knife. The tapering is straight, and may be single or, as here, double. Given that a straight-taper knife digs in, consider how an old-fashioned straight razor would act (Figure B)!!

But the straight razor is usually made of excellent steel, and some grinding will give a convex cross-section, as shown in figure C. This works just great on balsa. The idea came to me from somewhere, a friend or a magazine, about 1940, and I have been using my knife ever since. I wish I could give proper credit, but memory fails.



Anyway, you can pick up a straight razor at a flea market or, perhaps, a barber shop. Remove and discard the handle and grind a few notches into the tang. Use epoxy to set it into a nice big comfortable file handle. (Mine was set with plastic wood; epoxy did not yet exist in 1940.) When the epoxy has hardened, grind away the blade edge, taking care to keep the work cool. See figure D. Shape the tip to your taste, and grind the entire blade (except near the root, where some concavity cannot be avoided) to a convex shape. Finish the edge on an oilstone, and you will have a first-rate balsa tool. Reserve it for balsa carving only, and stone it after each use. A worthwhile precaution is to have a clear understanding with family and friends that you and you alone will be allowed to use it. I went further with marking on the handle, and that worked out well, even with two sons.

W. H. Jenkins
118 Goff Road
Corning, N.Y.
14830

Eppler Airfoils...continued from page 9

Even more Reynolds Number sensitive is the E230, which can be used for unswept flying wing models. One should try to obtain Reynolds Numbers of 200,000; these, of course, lead to very large chords.

The E374 has shown good results for a long time, particularly in aerobatic sailplanes and it can also be used to advantage in powered models. Its thickness of 10% permits construction of relatively light wings with this profile.

The E385 is very similar to the E174, so it's also well suited to thermalling, and it achieves low sink rates as long as the Reynolds Number is lower than 100,000. However, its performance at high speeds is only mediocre at best. The E387 has been designed for the smaller lift coefficient which occurs in slope soaring. Nevertheless, it's fairly well suited to thermalling; but, of course, it isn't as suitable as the E385. Wind-tunnel tests show that with this profile, too, a Reynolds Number of 100,000 should be provided. Its all-round characteristics (including thermal and slope soaring) make the E387 a very good choice.

The E392 can be used in the same way as the E387. However, it is not as suitable for smaller models with wingspans of less than 3 meters because its thickness of 10.2% requires large wing chords or higher flight speeds. This airfoil has been designed for the same purpose as the E387. However, due to the greater thickness, the performance is slightly worse at low angles of attack.

RCSD Data Base

...by Lee Murray

The RCSD data base now has 655 reference entries. The number of articles per issue continues to increase (see attached plot). This data base is now too large to publish in RCSD, however, the Sources data base is manageable and small enough to be published.

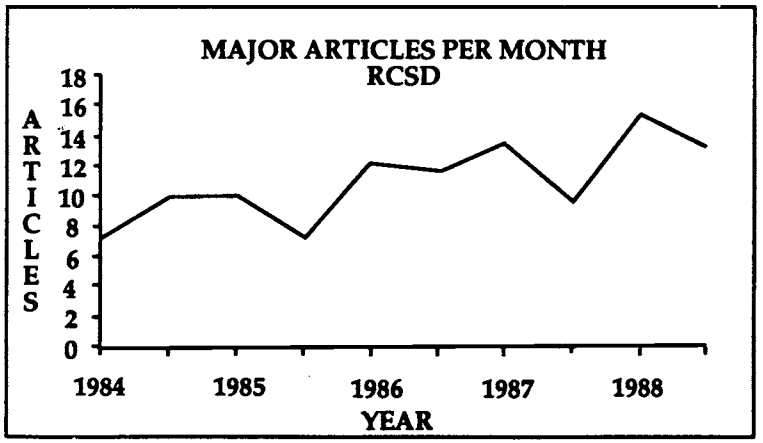
The Articles Data Base contains volume, issue, date, page, name of contributor, key words, and a brief description of the article. It is complete through the December, 1988 issue of RCSD.

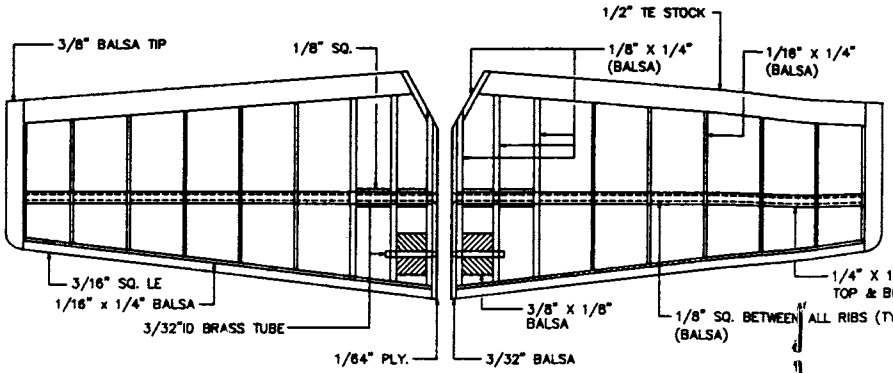
The RCSD articles Articles Data Base is available 24 hours a day from **Bears Cave BBS (414) 727-1605** (from the main menu). **First, go to the (F)ile section and view the directories by requesting (F)ile DirectoryList. The files are then listed for downloading. These are TEXT files which can be used as input for a number of database programs.**

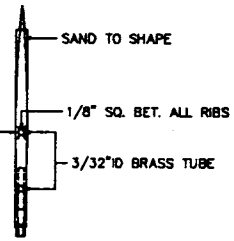
The Reference and Sources Appleworks databases are available on floppy disc for $5.00. Updates available for a minimum charge. Databases TEXT files on disc for IBM compatible computers available for $7.00.

Listings of the databases Reference and Sources for $5.00 sorted by Key Words.

Lee Murray
LJM Associates
1300 Bay Ridge
Road, Appleton,
WI 54915

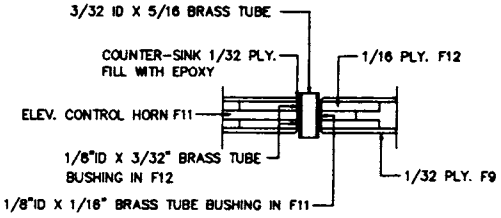






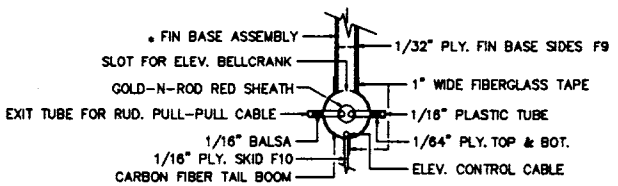
STABILIZER

FULL SCALE



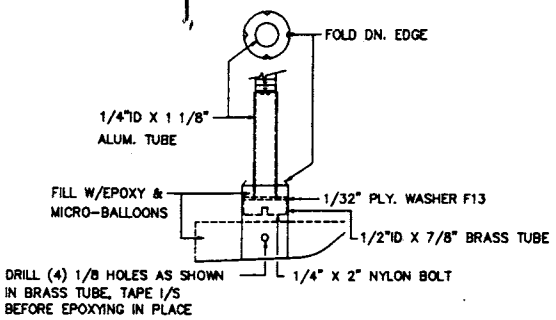
STAB. PIVOT DETAIL

SCALE : 3" = 1"



SECTION A–A

SCALE 2"=1"



WING BOLT DETAIL

SCALE 2" = 1"

FUSELAGE

FULL SCALE

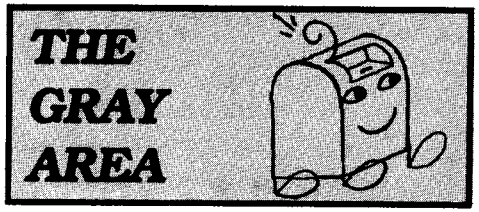
MARIAH	
DESIGNED & DRAWN by : ED BERTON	
SCALE : AS NOTED	DATE : JUNE 1998
SHT. 2 of 2	REV.

Mariah
The Definitive 2-Meter Sailplane?
...by Jim Gray

Ed Berton, Competition Products, 921 Birdie Way, Apollo Beach, FL 33570, has announced a new 2-meter competition sailplane that has just won (November, 1988) the Tangerine competition sponsored by the Orlando Buzzards.

It is available as a complete kit for $149.00. The kit includes a fiberglass fuselage with carbon-fiber boom. The wings are foam cores to be sheeted by the builder (sheet balsa supplied). The kit is very complete and includes a set of rolled plans 44" X 34" and 27 pages of building instructions!

MARIAH has a flat center section with tip dihedral of 3°. Controls feature ailerons and flaps, elevator and rudder. Flying weight with radio is between 34 and 37 oz. Airtronics 401 or Futaba S-33 servos are recommended because of their small size. The airfoil is a Selig 4061 — one of his newer airfoils, suited particularly to this size sailplane.



I receive letters each week from you subscribers, and most would be published here if it weren't for space limitations. Therefore, I publish only a few of the dozens received. The ones I publish are placed in print because they address a specific topic in a slightly different way; because they raise a point that needs clarification; or because they have something to say that will be of interest to all readers.

I'd like to mention right now that these letters really contribute as much to RCSD — and to me — as the articles! Some of them are so full of praise for RCSD that to print them would seem self-serving and too flowery, almost to the point of my embarrassment! Nevertheless, I think I ought to boil down the comments and tell you in general what our readers (YOU) have had to say in response to my questions of QUO VADIS — where we should go, and how we should get there...so here goes.

First, the majority of responses tell me to keep RCSD like it is; that is, NOT to use color graphics or "slick" paper, if it means more cost at the sacrifice of information. Second, you like the coverage of varied subjects with emphasis on thermal duration. Third, you would like to see more pages, and some of you would be willing to pay more for a "fatter" magazine. The changes made so far appear to be well received: clearer print, easier reading, more consistent appearance, etc. Once in awhile you tell me that I don't cover cross-country, F3B, electrics, slope, etc. My only defense to these comments is for you to look at the last 12 issues.

Some would like an "extra" issue each year, covering some special interest subjects, but — barring that — would be willing to have one of the regular issues expanded a bit to cover things like SCALE, for example. APPARENTLY, RCSD CONTINUES TO MOVE IN THE PROPER DIRECTION, so thanks for the input...which "keeps me honest"

Very few letters are critical of RCSD, yet those that are critical usually make a good point, and are appreciated because they call to my attention some things that I'd not see otherwise. The criticism is always positive and constructive, too, for which I thank you especially. I hope to improve the quality of photos and drawings.

NOW TO THIS MONTH'S LETTERS!

Dear Jim,

I like the 12-issue format. If it takes more money to publish a double issue a couple of times a year, say in March just before the season opens and again in October after it is basically wrapped up, then so be it. Your Hi Start column has been missing quite awhile, and I'm glad to see it back in the December issue. It 'sets the tone' if you will, for the rest of the contents. Please continue it.

...The spar and web character is getting a little old, as it doesn't matter what method you use if your glue joints are poor (seeing years of other peoples' wings fail bears this out). I believe that poor workmanship and not poor structure is responsible for 95% of wing failures, though I could be wrong.

Please thank your readers for all their interest in ORBITER. I had a heck of a time keeping up with correspondence. Nearly all sent S.A.S.E.'s so it wasn't as bad as it could of been. Very flattering. Got a letter from Israel, too! Unbelievable.

Well, I have to sign off, so take care and Merry Christmas. (signed) Eric; Eric Jackson, 4916 S.W. 56th, #108, Portland, OR 97221

Response: **Okay, Eric. I'll keep the Hi Start going for awhile. Didn't realize that readers bothered to read it until I got other letters like yours asking for it again. Yeah, we're all done with spar and web construction articles for awhile. I think you're probably right about those glue joints, but will just say that if there's a right way and a wrong way to build 'em, I'd prefer to do it the right way! I, too, have seen wing tips 'shake hands' in mid air, but most of these cases were plain over-stressing the structure, which is bound to fail at its weakest point — usually a joint, or some other type of stress riser. Thanks for your confidence...and I'm waiting for Orbiter's intro by Dodgson Designs. JHG**

♣ ♣ ♣

Dear Jim,

Better late than never. We held the 14th Annual Tangerine Soaring Championships on the three days following Thanksgiving, and had a most successful and enjoyable series of events, although the turnout was smaller than in the past few years due partly to the approach of Hurricane "what's his name". We flew Sport Scale and 2 Meter on Friday, Unlimited 7-minute Precision on Saturday, and Unlimited Triathlon on Sunday. Weather on Friday was superb, Saturday gloomy and raining slightly, and Sunday wet and blowing. Managed to get five rounds on all three days and finished before 3 PM on all three days!

Leonard Postage took First Place in Sport Scale with his beautiful Schweizer 1-26, a la Steve Moskal's plans. Rusty Rood from Pensacola was Second, Dave Elias from Palm Beach was Third, and yours truly brought up the rear with my Air Force detailed 1-26. I got high static score, but had 2 1/2-minute and 1 1/2-minute flights. Later, I found that I had a loose elevator control rod, resulting in so much "down" control needed that I was lucky to get back to the field!

...continued on page 16

THE GRAY AREA

...continued from page 15

Ed Berton picked up First Place in 2-Meter with his great MARIAH — now being kitted! Dave Elias was Second, and our gift from the U.K. - Malcolm Smith - took Third Place. This was in Expert Class. In Sportsman Class, Blaine Miller's son, Nathan, showed the way...followed by Joe Wellman from Jacksonville, and Mel Duval of the Pensacola contingent. Nathan, age 16, is a "full-scaler" and flies a Blanik "Big Bird!"

On Saturday, National Everything Champion Brian Agnew showed the boys how it's done with his beautiful METEOR. The Smith boys (not the cough-drop kids) Jim and Malcolm, took Second and Third in Expert. In Sportsman, Chuck Bull, Secretary of the Orlando Buzzards flew his LEGIONAIRE to win, followed closely by Karl Strayer and Rae Fritz from Pensacola.

Sunday was "Dad's Revenge" day, and when the dust settled, Dr.John Agnew had nosed out his son, Nat's Champ Brian, by 43 points! Jim Smith slipped into 2nd Place behind John by 19 points, and ahead of Brian by 24 points!

The overall Champions — Saturday and Sunday normalized and combined — were Brian Agnew, Fort Myers, FL in Expert, and Chuck Bull, Orlando Buzzards, in Sportsman.

The beautiful trophies, through five places in each class, were constructed and donated at cost by Dave Davidson, Buzzard's Vice-President. Four Sagitta 600 kits were awarded in random drawings, and other merchandise prizes were awarded.

We were honored by the presence and participation of NSS President Pete Carr and son Jeff. I was personally extremely pleased, as Pete donned "grabbers" and scaled a 60-foot Magnolia tree to extricate my almost-new scratch-built ATRIX which Mr. Dumb Thumb (yours truly) had launched a week prior! Thank you, thank you, Pete! I "re-habbed" it with all new covering and one practically new tip, and flew it again this past Sunday (radio ON!) and am thrilled with its performance.

The Tangerine this year was, in my opinion, the best ever — all club members and contestants pitched in where needed, and a special vote of thanks and pat on the back go to the CD's: Stan Pfost and Arthur Sark!

That's about it for now, Jim — am enclosing a few pic's (you may keep them) and thanks again for a wonderful publication! My best to you and yours during the Holidays.

(signed) Bud; E.B. Moore, 3670 Periwinkle Drive, Winter Park, FL 32792

Response: Bud, I wish I could use all those great pix you sent, but we just don't have the room. I did, however, enjoy looking at them myself. Nevertheless, here are a couple to give an idea of the activity.

National Champion Brian Agnew launching his Meteor

Ed Berton - 1st Place
Expert Class - 2 meter

Nathan Miller - 1st Place
Sportsman Class - 2 Meter

♣ ♣ ♣

Dear Jim,

The new Airtronics 'Vision' radio will be out to the public about January 1st. The USA F3B Team is scheduled to get 6 sets within about 2 weeks. Sheldon's Hobbies is taking orders for these radios at $450 each, complete. Vision is the name given to the combined efforts of CSL and Airtronics (Barbara Renaud). It was mentioned in By Blakeslee's column in MA.

Shortly, Gene and Tom (CSL) will be offering an update to the ATRCS system for present owners. Changes involve the way the throttle system is set up, and the entry level involving elevator centering and compensation. The change will allow usage of throttle stick in reverse mode from normal, as well as the normal direction, to permit neutral flap setting with throttle in 'down' position and trim in 'up' position.

In Vision sets and retrofit ATRCS units, centering of elevator will not be affected by compensation mixing. The retrofit will be a replacement of a couple of chips.

I'd like to see RCSD enlarge to the size of Flying Models to allow for x columns of each sailplane discipline: Thermal, Slope, F3B, and Experimental. I also think Electric must be included, with current interest in F3E on the upswing. Also, I am in favor of the monthly format.

Merry Christmas and Happy New Year to you and Peggy. (signed) Ed; Ed Devlin, 839 E. Verdugo Ave., Burbank, CA 91501

Response: Ed, I'm aware that electrics are up and coming, and I foresee them as an important adjunct to soaring in two areas: launching from small fields and restricted spaces, and for powered sailplane flight tasks which mirror those of the full-size ships. This, of course, cuts across Scale, too. In fact, it might even cut across PSS where a soaring jet model might be fitted with an electric-powered ducted fan...lots of room for thought here. Thanks for writing. JHG

♣ ♣ ♣

Dear Jim,

I goofed on the diameter of the Kevlar string: it's .005", NOT .050"! I've also enclosed a small sample for you to try on your next model.

Good Luck & Thermals, (signed) George Voss, 1403 Lincolnshire Rd., Oklahoma City, OK 73159-7709

Response: Well, George, I plan to use some of that tough stuff. It looks like ordinary twisted sewing thread — but, I know that when it's bonded to structure by CA, it will be a LOT different! Thanks, George. JHG

THE GRAY AREA

Wil Byers of the NWSS wrote to tell us a bit about the forthcoming NAT'S which will be held in Richland, Washington — one of the "Tri Cities" of Richland, Pasco and Kennewick — where the Slope Fun Fly was held last May, and will be again this May.

Dear Jim,

I have to fill you in on some of the great things that are happening for the Nationals and for their Scale Fun Fly. First, the Nat's: soaring will encompass Thermal, Scale, F3B, Cross Country, Handlaunch, and the wonderful world of Slope Soaring. This is a very full platter, I realize, but if everyone does their part, it will be a truly exciting time for the soaring enthusiasts. As you probably have guessed, I will CD the slope event which will be a basicly informal fun-fly format. However, we will host a non-competitive slope race (ha, ha) — which shouldn't be too bloody a competition! From my vantage point it is great to see slope soaring in some way integrated into the Nat's. Here's the schedule: Monday - Cross Country and Slope Fun Fly; Tuesday - Handlaunch and Slope Fun Fly; Wednesday - Scale & F3B; Thursday - Unlimited Thermal Duration; Friday - Standard; Saturday - Two Meter and Banquet at the Clover Island Hotel.

Now, for the Fun Fly. We expect it to be even better than last year. We did a mailing to all of the participants from last year and any potentials for this year - including some European mailings. Last year's participants plan to return and many more will be coming. We have had great support from the magazines, from dealers and from the industry in general. Gary Anderson of American Sailplane Designs is coming and will host the Friday-night wine-tasting and social. Viking Models is a contributor as well as Wilshire Models, Vinylwrite, Beemer R.C. West, and - not surprisingly - J.R.'s Tom Kikuchi is saying he will be a major contributor.

(signed) Sincerely, Wil; Wil Byers, 632 Meadows Drive East, Richland, WA 99352

Response: How 'bout that, soaring people? Sound like fun? You bet it does, and I will be at either the May Fun Fly or the Nat's — maybe both! At least that's the plan. Just in case you are wondering about the thermal events for the Nat's, Wil says there is a HUGE field, flat as a pancake and smooth as a pool table, with no obstructions, but with excellent access and close-by facilities. Contributions from all three of the "Tri Cities" have been outstanding in terms of support and $$$. This may be the best Nat's ever, and in a part of the country known for its spectacular scenery and wonderful hospitality. See you there? JHG

♣ ♣ ♣

Dear Jim,

I don't know how you could handle it, but it seems to me that a sailplane plans service would be a 'natural' for RCSD. There are few, if any, plans services for sailplanes only...and in addition to being a welcome service to your readers, it should also bring in some money to RCSD.

Also, have you thought about **sponsoring and sustaining members**? Most small organizations do this for money, and people with money feel proud to be in a sponsoring position...

I'd like to see a column each month on aerodynamics. It would be greatly appreciated by your readers, and I - for one - would love it!

Best Regards, (signed) Raymond Reiffer, 9060 80th Ave., Zeeland, MI 49464

Response: Ray, I like your ideas! The ideas

...continued on page 20

Dear Jim,

...My Sagitta 900 has proven itself to me this year. I flew it in 11 contests, some of which were in two classes: Standard & Unlimited, and I scored 11 wins, three 2nds, and three 3rds! Three times I won both classes on the same day. I never entered a contest this year in which I got lower than 3rd Place...in NY, Ohio, Pennsylvania, Illinois and Indiana.

The 'mods' to my Sagitta 900 are pretty standard: I took off the 'overbalance' on the rudder, making the hinge line straight. Then, I added a 3/4" wide strip to the front of the rudder to increase its area. The stab is a stock thickness and structure, except that I added 3/4" to the trailing edge — done during construction and not as an afterthought. You really can't do it after you've sanded the stab to a sharp trailing edge. The only other 'mod' I made was to cut the length of the spoilers down one bay on the end toward the fuselage. They are still very effective, but do not cause all the erratic responses you get with the full-length ones.

My Sagitta 900 weighs 51 ounces with an 800 mAH battery pack and three S32 servos. I can add one full pound of lead to bring the wing loading way up, and - believe it or not - it thermals just as well, even in calm conditions.

If I had to give any advice, it would be 'learn your ship!' Too many pilots give up too soon on a perfectly good sailplane — always looking for that 'pie in the sky'. Also, don't just balance your ship; experiment with the c.g. until you get the optimum performance out of it. Next, work for a high launch — meaning more time in the air. Don't be afraid to add perfectly balanced ballast, as the Eppler 205 is a good working airfoil at higher wing loadings than you might expect.

Practice does pay off. Do you want to just fly, or do you want to win? Get a stop watch and use it every flight, and WORK for those times you need to win. Don't just land at the end of each flight, but make a landing tape and USE IT EVERY FLIGHT!

Jim, if you can use any part of this, feel free, and God Bless, (signed) Brian Smith, 493 17th St., N.W., Barberton, OH 44203

Response: Readers ought to know that Brian was reluctant to "blow his horn" but I persuaded him to write the above as an assistance to those who are just beginning to enter the contest circuit with Sagitta 900 or similar sailplanes. Brian's success is apparent, and the things he tells us point to the fact that it's not the changes he made to his sailplane that makes the difference: it's the changes he made to his own style of flying that counted most. Read and heed!

Brian has also given us a couple of other hints that make sense: he says: COUNT ON WINNING — DON'T EVER GIVE UP 'TIL YOU SEE THE FAT LADY STEP OUT OF THE BUSHES AND START SINGING. He uses SANYO 800 mAH Cadnica packs which fit the Sagitta 900. These are available from Tower Hobbies at a reasonable price, and Brian swears by them. He enclosed some pix of his winch-retriever system mounted on a small trailer (see below). JHG

For fun, my personal winch & retriever mounted on a small trailer with three large batteries. Winch & retriever are hinged for getting at the adjustment bolts...and the height is just perfect for lawn chair launches!!!

...continued from page 18

of sponsoring and sustaining members are excellent, and I'll see what can be done to implement your suggestion. Also, I had originally given thought to providing a plans service — way back when I first started RCSD — but, as usual, work and time and money got in the way. It is STILL a good idea, and I'd like to have someone "volunteer" to do it for us, with my support, as right now, I wouldn't have the time. However, after I retire, who knows? Might be a neat thing to supplement Social Security. JHG

♣ ♣ ♣

Dear Jim,

I, too suggest the Olympic II as a beginner's plane — but, the UNLIMITED version can be (built) much easier than described. Build a NEW center section 36" long, using the root rib profile from the standard wing. Use the identical joiner structure found in the standard wing root, but put in the maximum dihedral the spars will allow at each end. Fill the space at the joiner tubes with epoxy, and wrap the spars right next to the ribs. Finally, sheet top and bottom of this new center section. The stock fuselage will control this new, longer wing of 136" span, with no trouble. Harder, more powerful launches are possible due to the sheeted center section. You also get much improved performance with the greater span and higher aspect ratio. The important thing is that you don't have to build a new set of wings to make the OLY II into an Unlimited Class sailplane! I don't bother with spoilers because 'power' thermals are too rare where I fly. The contest is against the clock in my flying, and - believe me - my 'Unlimited Class' OLY II with 136" span is a fantastic performer! This way of making your Standard Class machine into an Unlimited Class sailplane is also stronger than it would be if you made just another set of longer wings. Try it!

(signed) Rick; Rick Hallett, 65 Somerset Avenue, Pittsfield, ME 04967

Response: Great idea, Rick. You could probably use 48" balsa sheet and stick stock to make a 148" span "cross-country" OLY II — but in that case, I'll bet you'd have to increase the tail area and the fuselage length, too. Hey, if it works as you've done it, that's fine, too. In fact, I'll bet a lot of guys who read this will go out to the shop to make the changes and improvements. You just may have some competition with this new OLY Class! JHG

Ben Trapnell, who has appeared in RCSD before, has now joined the full-size sailplane and soaring ranks. His new Schreder HP-18 is shown here in all its glory. Ben is from Corpus Christi, Texas.

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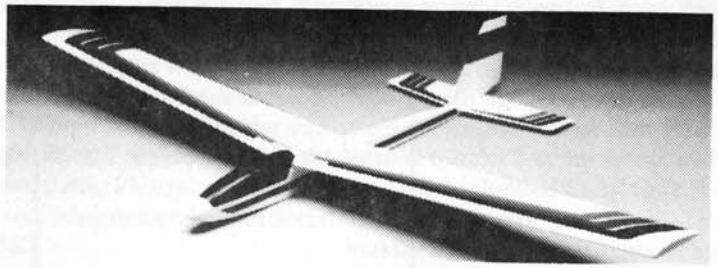

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GLIDER WINGS: Standard or Custom Tailored Foam Cores

Standard Profiles: E-193, E-205, E-374, E-392, S-3021, S-4061
Generic pre-covered wings with OBECHI veneer for standard profiles.
Customized cores available upon request.
Please call 415-462-0672 for quote.

Dress up your fuselage!

Send SASE to:
PRECISION FOAM CORES
850 Concord Street
Pleasanton, California 94566

OBECHI Avail. in Lge. Sheets