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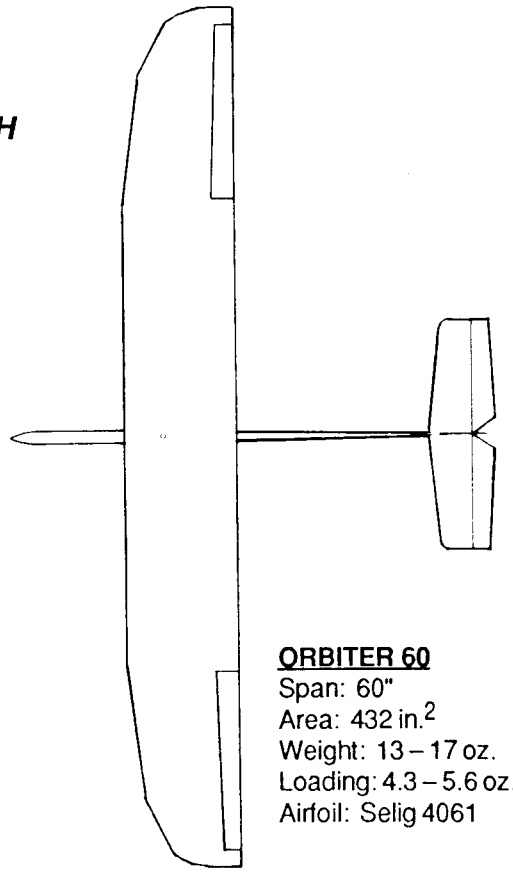
R/C Soaring DIGEST

Vol. 5 No. 11 November 1988

ORBITER 60

ORIGINAL HAND-LAUNCH DESIGN



ORBITER 60
Span: 60"
Area: 432 in.^{2}
Weight: 13 – 17 oz.
Loading: 4.3 – 5.6 oz./sq. ft.
Airfoil: Selig 4061

Eric Jackson ***1988***

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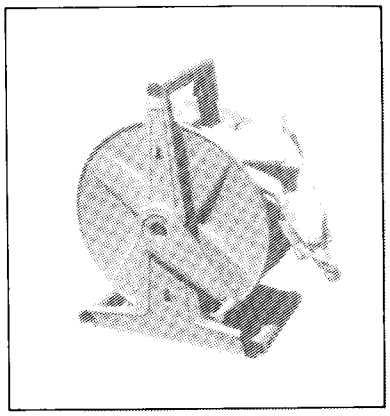

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rotor

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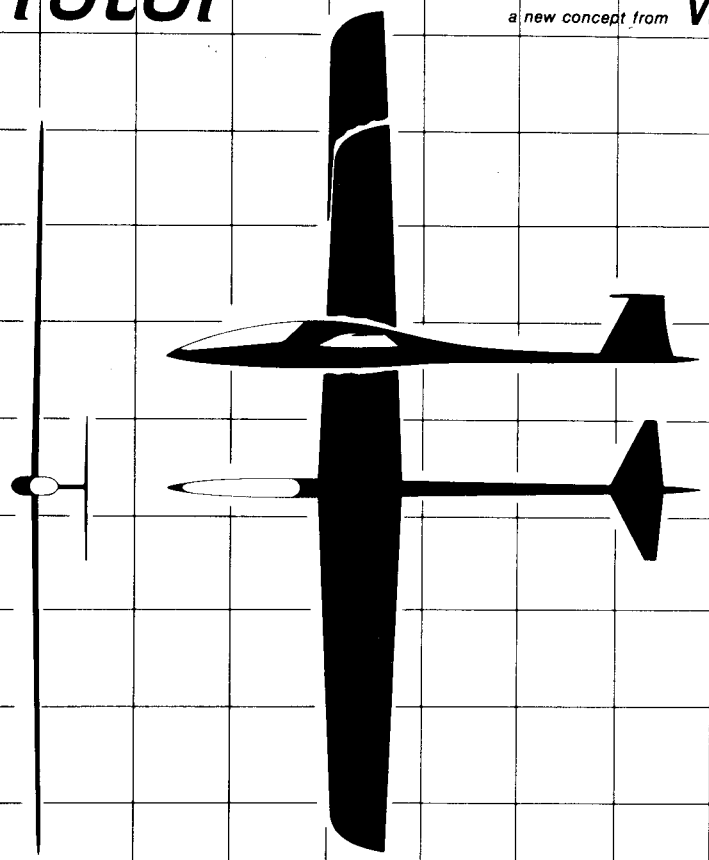

Span = 58 in. (2M-lite lift)

Length = 44 in.

Root/tip Chords 6.5/4.5(7/4.5) in.

Airfoil E 374 7.5(9.5)%

Aspect Ratio = 11(14)

Area = 305(441) sq. in.

Weight = 31(36.5) ozs.

Wing Loading = 15(12) ozs./sq. ft.

Controls - Pitcheron

Channels - 2

Servos - 2 of 50 oz. - in. torque minimum

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ORBITER 60 ..... Eric Jackson*

Editor's Preface: Ever since printing some information about ORBITER in past issues of RCSD, I have alternately threatened, cajoled, wheedled and pleaded with Eric Jackson (alias Dr. J. Bamboo) to provide more detailed information about his magnificent hand-launched sailplane. Finally, he promised me that if he won ALL of the hand-launch contests (10) sponsored by his club (Northwest Soaring Society) this season, he would furnish instructions and building details -- as well as his design philosophy for ORBITER. Today, I received the following letter, so I know two things: Dr. Bamboo is off his gourd, and ORBITER is possibly the winningest hand-launched sailplane ever flown. So, in Dr. Bamboo's inimitable style, here is what I received. Enjoy! (JHG).

The following is a paid for announcement from
Eric's Little Mental Emporium
Huge cash donations welcome.....

* *

Yes friends, it is time once again for some mostly moronic musings meant to make meek minds macerate! For you see, I am not that hot as a designer, and about average as a builder/flyer. And while trodding over the globe in search of soaring truths (and suitable beverage to wash them down), I have seen or heard many different ideas and/or theories over the last 100 years or so and I am not quite sure I have kept them all straight and in context. Neither have I remembered from whence they all came. So what I say may or may not be aerodynamically correct, in theory, practice, or spelling, so please kind reader, take it with a fairly straight grain of balsa.

Thanking you,

Dr. J. Bamboo

Dr. J. Bamboo
Lobotomized Practioner

Orbiter 60

After flying polyhedral HL gliders competitively for a season or two, I felt a need for a change. You see, I fly aileron ships (Dodgson's of course) exclusively in every other aspect of soaring. So I says to myself,

"Self, why don'tis thou get thine hiney in gear and designest thine own Whiz Bang 60?"

Being an inherently lazy person I of course looked around to see if someone else had saved me the trouble and designed an aileron HL plane that might fit my needs. No dice. A few long chats with my good friend Barry Kurath produced the most likely reason for this. It is (or was) a generally accepted notion that an aileron HL glider could not be made light enough to compete with the gas bags and that the extra drag from the ailerons would kill said plane in the turns. So after a couple more beers (real secret to great design sessions), Barry says to me,

"Eric, whyinthehell don't you just do it anyway?"

So I did.

Before starting to draw out my new plane, I kinda figured it might be a good idea to lay down some design goals to establish the performance parameters that I felt were needed to be competitive in our HL competition series. They were:

1. Ability to float with any gas bag in light conditions.
2. Fast rate of climb in small, light thermals, regardless of weight.
3. Superior turning characteristics, i.e. ability to turn faster, tighter, flatter, and more efficiently than a polyhedral job.
4. Good top end speed for coming back upwind.
6. The strength and toughness to allow ballasting in heavy conditions and to survive my seemingly endless supply of mid-airs.
7. And of course it had to be able to be launched measurably higher than any other plane on the field.

And I wanted it all without really having to ballast unless I felt it absolutely necessary. No big deal, huh?

Since the "wing is the thing", I figured I would start there. A Selig 4061 airfoil was chosen because it is relatively thin (9.6 or 9.7% I believe), has enough camber to suit me, and is slightly undercambered. I knew from experience that I DID NOT want a flat bottomed section of any kind. A Discus type planform was used for a couple of reasons. I have read that it is supposed to stop spanwise flow on the wing at low airspeeds. Could make my little ailery-ons more effective, I thought. Just looking at the planform shows that it keeps lots of wing area at the inboard part of the wing, so it follows that the tips will be small, tip losses less. And everybody knows that small tips are light tips and they turn better..... Hey! You don't have to draw me a map all the time! The spars were stopped at 75% of the span to further reduce tip weight. The D-tube is continued with the sheeting and shearwebs. In the May '88 RCSD the picture of my Orbiter shows how the sheeting has to curve funny. I was attempting to maintain the sheeting to a fixed percentage of the airfoil, more or less, so if the sheeting stoppage caused the airflow to trip it would do so uniformly, more or less. Capstripped ribs are used because they are much stronger than plain ribs and lighter than a fully sheeted wing. It also keeps the mass forward of the CG which I think reduces the tendency of a light structure to flutter. The T.E. is built up for this reason also. I opted for 3° of dihedral per side over the normal 2° in an attempt to make the rudder do some more of the work when small control inputs are used, like when working light lift. I figured that by making the rudder do a little more I could get by moving the stick a little less at those times. I was right. A side benefit of the extra dihedral is that it makes the plane a bit more stable, which is nice when you are a couple, three feet off the ground and trying to go out! (Yes I've done it countless times.) The wing chords and leading edge sweep breaks were chosen/positioned to ensure a wing area of over 400 sq. inches. It has been my observation that planes with low wing area really get pounded on light days at our local contests, regardless of how light they are. The area came out at 432 sq. inches, which is a little generous for a 60" plane I guess. With a good size chord (7" or larger) for about 85% of the span the Reynolds number is also improved compared to most designs I've seen.

All these items, straight wings, clean airfoil, ailerons, larger chord, smaller tip losses, low tip weight, and good control of the airflow over the wing produces a wing that has good lift, very low drag, low stall speeds, a gentle stall, and it turns much more quickly and with less control throw than would normally be required.

Since I hate to build fuselages, the KISS principle was used judiciously here. On paper the fuselage is basically 4 straight lines with a wing saddle cut in and a hatch and nose block thrown on. Obviously, it was kept to a minimum to reduce drag. The highest point is at the wing L.E. and is tall enough to accomodate an S-33 with ball links on top. It comes out to 2 3/4" O.D. The widest part is from the wing spar to the wing L.E. and is 1¼" O.D. Based on Leon Kincaid's HL design article I chose a tail moment arm of 21 3/4" measured from the rear of the spar. The nose moment arm is 10 5/8" measured from the rear of the spar. The radio compartment is 7 7/8" long. There is a 1" ballast box behind the radio compartment that will hold about 5 or 6 ounces of lead. While the fuselage looks small, there is plenty of room for three micro servoes and related goodies. This was essential since I had planned at the time (and since have) to add flaps and a full span trimmable trailing edge. The wing is held on Sunrise-style with a ¼"-20 nylon bolt just behind the spar and a 4-40 nylon bolt at the T.E. as a positioner. It has proven to be a most reliable way to keep a wing on an airplane, which is not always an easy trick for me! The fuselage has 3/32" balsa sides that are laminated over their insides with 1/64" plywood. 1/8" balsa longerons run the length of the fuselage on the bottom. All front sheeting back to the finger hole (yes I use one now) is run lengthwise. All sheeting to rear is crossgrain. The top deck and hatch are 3/4" light balsa. The top deck runs out onto the nose block to tie the two together and extends back from the rear of the nose block 2¼", effectively boxing the front end of the plane. All other sheeting

is 2mm contest grade. NO bulkhead is used in the traditional spot at the wing L.E. I used three: one at the T.E., one at the rear of the spar, and another 1" ahead of that one to form my ballast box. These fuselages are almost bulletproof and have survived millions of cartwheel landings and other natural disasters without breaking. And they build quick.

The original stab was 12.8%. It was a tad too small to provide good tracking at high speeds and at high angles of attack, both of which are quite prevalent in my launches. Hmmm. So I bumped it up to 14.1% and now the handling is quite the rock solid, E I E I O. The feathers are built up out of 1/8" medium balsa. On the original I used wood that was too light and had to add ½ ounce of tail weight! Quite gnarly, I can assure you.

Pushrods are .040" music wire for the elevator and rudder and #507 Sullivan cables for the ailerons. All control horns are hand made from 1/32" plywood. The aileron horn fairings are made from two layers of 3/4 oz. glass hot stuffed to the balsa "molds". After sanding them smooth, I just auger out the balsa and away we go. All my Orbiters have been covered with Super Monocote as I feel it is a bit stiffer than the other iron on coverings and adds more stiffness to the structure. Total weight ready to fly is about 13-14½ ounces. Control throws are 7/16" up ¼" down for the ailerons, 5/8" up and down for the elevator, and 1 1/8" left and right for the rudder. Decalage is 1 3/4°. The CG location has proven to be pretty critical for optimum performance. I start at the spar and trim from there. Both my planes have been trimmed for a nice moderate "cruise" speed, neither floating nor really moving out. You know it when you see it. It is slighty slower than the best L/D trim, for what that may be worth.

By now most people who have read this far are wondering if I managed to accomplish all my design goals and if this thing will really do what it was designed to do, win HL contests. YES. To both questions. It does everything it was designed to do and it does it better than I ever anticipated. It is fast and quick on the controls and also floats exceedingly well. It will climb very fast while floating, but when bumped up on step the rate of climb goes up dramatically. This plane has the annoying habit of climbing through other planes when it enters a thermal lower than they are! The Orbiter loves to fly fast, as the control response and L/D get better and better as the speed increases. Yet it will fly so slowly on lift that it quite literally sometimes hovers. You have to see it to believe it! And aileron response is real solid regardless of the airspeed. At extreme control throws the initial roll response is almost unmanagable at low altitude. I'm still getting used to it after over 1000, yes 1000, flights on my Orbiters.

To date I have won every contest I have entered with my Orbiters. In all kinds of weather conditions, from light thermals on overcast days to booming lift on calm days to marginal, spotty, fast moving lift on windy days it has consistently out launched, out thermalled, out handled, and just plain out performed every other HL design that it has flown against. And it has done it convincingly, usually winning by a couple hundred points out of 1800.

Naturally as the designer, I am a LITTLE biased. In all fairness, the Orbiter is not for everybody. It is not a flip and float type of plane and would probably be a disappointment to people who like to fly that way. It was designed to be a quick and hot contest plane for the balls to the walls type pilot who wants to go out and get his lift, not wait for it to be delivered to him. It can be a little demanding at times to get every ounce of performance out of it, but on the flip side, it has turned in some of the most remarkable flights in some of the most demanding conditions you could imagine. The other pilots around the N.W. who have flown the Orbiter have all liked the flight performance and handling qualities, and most have expressed a genuine interest in either building or buying one. They feel it is a winner, which is very gratifying in and of itself.

And I feel it is a winner. But who cares! That is not really the point. The real point is that the Orbiter IS different and has an interesting arrangement of old and new ideas to produce an airplane with and equally interesting performance envelope. It has been an immensely educational and highly rewarding project that has turned out to be one hot little contest plane. It is also a hellava lotta fun to fly!

Note: Due to requests from local fliers, plans will probably be available somewhere, somehow, by the spring of '89. A kit manufacturer has even expressed interest in kitting it. I have no plans to kit it or release plans as I simply have no time to do it. I had considered selling built up ones to help offset my college expenses, but initial interest was too high to even consider it. I'd be building forever! If you would be interested in plans or such, I guess you could contact Jim or myself and I'll see what I can do. Thanks.

Eric Jackson, 4916 S.W. 56th, #108, Portland, OR 97221.

QUASOAR REVIEW.....Edwin Wilson

5308 Sprucewood Drive, Louisville, KY 40291

In pic above, leading the formation are Paul Carlson's 100" (top) and 120" (bottom) QUASOARS. Behind them are Paul's prodigy (top) and Ed Wilson's Prodigy (bottom). Bringing up the rear is Ed's QUASOAR. Note family resemblance.

I recently returned from the NATS and wanted to drop you a note and pass on to you and your readers my impressions of Paul Carlson's new plane QUASOAR.

I attended a contest in June near Paul's home in Illinois where I flew against Paul's Quasoar. I was flying my four year old SAGITTA 1100 which is basically a streached 900 to three meter span. This was my yardstick to compare the performance between the two planes. At the contest Paul and I twice launched at the same time and worked the same lift. On both flights the Quasoar could pull away from my plane in the search mode. This was expected because of the Quasoars 8 1/2 inch cord verses my 10 inch cord with spans and weights being nearly equal. But what really impressed me was the climbing ability of the Quasoar verses my stretched Sagitta.

Using his flaps Paul could visibility out climb me with every thermal turn and when it was time to land Paul would drop his flaps and come diving in like a Windsong loosing lots of attitude quickly but safely.

Paul won the contest but I was already convinced and had to have one. Twisting Paul's arm I was able to buy one of the prototype kits in time to build it for the NATS. Just two weeks later I had a new Quasoar ready to fly. Paul's prototype weighs 66oz while mine came in at 70oz including a three ounce thermal sniffer.

The particulars on the kit are, 120 inch foam core wing, 960sq inchs of wing area, sealig 4061 airfoil, epoxy glass fuselage with clear molded canopy, and built up tail feathers. Controls used are rudder, elevator, and flaps.

Arriving at the Nats I had about ten flights on my Quasoar. The plane performed perfectly and after three flights I was a respectable

tenth place. On my forth flight my transmitter RF section quit causing me to crash on launch thus dropping me out of contention. Paul was third after three rounds but dug in a wing tip on his last landing and flipped over dropping him to tenth place.

Performance wise I couldn't have been more pleased with my Quasoar. I found myself in the third round at the NATS in very light lift with three Windsongs. With my flaps dropped slightly my plane would turn with the Windsongs but more important to me was out climbing them! Paul in my opinion has a winner on his hands. Construction is quick what with the foam core wing and the epoxy glass fuselage. There are fewer parts to assemble than most planes. I am currently building two Quasoars one will be for standard class and the other will be the regular 120inch version. Both versions are shown on the plans.

NEW PRODUCT ANNOUNCEMENT....SUPER QUALITY HI START RUBBER....Jim Gray

Magnum Hi-Start Company c/o C & D Enterprises, 5102 East Andorra, Scottsdale, AZ 85254, offers three grades of hi-start : M100, M200 and M300. These are made from mandrel-produced latex tubing instead of the more common extruded variety. The advantage of the mandrel product is strength and perfromance. As Don Scegiel, president of the company told me: "It's like tree rings or layers of rubber layed up on top of each other to make a superior product." The three sizes are intended for 2-meter up to 100" machines (M-100); 100" to 130" span (M-200); and for 130" on up to maximum cross-country size sailplanes. As an example, the M-300 has a 35 lb. pull at the start! Magnum hi-starts come with parachute, rings, attachments and a special reel. In our opinion, you won't find a better quality system anywhere. RCSD hopes to do a review of the Magnum M-100 in a coming issue. Prices are: M-100: $69.95; M-200: $74.95; and M-300 $84.95. COD is available on shipping charges only, or add $5.00 with order. Check or Money Order preferred. For more information, write Don at the above address, or call him at: (602) 953-2048. You'll be interested to know that Don has ground-launched his ALPINA with the M-300, and he says that a PRODIGY will go early ballistic with the M-200; and a 2-meter sailplane will do the same thing with an M-100. Try one and see!

TOW HOOK.....John Stevens

John Stevens is not a newcomer to RC soaring, as he won Interglide 1988 and took first in the British Nationals this year. His ECLIPSE was featured last month in RCSD. Here's his contribution to RCSD by way of the newsletter VERBALS from Soar Valley Soarers in England. (JHG)

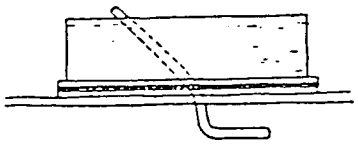


Fig. 1

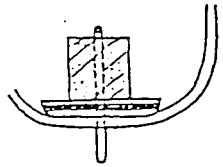
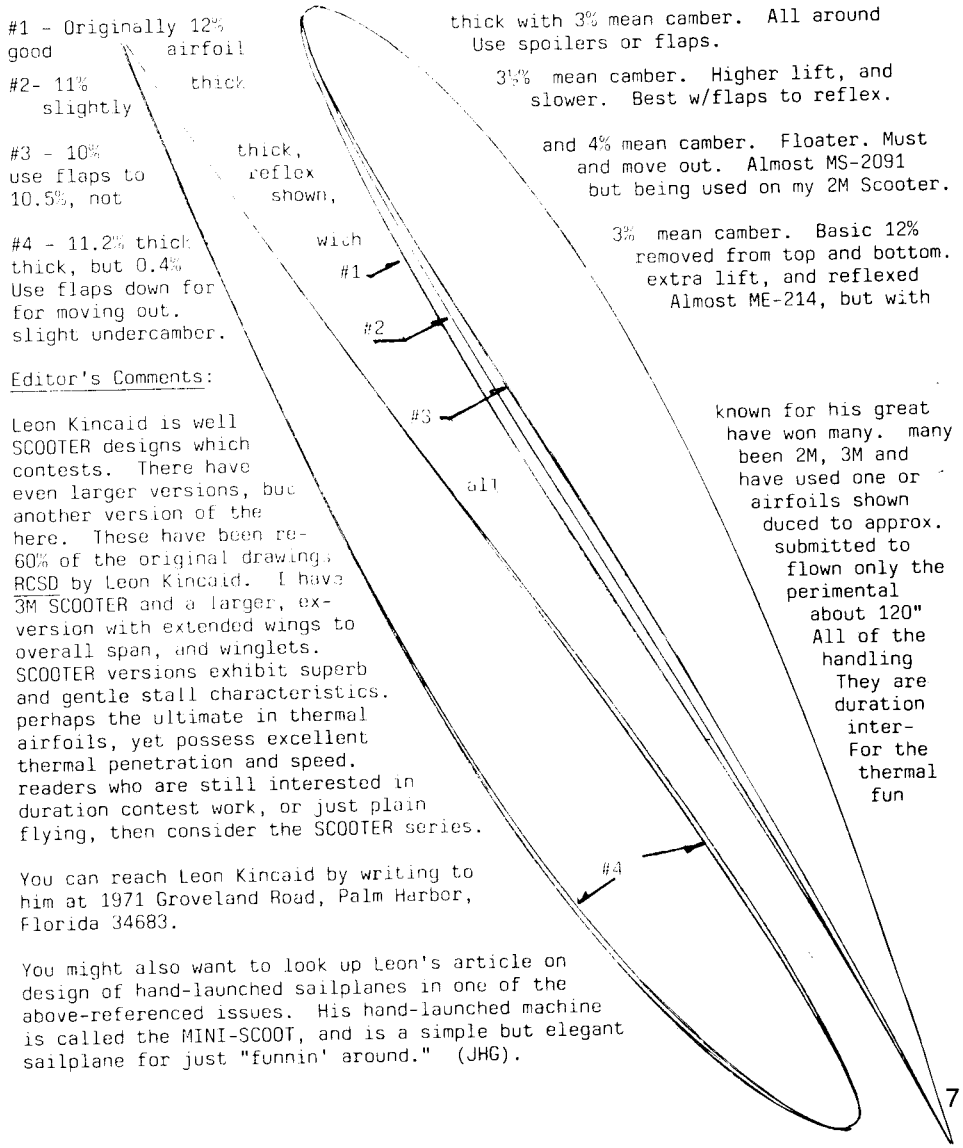


Fig. 2

Figures 1 and 2 show my method of fixing tow hooks - very secure and at the same time very easy to re-position for fine tuning. (Heat the wire hook, pull it free, drill another hole and epoxy it in). The drawings are self-explanatory: the top beechwood block is mounted on a 1" strip of 1/8" plywood to spread the load, and the #14 SWG (standard wire gauge) piano wire is strong enough fro any breaking strain line. Note the angle at which it enters the fuselage prevents it from pulling out. If you make a mistake when bending the wire, start again with a fresh piece because any bending, straightening and re-bending will weaken it. The drawing shows a fiberglass fuselage, but if fitting the hook into a wooden one, make the ply plate large enough to sit on the bottom longerons/stringers.

Origin of the 3311 Airfoil.....Leon Kincaid

"I didn't really want to call it my KME-214U as I first listed it (see RCSD Nov. '86, Jan - Feb. '87) because I didn't modify an E214, nor did I modify Woody Blanchard's ME214F. I simply thinned out my K3312. When I thinned it (it is really 11.2% thick) and found that it fell so close to Woody's modified E-214 that appeared in the NSS Sailplane, and an article in Herk Stokely's Soartech #2 by Hewitt Phillips on "Flapped Airfoils", I just felt it was a good compromise. Both Woody's and mine should be a lot cleaner than a 214 with flaps reflexed up .02C. One of the reasons I sent you the print-outs of my K3311 and K3312 airfoils was to show you how I measured and plotted them using Chuck Anderson's program. (See RCSD Oct. '86). I guess I should add that my airfpoil numbering system is **not** NACA's system. The second digit in their system is the position of the mean camber, but my second digit is the pos-ition of the thickest section. So, my K3311 or 3312 is basically a 3% mean camber located 33% aft and 11% or 12% thick, respectively."



Editor's Comments:

Leon Kincaid is well known for his great SCOOTER designs which have won many. many contests. There have been 2M, 3M and even larger versions, but have used one or another version of the airfoils shown here. These have been re- duced to approx. 60% of the original drawing, submitted to RCSD by Leon Kincaid. I have flown only the 3M SCOOTER and a larger, ex- perimental version with extended wings to about 120" overall span, and winglets. All of the SCOOTER versions exhibit superb handling and gentle stall characteristics. They are perhaps the ultimate in thermal duration airfoils, yet possess excellent inter- thermal penetration and speed. For the readers who are still interested in thermal duration contest work, or just plain fun flying, then consider the SCOOTER series.

You can reach Leon Kincaid by writing to him at 1971 Groveland Road, Palm Harbor, Florida 34683.

You might also want to look up Leon's article on design of hand-launched sailplanes in one of the above-referenced issues. His hand-launched machine is called the MINI-SCOOT, and is a simple but elegant sailplane for just "funnin' around." (JHG).

ON THE 'WING . . .

Bill & Bunny (B^2) Kuhlman
P.O. Box 975
Olalla, WA 98359-0975

Our fascination with tailless aircraft of various kinds goes back several years and owes its beginnings to our acquiring plans for Dave Jones' "Raven" from Model Builder and seeing a photo of Curt Weller's "Elfe 2" in Model Aviation at about the same time. Since then we have built and flown 12 sailplanes, of which 10 have been flying wings. In fact, we decided some time ago to build no more tailed sailplanes for ourselves. Our dedication to this ideal caused some consternation to Bob Dodgson a couple of years back when we won a "Windsong" kit at a contest. His fears increased noticeably when we confided to him that we felt an inverted Eppler 214 to be an acceptable airfoil for a "plank" design.

We must now confess to all that (1) we are now building the "Windsong" kit, (2) it will have a tail, and (3) it belongs to our son. However, we do have two 'wings currently under construction: a 1/4 scale Marske Pioneer II-D (which will be flying at the Richland Fun Fly in May), and a large swept 'wing for unlimited class competition. Plus, there are construction plans for at least two more tailless designs either already drawn up or rolling around inside our heads.

We are genuinely excited to see a surging interest in flying wings and tailless designs, and believe that this is probably due to an increase in slope soaring activity. The explanation for this correlation has to do with the characteristics of nearly all of the currently available tailless designs, be they kits, magazine offerings, or scratch-built creations. Tailless soarers are in general conveniently compact, they tend to fly faster than conventional designs of the same wing loading, and they usually show good aerobatic capability. Since their relatively high sink rate is not the disadvantage on the slope that it is in thermal flying, these 'wings, with all of their positive qualities, are a dream come true for the dedicated slope soarer.

More and more thermal flyers are being attracted to tailless sailplanes as new designs demonstrate lower sink rates, and it has become apparent that further increases in performance are probably not all that difficult to obtain. The fact is, there are certain AMA events in which flying wings are specifically excluded due to the overwhelming advantage they've demonstrated in the past. Our belief is that flying wings can be competitive in both thermal duration and F3B contests.

At the flying field, we and our 'wings have always been met with numerous questions, and it was readily apparent to us from the start that many people are naturally curious about flying wings. There is a hesitancy on the part of most modelers when it comes to actually building a 'wing, and it is our thought that this is due to insufficient available information. What we would like to do is share some of the information that we have been (and still are) accumulating, perhaps alleviating some of the perceived information gap, and maybe giving some readers the courage to build and fly a 'wing. We would welcome the opportunity to write about the new airfoils specially designed for tailless aircraft, construction techniques that can better assure rigid structures, methods of improving performance, some thoughts we have about a flying wing perhaps being the best XC machine and Hand Launch, and other assorted topics.

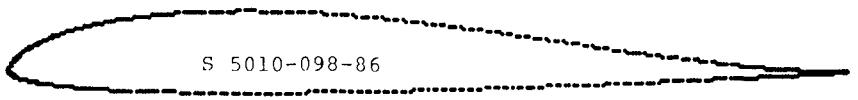
As you can probably tell, we both have strong feelings about the importance of sharing information; equally important in our minds is saying where that information was found. Revealing an information source has several beneficial effects: (1) it gives credit where credit is due, (2) it lends credibility to the statements offered, and (3) it gives the interested reader an opportunity to explore a little further.

We are eager for feedback on the ideas presented here, and we are always appreciative of comments, questions and more information about flying wings and tailless aircraft of any type.

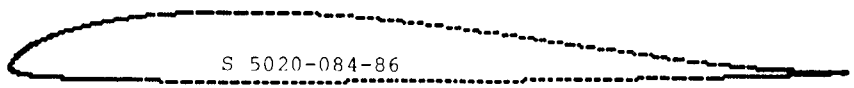
ON THE 'WING...

Bill & Bunny (B^2) Kuhlman
P.O. Box 975
Olalla, WA 98359-0975

These two airfoils were published in SOARTECH #7, "The FLYING WING Edition". As you can tell by the "S" prefix, they are from the computer of Mike Selig. Dave Jones had asked Mike to design some sections for flying wings, the resulting sections would then be placed in SOARTECH. Mike came through with these. They both have positive pitching moments and could be used for "plank" designs. The moments are not so strongly positive as the Eppler 184 and 186, 228 and 230. However, these sections should be able to give better performance than the Epplers due to decreased drag and higher maximum coefficient of lift.



The S5010-098-86 is 9.8% thick. It has a moment coefficient of +0.0086 and a zero lift angle of +0.64 degrees.



The S5020-084-86 is 8.4% thick. It has a moment coefficient of +0.0084 and a zero lift angle of +0.82 degrees.

If you decide to use these sections, there are a couple of things to remember: First, the leading edge of both sections is relatively blunt. According to Dave's experience, this is probably detrimental to penetration if you're operating with a light wing loading. Second, the trailing edge of both sections is relatively thin. If you're building an all wood structure this leads to difficulties in construction. Taken together, these two items point in the direction of a foam core structure.

One other thing to keep in mind is the noticeable performance increase to be derived from having the trailing edge of the wing straight and sharp. A blunted trailing edge does terrible things to the pressure gradients over the aft portion of the wing and can disrupt the airflow well forward. The modern computer generated sections we're seing these days seem to thrive on sharp trailing edges, and these two Selig sections are no exception. Many of us are still living in the dark ages; we take a piece of trailing edge stock and glue it into place, then we take the covering material and attach it directly to the trailing edge stock after a minimum of sanding. Such procedures may be OK for powered craft, but we're looking for peak performance from our sailplanes. Laminating the trailing edge from two pieces of 1/16th sheet with 1/64th plywood between is a superior method, from both a structural and performance view. The balsa sheets should be carefully mated to the plywood at the trailing edge to preserve the airfoil section, and if you can manage a knife-sharp edge on the plywood, so much the better. You might also consider cutting your foam cores to accept 1/64th plywood or fiberglass skins; these techniques make sharp trailing edges even easier to obtain. Take some time getting the trailing edge perfect - it's worth the effort!

These two sections look VERY promising. If any RSCD readers put them to use we'd appreciate hearing about their performance.

AIRFOIL S5010-098-86

N	X	Y
0	100.000	0.000
1	99.676	0.001
2	98.707	0.007
3	97.101	0.036
4	94.870	0.108
5	92.041	0.256
6	88.667	0.516
7	84.828	0.903
8	80.608	1.406
9	76 076	2.008
10	71.307	2.688
11	66.377	3.420
12	61.355	4.163
13	56.296	4.877
14	51.247	5.529
15	46.251	6.093
16	41.348	6.546
17	36.576	6.873
18	31.969	7.063
19	27.560	7.113
20	23.383	7.023
21	19.473	6.799
22	15.860	6.445
23	12.573	5.968
24	9.637	5.377
25	7.071	4.688
26	4.889	3.915
27	3.102	3.081
28	1.718	2.214
29	0.739	1.348
30	0.167	0.533
31	0.015	-0.140
32	0.424	-0.650
33	1.456	-1.084
34	3.028	-1.471
35	5.123	-1.804
36	7.718	-2.082
37	10.785	-2.306
38	14.291	-2.481
39	18.194	-2.609
40	22.448	-2.688
41	27.008	-2.715
42	31.829	-2.691
43	36.864	-2.623
44	42.055	-2.517
45	47.345	-2.381
46	52.675	-2.219
47	57.983	-2.039
48	63.209	-1.846
49	68.292	-1.645
50	73.173	-1.443
51	77.792	-1.243
52	82.095	-1.049
53	86.030	-0.863
54	89.547	-0.691
55	92.603	-0.527
56	95.163	-0.367
57	97.211	-0.212
58	98.730	-0.088
59	99.678	-0.019
60	100.001	0.000

AIRFOIL S5020-084-86

N	X	Y
0	100.000	0.000
1	99.683	-0.001
2	98.736	0.000
3	97.160	0.015
4	94.964	0.066
5	92.171	0.186
6	88.833	0.413
7	85.028	0.766
8	80.840	1.234
9	76.339	1.793
10	71.594	2.430
11	66.672	3.116
12	61.644	3.827
13	56.576	4.524
14	51.519	5.170
15	46.516	5.736
16	41.608	6.198
17	36.830	6.539
18	32.218	6.748
19	27.803	6.821
20	23.620	6.759
21	19.702	6.565
22	16.081	6.244
23	12.785	5.802
24	9.837	5.249
25	7.257	4.596
26	5.059	3.862
27	3.252	3.065
28	1.843	2.234
29	0.833	1.401
30	0.219	0.613
31	0.002	-0.049
32	0.308	-0.507
33	1.226	-0.815
34	2.727	-1.037
35	4.807	-1.192
36	7.434	-1.310
37	10.563	-1.404
38	14.148	-1.478
39	18.141	-1.534
40	22.491	-1.569
41	27.150	-1.583
42	32.064	-1.576
43	37.179	-1.550
44	42.436	-1.507
45	47.776	-1.449
46	53.139	-1.379
47	58.462	-1.297
48	63.687	-1.206
49	68.753	-1.108
50	73.601	-1.004
51	78.178	-0.896
52	82.430	-0.785
53	86.308	-0.672
54	89.767	-0.557
55	92.767	-0.440
56	95.276	-0.317
57	97.297	-0.188
58	98.763	-0.079
59	99.686	-0.018
60	100.001	0.000

SOARTECH #7, Gene Dees, Editor. Volumes #1 through #6 are also available. SOARTECH is published by Herk Stokely, 1504 Horseshoe Circle, Virginia Beach, VA 23451.

Dave Jones/Western Plan Service, 5621 Michelle Drive, Torrance, CA 90503.

ISA - BEL: UK SLOPE DURATION

RECORD HOLDER - 15 HRS 12 MIN

SPAN - 144"

LENGTH - 67"

WEIGHT - 5.75 LBS

DESIGNER-BUILDER: PETER STEVENS

WING AIRFOIL: EPPLER 193

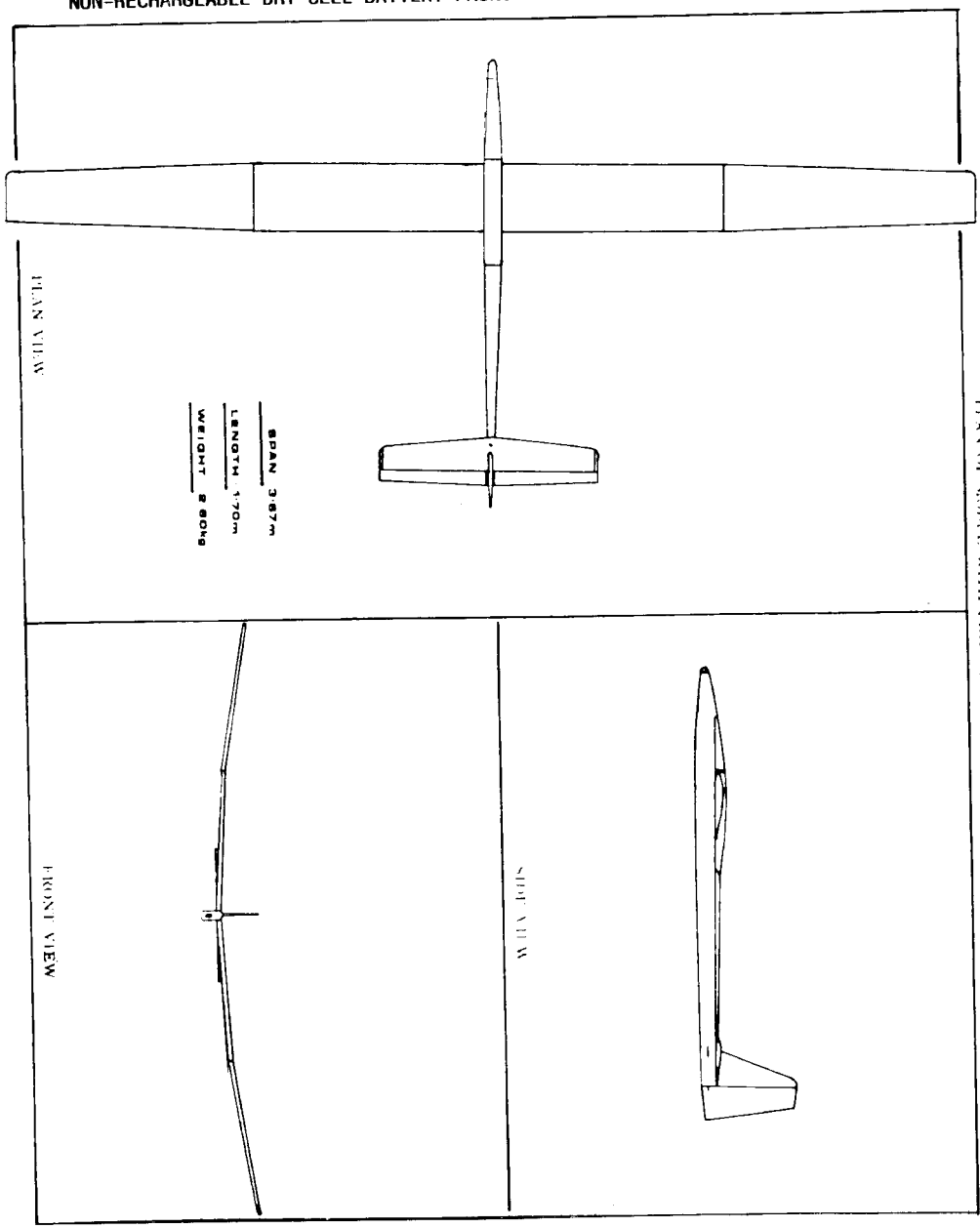
STABILIZER AIRFOIL: CLARK Y

FIN/RUDDER - SYMMETRICAL

SIMPLE, OPEN STRUCTURE OF BALSA AND PLY;

SOLARFILM COVERING; 2-CHANNEL RADIO;

NON-RECHARGEABLE DRY CELL BATTERY PACK.



15 HOURS AT EASTER .....Peter Stevens

91 High Street, Northchurch, Berkhamsted, ENGLAND HP4 3QL

Editor's introduction:

Peter Stevens has been a good friend ever since we first met in California eight years ago for the first Two Meter World Cup contest -- and before that, in England at his home club at Ivinghoe Beacon near Dunstable north of London, back in 1978. Even then, Peter was using the Eppler 193 airfoil for his own designs, but somewhere between then and now he became fascinated with cross country, and more recently duration flying. Here's his story of his UK record flight. I'm sure we'll hear more from Peter in the near future, because he has his eyes set on the World Record Duration flight. (JHG).

I recently made a non-stop flight of 15 hours 12 minutes at Ivinghoe Beacon, my intention was to beat the BARCS duration record of just over 18 hours. Some people have a strange way of celebrating Easter! This flight was also intended to be a team warm-up for an attempt by the Ivinghoe Soaring Association on the World Record for Model Sailplane duration, which currently stands at 33 hours and some minutes. Our flight took place on Friday 1st April 1988 (yes - I know!) and lasted from 05.48 in the morning to approximately 21.00 in the evening. A lot was learned in this 15 hour flight period about long duration flying - the main item being that it is only slightly more exciting than watching paint dry - but a darn sight more painful!

On the evening before the attempt, phone calls were made to ensure that all manpower and equipment was ready for the attempt. Our main concern was with the weather forecast because in the week up to the attempt day, the actual weather had not been good. During discussions with our resident piece of wet seaweed - otherwise known as Peter Perman, he and I decided it was worth risking the somewhat inaccurate forecasts and to give the GO signal. For the record, the official forecast was "unsettled, with rain followed by colder showery weather, wind N.W."

04.30 hours, 1st April 1988

As pre-arranged, a small party from the club met at the Beacon carpark and began to assemble ISA-BEL, the specially-designed sailplane. This party consisted of Jim Chambers, the electronic wizard of the team, Bob Moller, the BARCS Official Observer and one other - the flying fool. It was still very dark and cold with no moon. Assembly was taking place by the light of various torches when who should pop up in a blaze of headlights and questions? - yes, Nick and Plod (the boys in bloo). Quite what they imagined we were up to, I don't know, but after long explanations, they went away. Not happy - but reasonably content. Mind you, the glare from the police Rover headlights gave Jim all the light he needed to finish assembly of the sailplane.

05.00 hours

Official sunrise for the day was scheduled for 06.33 and therefore we set up at the Beacon top by just after 05.00. With windbreak, chairs, and ancillary equipment in place, we were on target to take advantage of the first opportunity to launch. The wind at this time was very light (almost non-existent), South-Westerly, but was steadily increasing in strength.

05.48 hours (the launch)

I made my first and only decision of the day, rubbed the sleep from my eyes - and launched into a sky which was light enough to require only the occasional use of our night vision system. The wind had picked up by now, and it was cold, in fact it was 38 degrees farenheit and as the light improved we could see that a heavy frost covered the Beacon top.

06.30(ish) about 1 hour of elapsed flight time

The trim of the model elevator has radically changed since I had last flown it (it had been in the hangar for last minute 'tweaking') so forty plus minutes and several heart attacks later (keep going yer bugger) with nearly full down trim and rough air to contend with, I was forced into a decision to land for adjustments to the elevator setting. This would have wasted nearly an hour of elapsed time. On the downwind leg of landing, the wind dropped, the turbulence went away and I quickly headed back for the slope with the sailplane in a much more pleasant mood - perhaps it doesn't like to get up early. Because the wind had died to about 8 mph - South Westerly, the next two hours were spent very low in the "slope scratching" mode - but at least the sailplane was handling well. The full down trim setting was acceptable for the rest of the flight until the return of turbulent air - in darkness just when I didn't need any more problems!

Elapsed flight time = 3.5 hours

The lift began to improve and I could relax a little - (not a lot!). What can I say about the rest of the flight? From the point of view that it was nearly uneventful - it was perfect. The very excellent Fleet radio systems - suitably "attended to" by Jim Chambers - worked perfectly (channel 68) as did the Ever-ready battery packs.

How's it going so far?

The National weather forecast had proved to be quite wrong, but we had successfully outguessed it and enjoyed a steady near-westerly 10-knot breeze, lots of sunshine and good lift all day. This was a drawback in itself because, what with the good conditions and it being a Bank Holiday, the sky at times was uncomfortably thick with gliders, not all of them well-flown, and the crowd on the ground was somewhat intrusive and undisciplined. During this time, the airborne radio suffered three "glitches" but these, luckily, were only a minor inconvenience. I find it quite surprising that, being told a record attempt is under way, flyers - some of them club members - behaved in such a manner particularly in the late evening when conditions again became difficult.

Elapsed flight time = 8 hours

Up to now it was all rather b-o-o-o-o-ring with me doing a couple of loops and a stall turn and a walk around the site to keep alert. Constant pre-occupation with my bodily functions proved diverting ("don't eat or drink too much - 'cos what goes in must come out"). The problem with it being slightly too cold was always present - my wife made a very welcome visit but, despite the windbreak, couldn't bear the low temperature too long and had to leave.

Elapsed flight time = 9 hours

The flight became increasingly agonising from a pain in the back of my neck and the cold. The pain was caused mainly because of having to fly at a higher altitude than necessary to avoid the mass of other gliders, it was obvious they were making no attempt to avoid me!

Elapsed flight time = 10 hours

Around this time, my concentration slipped a couple of times and I found myself pulling on my reserves of experience and expertise - such as they are - to avoid disaster.

Elapsed flight time = 12 hours

The sky became crowded with hot-air balloons on a charity flight. They passed over at about 100 ft. altitude and provided a welcome, and colourful, diversion. Hope somebody was busy with a camera! A pleasant episode and I hope the pilots weren't upset by the rudery which passed from ground to air.

Elapsed flight time = 13 hours

The night vision team arrived and things began to get busy - now was their big moment. With the failing sunlight, the wind began to move to the south but was still flyable on the west face of the beacon slope.

Elapsed flight time = 14 hours

The dark was with me and the night vision team began to work their magic. Elapsed time hour 14.30(ish) and the wind, within a minute or so, switched suddenly to almost due south, the air became turbulent, the team couldn't change slopes quick enough, there was not enough down-trim available, my head was in agony, I was bustin' for a pee but I struggled manfully for a further half an hour, or so.

Elapsed flight time = 15 hours 12 minutes

I flew an ill-advised low pass, flopped onto the slope side and that was the end of that.

Congratulations and commiserations all round - but we had got another UK record in not-too-easy conditions. At the time of writing an inquest has not been held.

I suffered no lasting effects. The neckache went away within a couple of hours. Simple tiredness was never a problem but I had a sort of writers' cramp in my "rudder/elevator" hand, which lasted about two days.

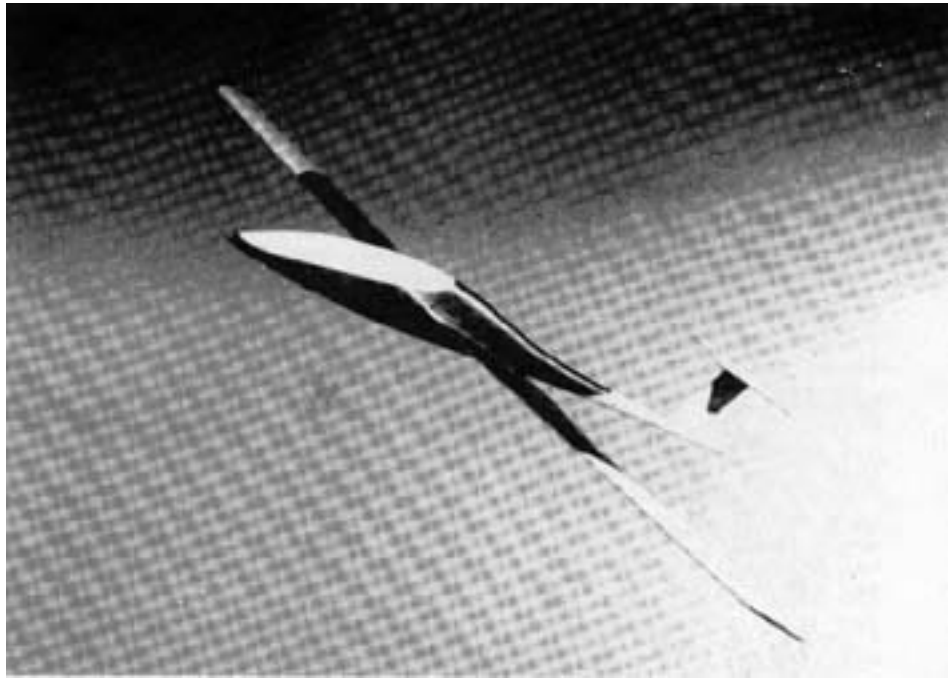
****

FIRST AUSTRALIAN LSF LEVEL V

Mal Pring of Adelaide has completed LSF Level V, and is believed to be the first person to do so outside the USA. Congratulations Mal!

"PUSH-BUTTON" RADIO IS HERE FOR R/C SAILPLANES

Control System Labs, 1361 Fallen Leaf Drive, Milpitas, CA 95035; Telephone (408) 946-4142 will take Airtronics Module, Quantum, or Spectra radios and turn them into "push-button" radios. Apparently, they remove existing electronics and add new electronics. The new system is called ATRCS (called A-Tracks) and does NOT require additional battery. The new system uses a microprocessor of low power consumption operating at 16 MHz...a 16-bit wide bus calculating machine. At the present time, according to information received by RCSD, they are doing only the "Modules" or "PCM's" . You send them your transmitter and receiver and get back your equipment with a 16-character liquid crystal display and six push-button style program switches...all for under $300. RCSD advises you to call or write before you send in your radio.



ROTOR is a new high-performance slope sailplane that is totally unique. It's extremely fast-building, rugged enough to survive the slope and allows you to easily surpass the performance and dynamic looks of most fiberglass soarers with its simple wood structure and innovative design. ROTOR features fast and precise roll control, superior inertial carry-through (or ballistic capability), outstanding inverted performance, and the ability to squeeze more energy from the wind than any other sailplane you've yet flown. Best of all, its reasonably priced.

The ROTOR concept combines aesthetics with the best current thinking in aerodynamics, offering very low frontal area and an advantageous body fineness ratio. These are coupled with an efficient t-tail, reducing parasite and trim drags to a minimum. A substantial wing aspect ratio (11 with 58 inch span) helps with induced drag and a 7.5% thick modified Eppler 374 reduces profile drag at speed while retaining good stall resistance.

By far the most important innovation contributing to ROTOR'S success is its control system. ROTOR is the first airplane in the domestic market to use all-moving wing panels for roll and pitch control instead of ailerons and elevators. When moved in opposite directions, roll control results; when moved together, pitch (elevator) control results. Mixing the two allows the full spectrum of control to be achieved. This system is no longer a concept. It exists and it works. This "pitcheron" control concept has been thoroughly tested and proven, functioning exactly like the aileron-elevator system in terms of flight characteristics but is of lower drag and far simpler to construct. In fact, because the tail surfaces are stationary and the remaining structure is so simplified, a 30% reduction in building time has been recorded. About 20 hours is required to build ROTOR. The pitcheron system is ideally suited to radios that have elevon or v-tail mixing, though a mechanical mixer is detailed in the kit. Construction with conventional controls is also shown.

An interchangeable, 2 meter, light-lift wing is also offered for low-wind cruising, training, or hi-start/winch launching. Wing loading reduces to 12 ounces per square foot.

PRODUCT REVIEW: MaxSoar/PC-Soar
Sailplane performance analysis programs
for the Macintosh and IBM PC computers

Producer: LJM Associates
1300 N. Bay Ridge Road
Appleton, Wi. 54915

Price: $34.95 for PC-Soar
$49.95 for MaxSoar

by Doug Klassen

Remember when you were a little kid and your mom MADE you eat broccoli? How could a human being possibly be expected to eat something that smelled like old gym socks? Well friends that's how I felt when my boss at the Volkswagen Arizona Proving Grounds walked into my office and announced that they were modifying my work assignment to include a new area that would require the use of a COMPUTER! AARRGGHH! Like mom and her broccoli the computer was not going to be an option for me. Eat or else.

I never did figure out a way to make broccoli taste better but it didn't take me long to figure out what the real purpose was for the IBM XT computer that they dumped on my desk: MODEL AIRPLANE STUFF! Before you could say "floppy disk" I remembered the PC-Soar program advertised in RCSD and had a check in the mail the LJM Associates.

You may have gathered already that I have no great love for computers. Never the less I pride myself on being flexible and willing to learn. By the time the PC-Soar program arrived I had learned enough about the XT to handle the word processing program and a little bit of the Lotus 123 spreadsheet program. I popped the PC-Soar floppy into the XT and commenced tapping keys. Zip. Nothing. Maybe I should read the instructions? I read the instructions. I didn't understand them but I read them. I was learning how much I didn't know about computers. I finally resorted to swallowing my pride and asking one of our resident computer whizes (thick glasses, pocket full of pencils, you know the type) for help. In short order the program was up and working except for the graphics portion. A quick call the Lee Murray solved the problem and I was on my way to designing my own sailplanes, sort of.

I'm told that the PC-Soar program is a fairly simple one.

That is to say it doesn't have a lot of safeguards built into it. You must follow the program sequence for data entry step by step and once you start into a design sequence there's no turning back short of bailing out and completely reloading the program. Not sure about what data parameter to enter? Too bad! No "Help" files here to save you. It wasn't long before I became expert at typing "cls" "load spss.bas" "run" and starting back at square one. As I became more familiar with the workings of the program it became easier and easier and I became more and more addicted to the wonders of building a glider electronically.

By now you're asking yourself "What is it that this program actually does?" First, it comes with a small selection of airfoils and gliders already in the program files. By answering a series of 28 or 29 design parameter questions in the "Design A Sailplane From Prompts" section you can add more sailplanes to the files. You can use dimensions from a real model or you can put together your own theoretical wonder plane. The airfoil files contain a number of popular foils like the Eppler 205, 387, 193 and a couple of the better Selig airfoils. Using a different section of the program you can add additional airfoils of what ever type you like assuming you have the required performance data and polars.

So, now you've got sailplanes in the computer. What next? Step two is to compute the performance of any of the planes you choose. The computer does this in a matter of seconds giving you more data on a model than you ever knew existed. Not just wing loading or area but sideslip instability factors, cg range, neutral points, recommended dihedral to increase stability, stab moment arm, fin/rudder moment arm, in total about 23 different areas of data. It then plots out theoretical L/D, sink rate and Reynolds numbers at a variety of airspeeds and then turns that data into two on-screen graphs. You can run through these computations for up to four gliders in a group and then have the program list the performance data in columns for comparison and display two graphs showing the computed L/D and sink rate for all four planes. Then using another section of the program you can change any parameter of any or all the planes, re-compute performance and see if you made things better or worse. I found out my wonder glider won't work...

You can also modify airfoils in the file and save any sort of weird thing that you dream up. In short you can try out all sorts of design ideas before you spend two months at the building table! All in all the PC-Soar program is very interesting for anyone who takes their designing and building somewhat seriously. There are some limitations to the program. It isn't as user-friendly as it could be for those of us who are tad simple-mind and it doesn't do flying wings or canards. It's primary orientation is toward thermal type planes rather than slopers. I've designed a couple of interesting slope ships and the computer keeps telling me to add six inches of dihedral to make it more stable. I did note that the LJM Associates ad in the August issue of RCSD is offering some additional programs for flying wings and such. Lee Murray (LJM) also tells me that they are working on an additional floppy that will add about a hundred or so airfoils to the program. It's probably a good idea to go whole hog and order the additional airfoil sets since entering new foils is a little tricky if you don't understand all the airfoil terminology.

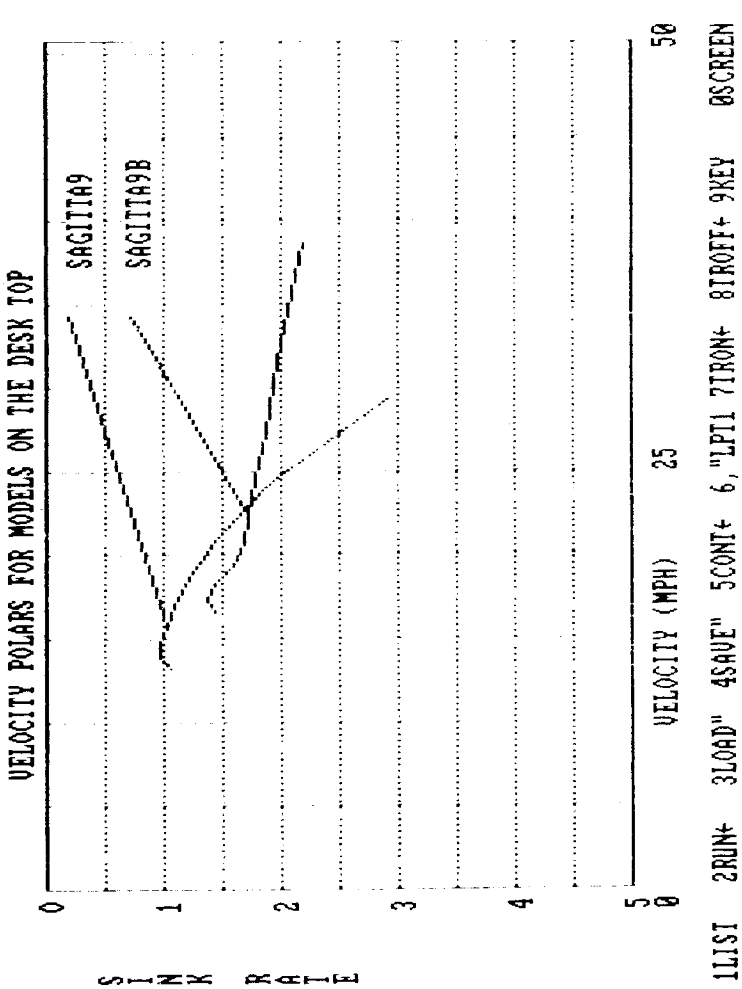
Bottom line is this: PC-Soar is a wonderful tool. It's absolutely fascinating take a well known design like the Sagitta 900 and say change the airfoil to an Eppler 193, add a pound of ballast and see what a difference it makes in the performance. PC-Soar represents a very good value for the money and I highly recommend it if you have access to an IBM PC or Apple II type computer.

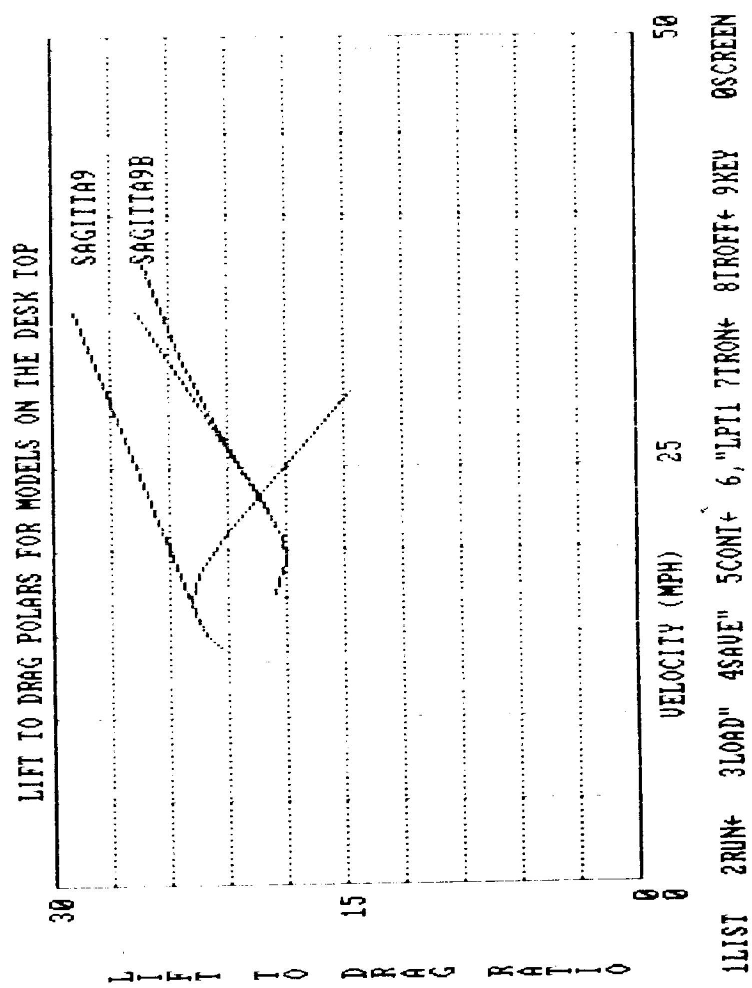
COMPARISON OF THE FIRST FOUR MODELS ON THE DESKTOP

MODEL NAME	SAGITTA9	SAGITTA9B		
AIRFOIL	E205	E193		
WING TYPE	POLYHEDRAL	POLYHEDRAL		
WING POSITION	SHOULDER	SHOULDER		
H. STAB TYPE	MID	MID		
MODEL WEIGHT	44	76	0	0
WING LOADING	7.114066	12.28793	0	0
WING SPAN	99.88	99.88	0	0
WING AREA	890.6299	890.6299	0	0
WING A/R	10.77018	10.77018	0	0
STAB AREA	113.0323	113.0323	0	0
LONG. S.F.	.4033466	.4033466	0	0
FIN AREA	50.616	50.616	0	0
VTVC	1.528899E-02	1.528899E-02	0	0
MIN SINK RATE	.9678886	1.367478	0	0
MAX L/D	22.8146	25.85116	0	0
BEST MPH	17.01884	38.74103	0	0

HIT ANY KEY TO CONTINUE

1LIST 2RUN← 3LOAD" 4SAVE" 5CONT← 6,"LPT1 7TRON← 8TROFF← 9KEY 0SCREEN





MaxSoar/PC-Soar

Sailplane Performance Analysis Programs
for the Macintosh and IBM PC Computers.

Features

- Online documentation.
- Use polars and sailplanes provided or enter own.
- Multiple Reynolds Numbers on Airfoil Polars.
- Metric / English capability.
- Plots sink rate & lift / drag versus flying speed.
- Overlay plots to compare aircraft performance.
- Calculates standard design parameters such as: areas, aspect ratios, aerodynamic centers, average chords, tail volumes, instability factors and more.

Polars Included:

E193, E205, E214, E387, E392, FX60-100, FX60-126, HQ2.5/8, HQ2.5/9, S4061

Sailplanes Included:

Sagitta 600, Sagitta 900, Sagitta XC, Prodigy, Epsilon

MaxSoar Price: $49.95

MaxSoar Requirements:

Apple Macintosh with 1 megabyte of memory, 128K Roms and

PC-Soar Price: $34.95

PC-Soar Requirements:

IBM PC, XT, AT, or Compatible Computer, 5.1/4" Floppy Drive, BASIC, BASICA, or HBASIC and Graphics Compatible

Announcing
Airfoil Polar and Sailplane Design Libraries
for MaxSoar and PC-Soar!

Airfoil Polar Library includes:

Wind Tunnel:		Theoretical:	
AH79-100A	E475	E184	E387
AH79-100B	FX-M2	E186	E471
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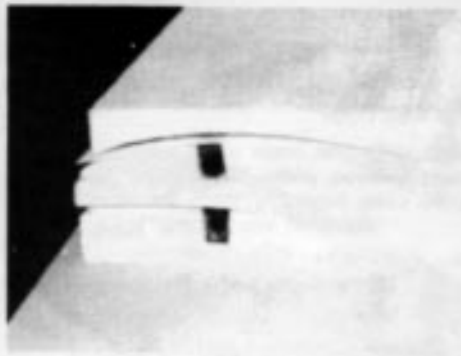
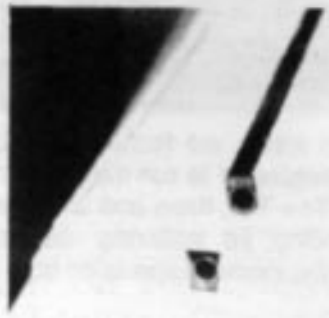


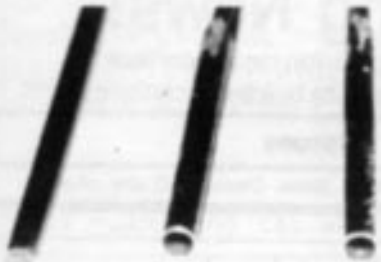
HI PERFORMANCE SAILPLANES

(See "Products You'll Like- October 1988 RCSD)

Left: HP Cell wing kit. HPP 1 foam wing core with sandwich sides of HPC 1. Carbon fiber spar cap with molded wing rod tube installed...



Right: Open view of spar cap assembly installed in the airfoil made from HPP 1 foam...



Left:

Molded carbon fiber spar cap and wiong rod tube, molded as one unit. Dihedral is set into the assembly when it is made up...

Right: Photo shows braid and spar caps used in the assembly of HI PERFORMANCE SAILPLANES wings. Contact them at 17902 Northeast 156th Street, Woodinville, WA 98072. TEL: (206) 487-1721

In last month's issue, we featured the ECLIPSE by John Berry, Australia. However, we neglected to run the photo of this fine sailplane ... so here it is. Ship features Tee Tail, flaps and ailerons, plus coupled elevator and "crow" set up for landing; i.e. reflexing ailerons and deployed flap. John Berry shown holding the model. Expression from looking into bright sunlight.