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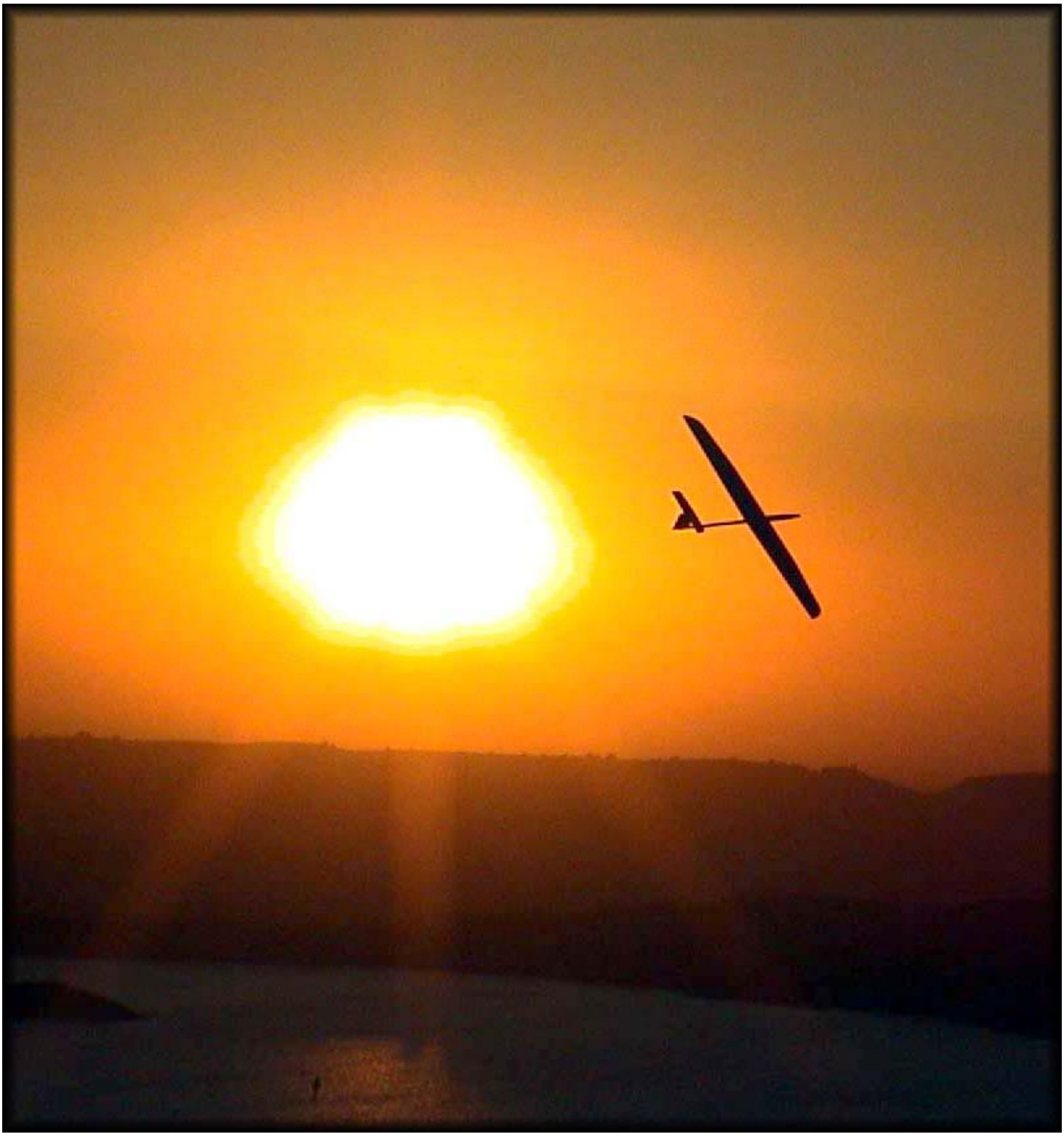
R/C Radio controlled SOARING DIGEST

THE JOURNAL FOR R/C SOARING ENTHUSIASTS



R/C Radio controlled SOARING DIGEST

THE JOURNAL FOR R/C SOARING ENTHUSIASTS

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

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

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..... "The Square-Cube Law and Scaling for RC Sailplanes" by Dr. Michael Selig
..... "Modifying & Building the MB Raven (Parts 1-4)" by Bill & Bunny Kuhlman
Bookshelf Listings - A listing of recently published books of interest to aeromodelers.
Complete RCSD Index, 1984-1999

The Soaring Site

"Sailplanes, Volume 1, 1920 - 1945"

In a recent message from Martin Simons, regarding his current work of art in progress, "Sailplanes, Volume 1, 1920 - 1945," he provided us the following update:

"I heard on Monday from Klaus Fey, the publisher in Germany, that my new book, "Sailplanes, Volume 1, 1920 - 1945," is now published (two months late) and is on sale. I don't know the price and have not yet seen a copy myself, but I believe it looks good, has been well received and is already selling rapidly.

"There are two versions, one with English Language text and the other in German. All the 120 full page drawings and some 300 + photographs are the same, of course. The drawings are in colour and very accurate, on a standard scale of 1:50 except for the gigantic 30 metre span 'Austria' which would not fit the page and had to be scaled down. If you would like more details you could e-mail the publisher at <eqip@eqip.de>. They speak excellent English.

"Copies will also be available from:

Vintage Glider Club Sales
22 Elm Avenue
Watford,
WD1 4BE,
England

"Probably the book will also be made available through <Amazon.com.de>, the German division of Amazon, but I have no other information at present."

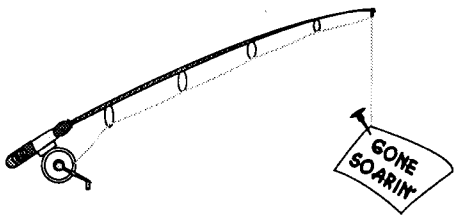
For a quick update as to availability in the USA, for those of you waiting patiently for the book, contact Raul Blacksten at <raulb@earthlink.net>.

F3J Changes & Discussion

For those of you that have an interest in F3J, with e-mail access, you're likely familiar with the F3J rule change and the discussion that ensued. For those of you that do not have e-mail access, nor access to the web sites hosting the discussion(s), we plan to include the pertinent information in a future issue, along with many of the replies and suggestions. Thanks go to Bill & Bunny for forwarding the messages to us.

Happy Flying!
Judy Slates

Books by Martin Simons: "World's Vintage Sailplanes, 1908-45", "Slingsby Sailplanes", "German Air Attaché", "Sailplanes by Schweizer". Send inquiries to: Raul Blacksten, P.O. Box 307, Maywood, CA 90270, <raulb@earthlink.net>. To view summary of book info.: http://home.earthlink.net/~raulb



ZIKA

R/C Soaring Resource Changes & Additions

(The following changes have been submitted this month and will be added to the "R/C Soaring Resource" listing(s): on-line pdf file, and periodic hard copy distribution.)

New listing:

Taiwan - Taiwan Association of Remote Control Glider, Jinn Tsai, tjinn@ms28.hinet.net, mobile: 0915468977, <http://www.geocities.com/tarcg>.

SYNERGY IN FLIGHT

Photography taken at a Fresno slope this past summer during the annual 'Volz and Gordy's Great Pre-Visalia Slope Adventure' by Michael Volz, Germany, with a digital video cam.

It was right at sundown, and the sun was almost on the lake. Gordy Stahl was making an approach circle out and low in order to enter the Dynamic Soaring course. The Plane is an RnR Synergy 5, hollow molded 110" RG14 T-tail, and his all time favorite slope ship. As he banked into a diving circle to pick up speed and come back over the slope, Michael got the shot. Both groaned from the glare, as neither of them were paying attention to where the sun was!

Jer's Workbench

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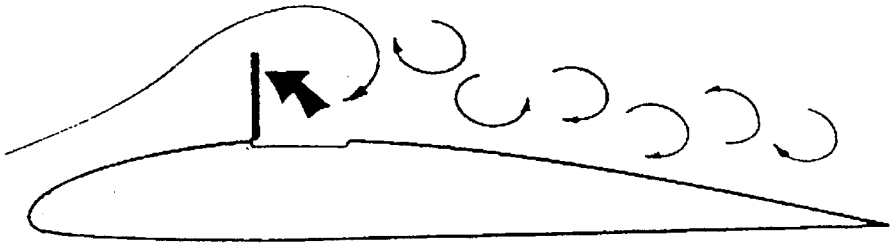


FIGURE 1 - SPOILER IN USE

Spoilers 101 - Part I

spoil'er, N. 1. A plunderer; a pillager; a robber. 2. One who corrupts, mars, or renders useless.

Many efficient rudder, elevator models find it difficult to lose altitude and speed, in order to obtain a spot landing. Consequently, some sort of a device is needed to spoil the lift for a good wing, thereby slowing the model's forward speed allowing for a controlled spot landing. One way to accomplish this is to install a set of spoilers on the model.

How should the spoilers be installed? What size should they be?

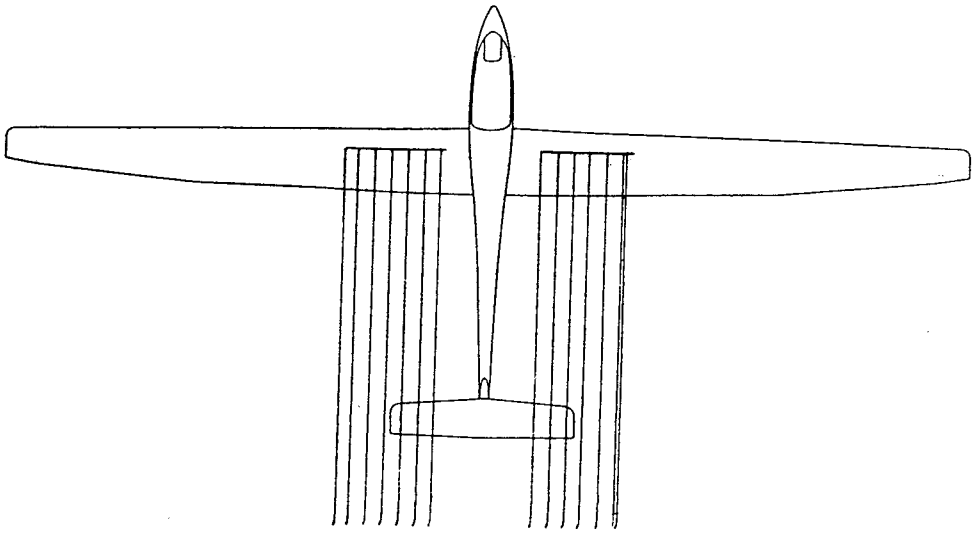
Where to install spoilers

Find the high point or the maximum depth point behind the main spar. See figure 1. Position the spoilers as shown in figure 2. The spoiled air from a raised spoiler shouldn't interfere with the stabilizer.

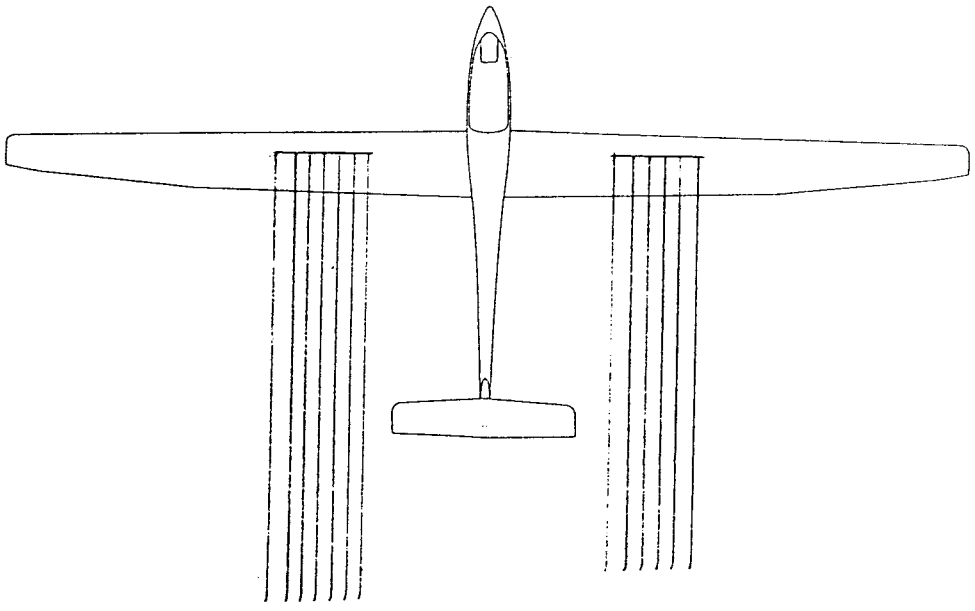
How to size a set of spoilers

To my knowledge, there is no secret formula to determine a spoiler's size. But I do know that if the model has a 100" wing span, a set of spoilers 10" long and 1" wide, that this is sufficient to bring the model down. Sizing, itself, is not an absolute number. Whether the spoilers are a bit larger, or a bit smaller, they should still work quite well. For example, note the photograph of my Aquila Grande with its 124" wing span. Those spoilers are 14" long by 1" wide, and work quite well.

FIGURE 2



SPOILED AIR OVER STABILIZER



CLEAN AIR OVER STABILIZER

Spoilers up on Aquila Grande; 124" wing span, with 14" spoilers.

How to use your spoilers

Figure 3-A depicts the normal glide path of a landing model that is not equipped with spoilers. With spoilers installed, as shown in figure 3-B, the glide path can be shortened by one half.

Checking spoiler installation

OK, let's check out spoilers that have just been installed for the first time.

First, find a spot with the sun at your back. Launch the model and settle in at about 300-400 foot of altitude. Raise the spoilers and note what happens. The nose of the model should pitch down. If you hold this position for long enough, the model will commence a vertical dive. DON'T PANIC! Simply close the spoilers to recover.

Now, go find another thermal, positioning the model in the same location, again. This time, raise the spoilers just a bit and, at the same time, apply a little up elevator. Raise the spoilers a little more, and apply more up elevator. Continue to repeat this operation until the model starts to sink, not dive.

By repeating this process several times, it should give you a handle as to how much spoiler and elevator causes the model to do what you want it to do. Once comfortable with the spoiler configuration, now's the time to commence practicing spot landings. Good luck!

Next month, I'll share a couple of different ways that spoilers can be 'hooked up'.

■

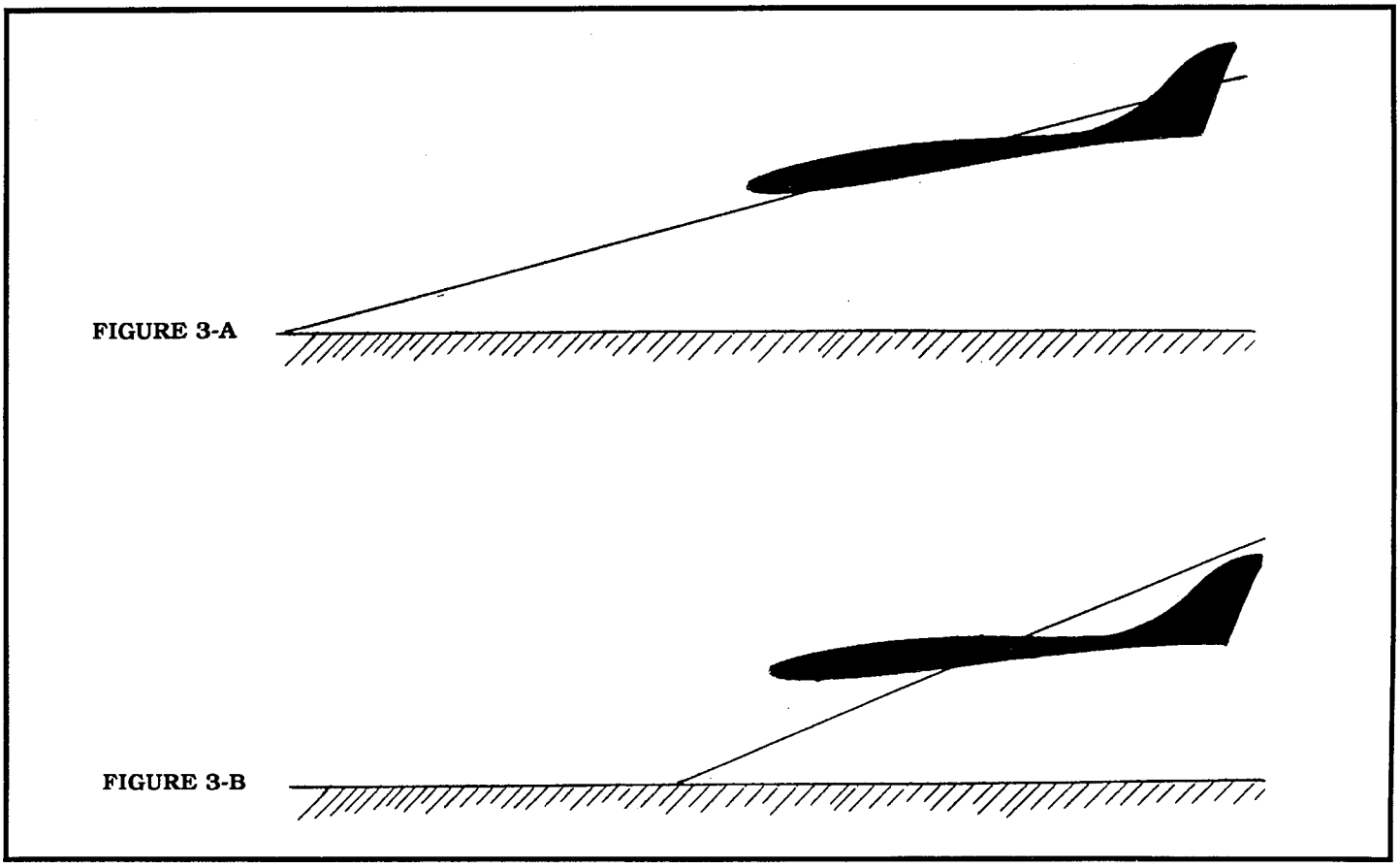


FIGURE 3-A

FIGURE 3-B

PROJECT PENUMBRA

(Above) Photography by Dr. Walter Panknin.
(Right) Photography by Bruce Abell.

on the Wing B^2

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http://www.halcyon.com/bsquared/

Penumbra.5

After a respite of several years, we've decided to commence the design, construction, and eventual test flying of what will be the fifth iteration within our Penumbra project.

Project Penumbra originated as an exercise in developing a tailless sailplane for thermal duration events, and possibly for F3B. The planforms for Penumbra.1 through Penumbra.4 were derivations of Hans-Jürgen Unverferth's CO2, the best performing swept wing sailplane then in existence. As swept wings must have both strength along the span and torsional rigidity, the series has consisted of much experimentation focused on construction materials and methods.

The basic planform for the series up until now uses a span of around 110 inches, a chord of nearly 12 inches, and 18 degrees of sweep. We've consistently used the EH 1.0/9.0 airfoil and one degree of twist starting at the mid point of the semi-span. Since we're designing for thermal flying, winglets have always been added.

For those relatively new to *RCSD*, here's a brief overview of the Penumbra series thus far:

Penumbra.1

The first of the Penumbra series was constructed almost immediately after attending the 1989 MARCS Symposium and devouring Dr. Walter Panknin's presentation on the design and construction of swept wing tailless aircraft. Like all of the Penumbra series thus far, it was constructed of pink foam with a vacuum bagged fiberglass skin. We used the spar system advocated by Dr. Panknin for his balsa

Photography by Dr. Walter Panknin.

skinned Flying Rainbow series, and this turned out to be a major error. The fiberglass we applied was not sufficiently strong in compression, and the first winch launch buckled the upper surface of the wing a short distance outboard of the end of the main spar. Despite the structural failure, the first and only test flight was an unqualified success. The winch launch using a single tow hook was otherwise uneventful, and the 'wing was downright docile in flight.

Penumbra.2

Built with a better spar system than Penumbra.1, Penumbra.2 was flown several times at 60 Acres in Redmond Washington during and after Bruce Abell's visit to America in 1990. The tow hook was initially mounted too far back, leading to what can only be described as a "flat spin" from a height of about 50 feet. It suffered no damage. The wing-fuselage joints were retaped and the tow hook was moved slightly forward. Subsequent launches exhibited no such difficulties, and Penumbra.2 was thermalled later that day. A strong launch resulted in a few cycles of flutter, but none was seen during flight, despite some high speed passes. Flap deflection was extremely effective at markedly slowing the 'wing.

Penumbra.3

This wing, with spars extending slightly outboard from those used in Penumbra.2, did not have what we considered to be sufficient strength in the spanwise direction. It was also our first experience with applying paint to the mylar sheets before vacuum bagging, and so was slightly heavier than we thought it should be. Penumbra.3 was never flown.

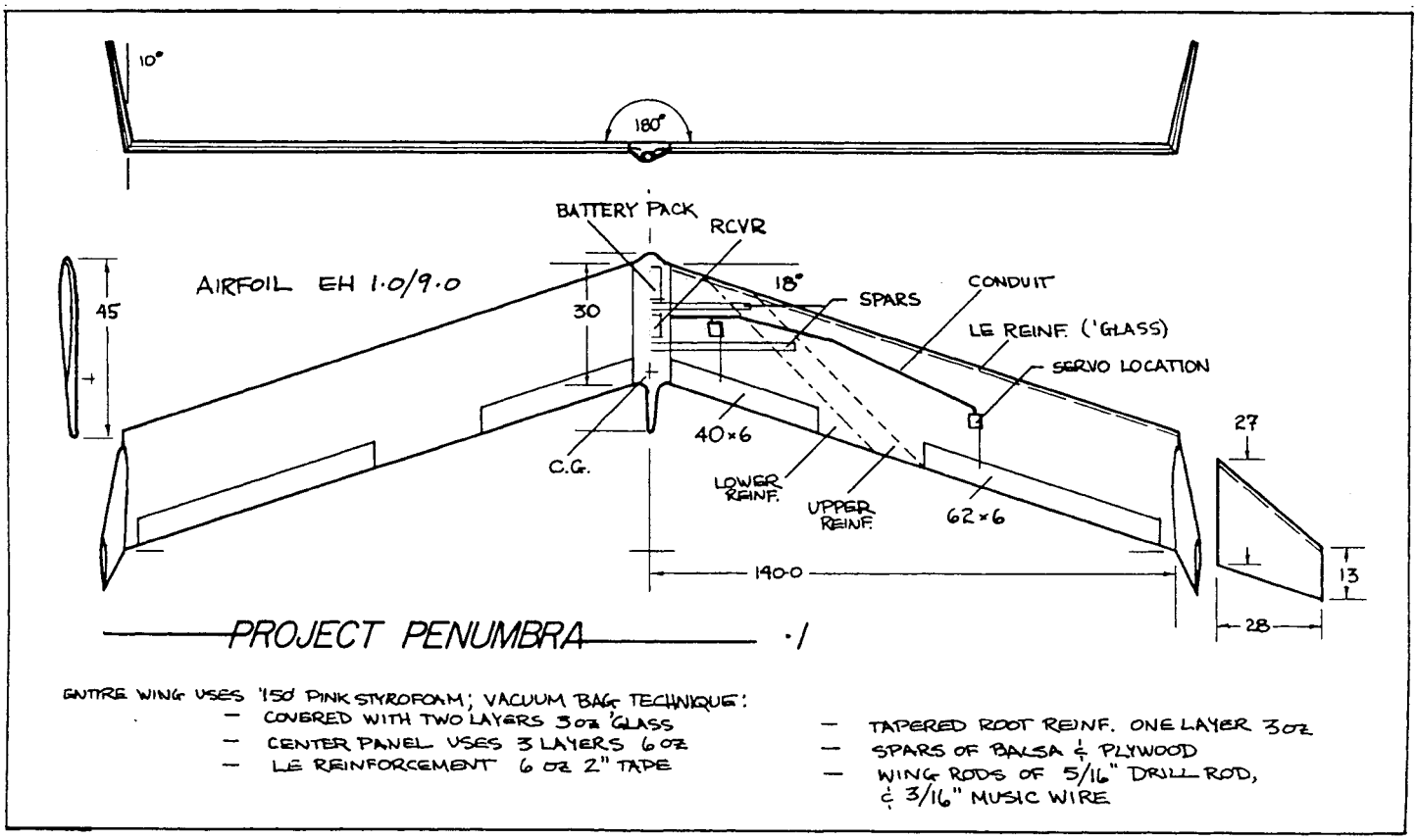
Penumbra.4

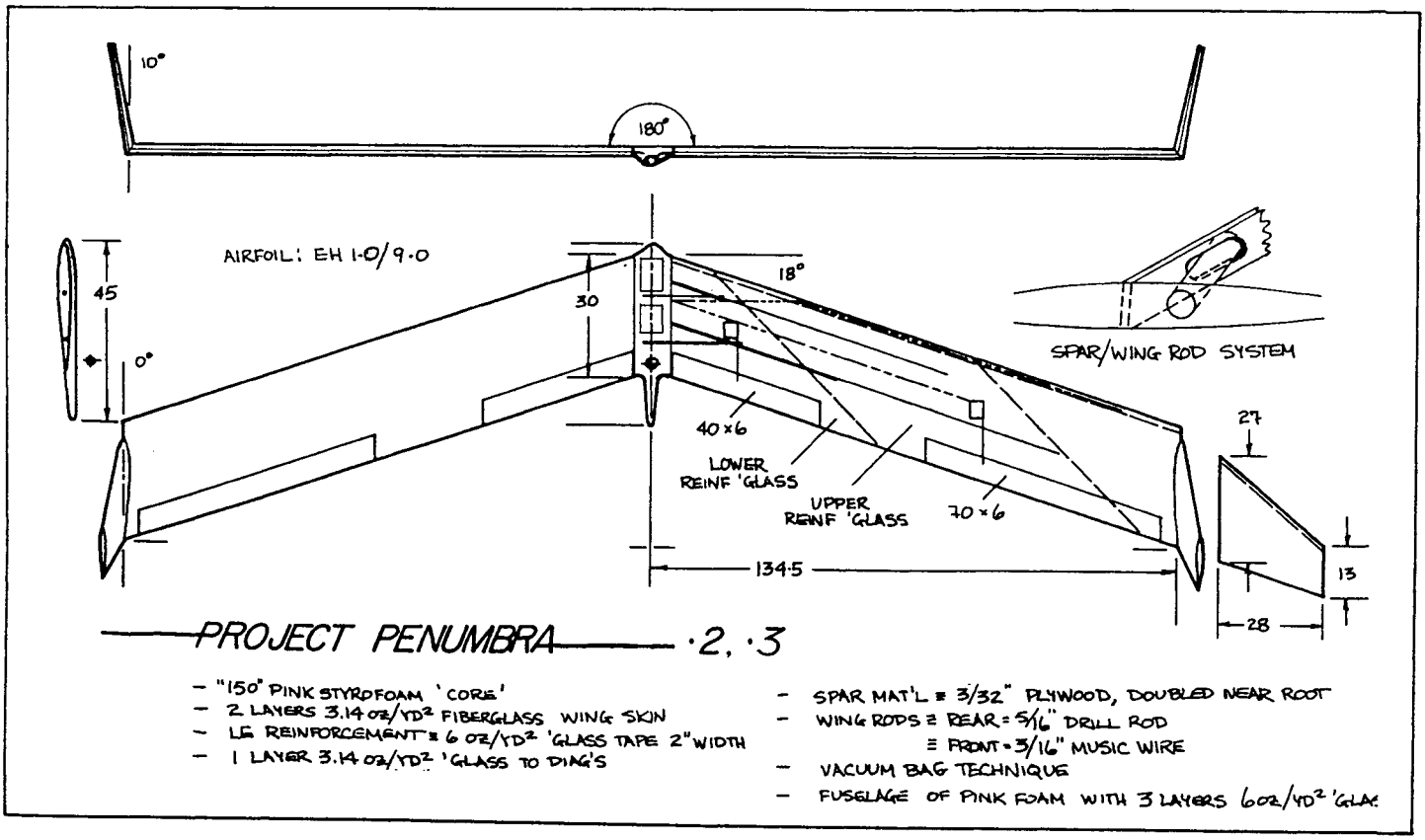
Tapered carbon spar caps were fabricated using the vacuum bag technique, and this wing is very strong along the span and in torsion as well. First flights were made April 20th 1991, during Dr. Panknin's visit while on his way back to Germany. The first winch launch was a replay of that of Penumbra.2, with a flat spin shortly after release. Again no damage, so everything was retaped and the tow hook moved forward. Subsequent launches were without problem, and the tow hook was moved back a bit on later launches. This 'wing does not seek out lift, but will thermal even in light lift, despite weighing 100 ounces. Once circling in rising air it flies

RS004A		RS004AT	
1.00000	0.00000	1.000000	0.000000
0.99726	0.00027	0.997260	0.000100
0.98907	0.00118	0.989070	0.000465
0.97553	0.00281	0.975530	0.001190
0.95667	0.00504	0.956670	0.002306
0.93301	0.00771	0.933010	0.003805
0.90451	0.01080	0.904510	0.005730
0.87157	0.01431	0.871570	0.008095
0.83457	0.01823	0.834570	0.010890
0.79389	0.02242	0.793890	0.014025
0.75000	0.02687	0.750000	0.017490
0.70337	0.03167	0.703370	0.021270
0.65451	0.03674	0.654510	0.025295
0.60396	0.04189	0.603960	0.029410
0.55226	0.04678	0.552260	0.033195
0.50000	0.05126	0.500000	0.036525
0.44774	0.05520	0.447740	0.039510
0.39604	0.05823	0.396040	0.041985
0.34549	0.06020	0.345490	0.043785
0.29663	0.06101	0.296630	0.044815
0.25000	0.06053	0.250000	0.044945
0.20611	0.05869	0.206110	0.044095
0.16543	0.05553	0.165430	0.042235
0.12843	0.05111	0.128430	0.039325
0.09549	0.04554	0.095490	0.035375
0.06699	0.03894	0.066990	0.030450
0.04323	0.03142	0.043230	0.024735
0.02447	0.02317	0.024470	0.018480
0.01093	0.01453	0.010930	0.011920
0.00274	0.00640	0.002740	0.005635
0.00000	0.00000	0.000000	0.000000
0.00274	-0.00487	0.002740	-0.005635
0.01093	-0.00931	0.010930	-0.011920
0.02447	-0.01379	0.024470	-0.018480
0.04323	-0.01805	0.043230	-0.024735
0.06699	-0.02196	0.066990	-0.030450
0.09549	-0.02521	0.095490	-0.035375
0.12843	-0.02754	0.128430	-0.039325
0.16543	-0.02894	0.165430	-0.042235
0.20611	-0.02950	0.206110	-0.044095
0.25000	-0.02936	0.250000	-0.044945
0.29663	-0.02862	0.296630	-0.044815
0.34549	-0.02737	0.345490	-0.043785
0.39604	-0.02574	0.396040	-0.041985
0.44774	-0.02382	0.447740	-0.039510
0.50000	-0.02179	0.500000	-0.036525
0.55226	-0.01961	0.552260	-0.033195
0.6039	-0.01693	0.603960	-0.029410
0.65451	-0.01385	0.654510	-0.025295
0.70337	-0.01087	0.703370	-0.021270
0.75000	-0.00811	0.750000	-0.017490
0.79389	-0.00563	0.793890	-0.014025
0.83457	-0.00355	0.834570	-0.010890
0.87159	-0.00188	0.871590	-0.008094
0.90451	-0.00066	0.904510	-0.005730
0.93301	0.00010	0.933010	-0.003805
0.95677	0.00043	0.956770	-0.002299
0.97553	0.00043	0.975530	-0.001190
0.98907	0.00025	0.989070	-0.000465
0.99726	0.00007	0.997260	-0.000100
1.00000	0.00000	1.000000	0.000000
C_m = -0.0418		C_m = 0.0000	
α_{0L} = -1.8066°		α_{0L} = 0.0000°	

very nearly hands off with a bit of up trim. It has no tendency to spiral in, and no corrective aileron is needed.

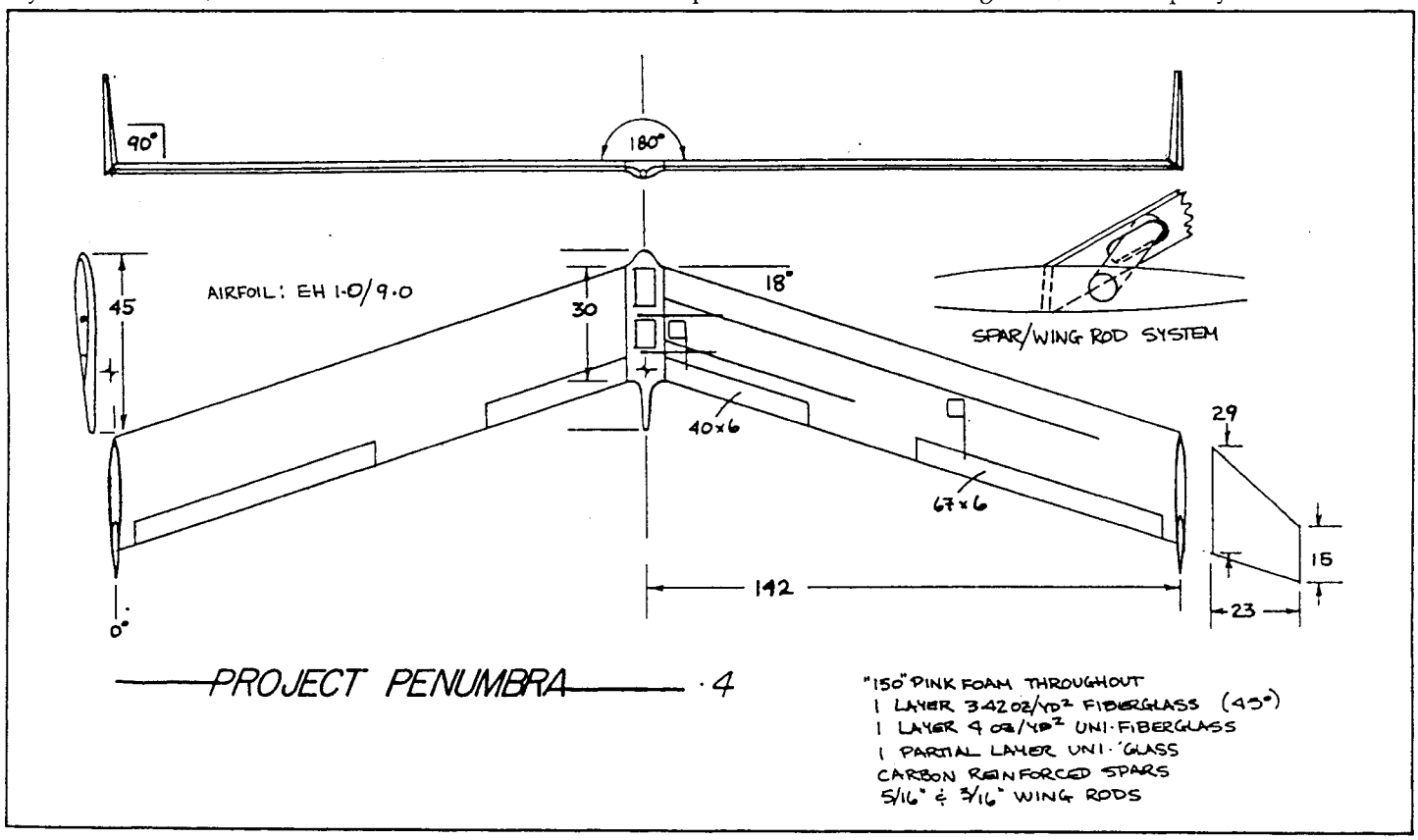
The strength of this wing is amazing, as attested to by an experience in Richland Washington. Penumbra.4 was flying fairly far out when, without warning, the transmitter battery went dead. The aircraft made a wide semi-circle while slowly pitching down. It was coming down at high speed and at about a 60 degree angle when last seen. We found it in a front yard, flat on the ground, with a large piece of cactus next to it. The only damage was to the right wing which had a three inch section of its leading edge

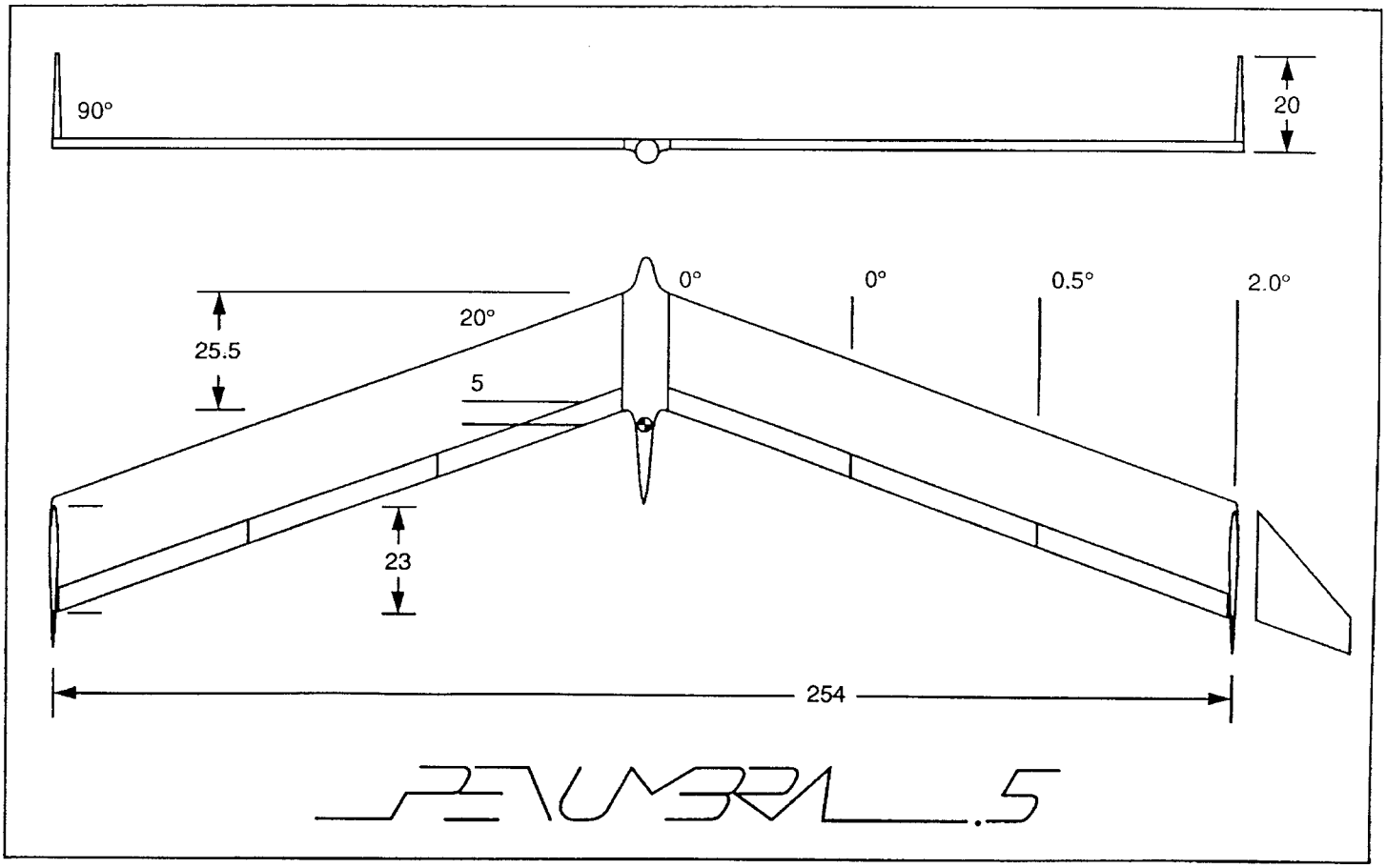




punched back in a bow of about a quarter inch in depth. This ding was easily repaired. Damage to the cactus was more severe. Penumbra.4 is still in flyable condition, but has not been in the air for several years.

Between then and now, we've been flying our various Blackbird 2M models and a couple of Ravens. But having a swept wing tailless soarer flying overhead, searching out the elusive thermal, still resides in our minds. Their ability to climb out in light lift, travel rapidly between





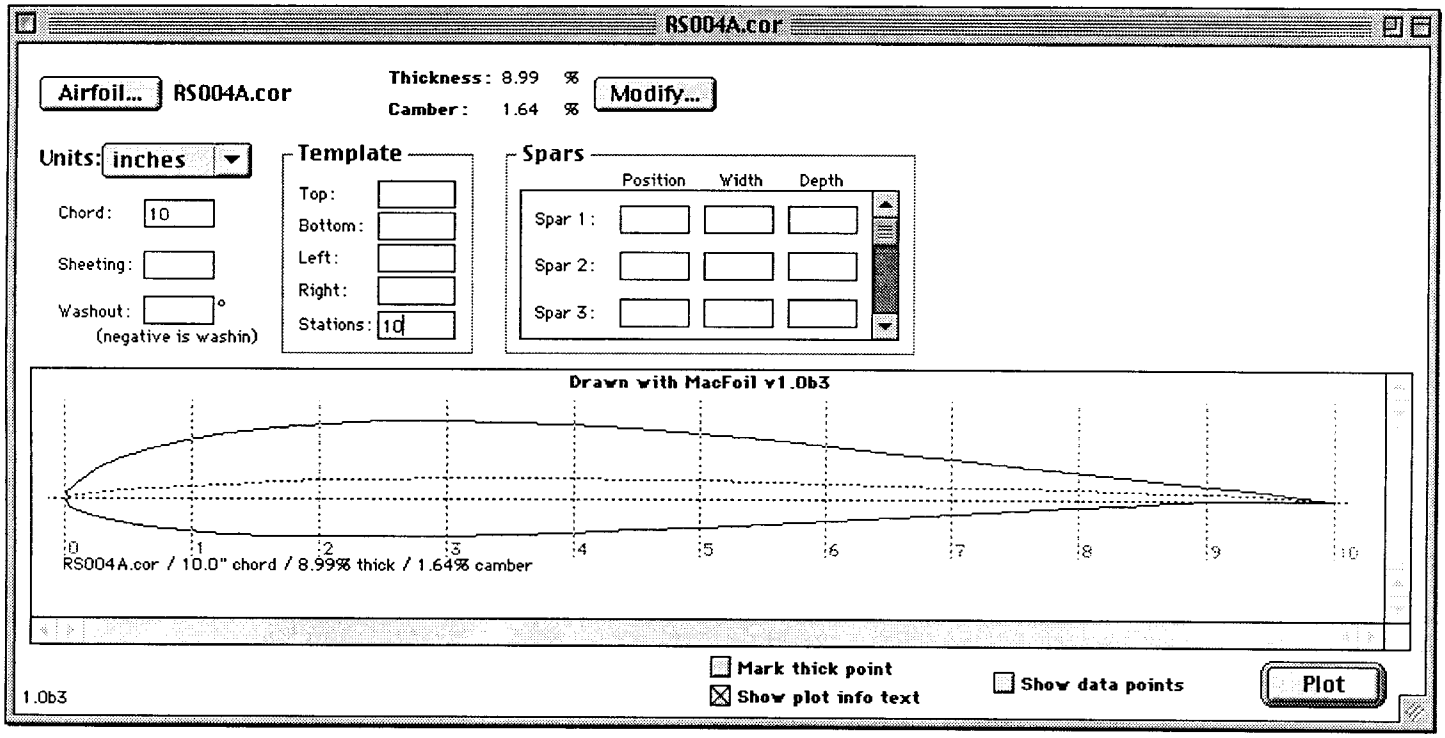
thermals, and just look good in the air has always been just too much to disregard.

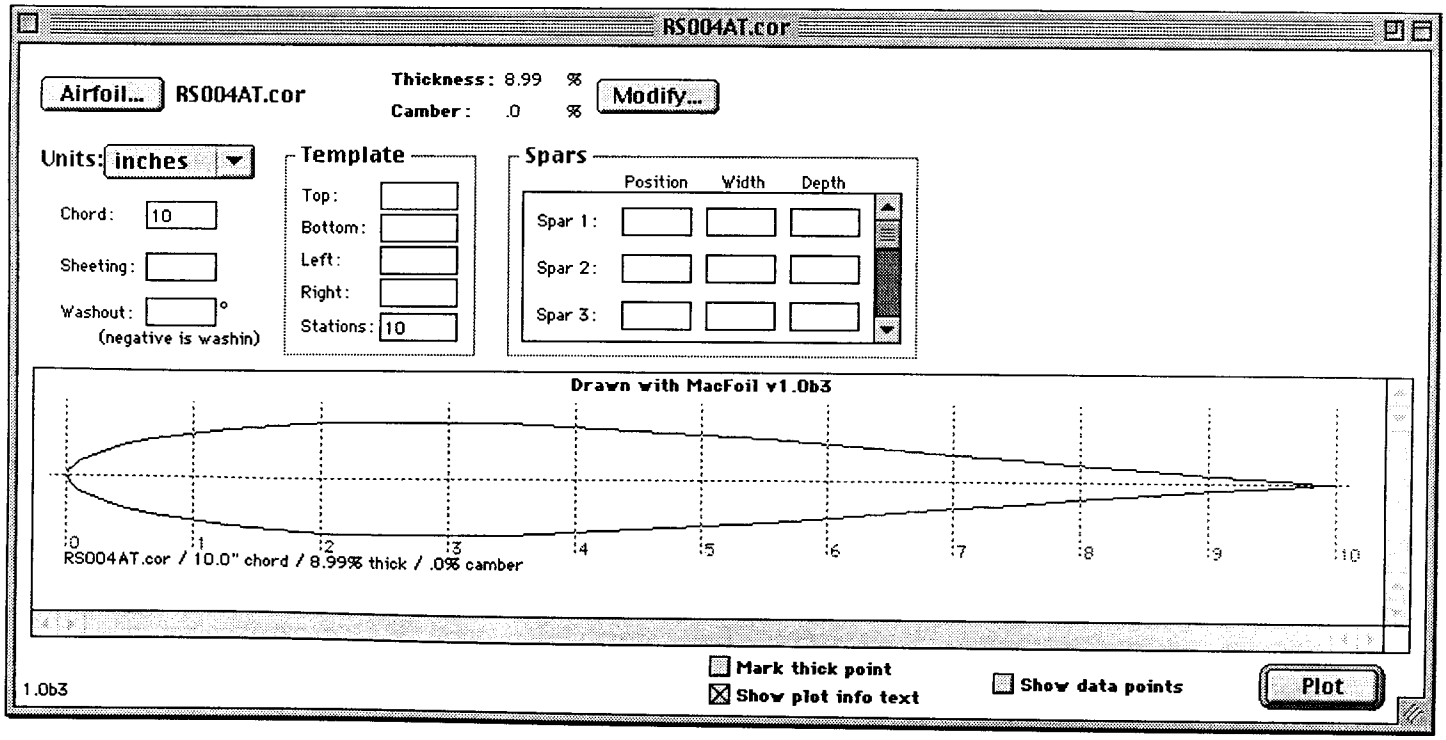
Penumbra.5

The impetus to build another swept wing tailless sailplane has come from several sources.

First, there is the recent discussions on the internet nurflugel e-mail list concerning various wing twist paradigms. Of special interest to us are the pros and cons of the Horten and Culver methods of distributing the twist along the wing span. In brief, the Horten method has most of the twist in the outer portion of the wing, and there is a bell-shaped lift distribution. It is possible to set up the twist distribution such that there is proverse yaw during turns, despite lack of a rudder function. The Culver method, on the other hand, concentrates most of the twist over the inboard portion of the wing, and the lift distribution is elliptical. Inhibiting adverse yaw may require some sort of rudder control. (We're currently working on articles which will examine both of these twist distribution methods, along with other paradigms.)

Second, and along these same lines, we read the condensations of presentations given by Al Bowers at meetings of TWITT (The Wing Is The Thing) in which he described various twist distributions, planforms, and control surface placements. This reinforced some ideas we had about incorporat-





ing a "six flap" control system in a new design.

The successes of Glyn Fonteneau and Dave Camp — Vitesse and CO8 2M — certainly increased our confidence.

And we got some news about the RS004A from Aaron Coffey.

"...I've been learning to use Xfoil in order to eventually figure out an airfoil for a flying wing, starting with examining the RS004A. It's a very interesting 'foil. The maximum L/D occurs at almost the same C_l as on the widely used MH-32, although the MH-32's L/D is theoretically 3.5

Penumbra.5/CL=0.1 (SS)

B33

Fill In this Stuff			This Stuff Will Be Calculated		
Wingspan	100	inches	Wing Loading	8.64	ounces/ft^2
Root Chord	10	inches	Lift Coefficient	0.10	CALCULATED FROM LOADING AND SPEED
Tip Chord	10	inches	Wing Area	1000.0	in^2
Angle of Sweep	20	degrees	Wing Area	6.9	ft^2
Root Airfoil Zero Lift Angle	-1.8066		Mean Chord	10.0	inches
Tip Airfoil Zero Lift Angle	0		Aspect Ratio	10.0	
AirfoilMoment coefficient- root	-0.0418		Taper Ratio	1.0	
AirfoilMoment coefficient- tip	0		Aerodynamic Center	11.6	INCHES BEHIND LEADING EDGE AT ROOT
Stability Factor (static margin)	0.035	VARIABLE	Alpha aero	-3.3	
Speed (average)	45	miles/hr			
Weight	60	ounces	Alpha geo	-1.5	DEGREES TWIST REQUIRED
			CG	11.2	INCHES BEHIND LEADING EDGE AT ROOT
Prepared by Joa Harrison (jharrison@precast.com)					
K1	0.50				
K2	0.50				
D1	18.198512				
LW1	2.5				
LA1	2.5				
D	18.198512				
LW	10				
LA	10		Coefficient of Lift	1.0429e-1	
Weight	50				
Twist formulas the work of Dr. Walter Panknin					

100

Penumbra.5/CL=0.6 (SS)

B33

Fill In this Stuff			This Stuff Will Be Calculated		
Wingspan	100	inches	Wing Loading	8.64	ounces/ft^2
Root Chord	10	inches	Lift Coefficient	0.59	CALCULATED FROM LOADING AND SPEED
Tip Chord	10	inches	Wing Area	1000.0	in^2
Angle of Sweep	20	degrees	Wing Area	6.9	ft^2
Root Airfoil Zero Lift Angle	-1.8066		Mean Chord	10.0	inches
Tip Airfoil Zero Lift Angle	0		Aspect Ratio	10.0	
AirfoilMoment coefficient- root	-0.0418		Taper Ratio	1.0	
AirfoilMoment coefficient- tip	0		Aerodynamic Center	11.6	INCHES BEHIND LEADING EDGE AT ROOT
Stability Factor (static margin)	0.035	VARIABLE	Alpha aero	-5.5	
Speed (average)	19	miles/hr			
Weight	60	ounces	Alpha geo	-3.7	DEGREES TWIST REQUIRED
			CG	11.2	INCHES BEHIND LEADING EDGE AT ROOT
Prepared by Joa Harrison (jharrison@precast.com)					
K1	0.50				
K2	0.50				
D1	18.198512				
LW1	2.5				
LA1	2.5				
D	18.198512				
LW	10				
LA	10		Coefficient of Lift	5.8501e-1	
Weight	50				
Twist formulas the work of Dr. Walter Panknin					

100

points better. Close though. What really caught my attention was the fact that as the C_l approaches stall, the C_{m0} of the RS004A approaches zero! So, after plugging the C_{m0} into the Panknin twist formula I found that the CO8 can be flown at least as slow as 13.5 mph and the wing twist (not linear, so this is a little off) remains within 0.1 degree of exactly the right amount: 2.9. If this matches with reality... amazing.

"I think this is a result of a combination of the shape of the camber line near the TE and the separation bubble. Following the flows along the top and bottom boundary layers, the effective airfoil is one that possesses increasing reflex as the C_l increases. So if all this is true, this C_{m0} reduction is a very desirable property for a flying wing airfoil.

"I still have to figure out how to do flap deflection calculations, so it'll be awhile before I can calculate what the max C_l possible is. And longer still 'til I can use the program's results with confidence. Oh, the MH-32 also exhibits the same C_{m0} reduction, though not as great."

Our visit to the Puyallup Model Expo in February was the real trigger, however. We found some very small but powerful servos at the Thermal-Gromit Works booth. These MPI (Maxx Products, Inc.) servos are powerful, putting out 47 in.-oz., about the same as the standard JR servos we've used previously, yet they are a small 31.0 mm x 16.1 mm x 30.0 mm (1.22" x 0.63" x 1.18") and weigh just 0.85 ounces. The rotational speed is fairly fast as well, 0.18 sec/60°. We bought six, already mentally configuring a swept wing of 100" span with flaps and elevons outboard and at mid-span.

Penumbra.5 will depart from our previous tack in several respects — sweep angle, airfoil, and control system.

We used Joa Harrison's Excel spreadsheet of the Panknin formula to set up the initial design. We've included two screen shots which show the required twist values for lift coefficients of 0.1 (cruise) and 0.6 (thermalling). The Panknin formula assumes a constant rate of twist from the root to the tip. We're going to construct our wing so that the twist is concentrated in the outboard third of the wing. The inner third of the wing will have no twist at all; at two-thirds span the twist will be one half degree; the tip will be set at an angle of -2.0 degrees. The additional one half degree will compensate for the difference in the twist distribution. The outboard elevons should be in their neutral position for cruising between thermals. The trim for thermalling will be a few degrees of up trim so that the effect is similar to increasing the twist to about four degrees.

Control surfaces for this new machine will consist of inboard flaps, mid-span elevons, and outboard elevons, with each control surface taking up one third of the semi-span. We've not yet decided on the initial mixing percentages, and probably will not achieve a good balance of aileron and elevator authority and elimination of adverse yaw until well into flight testing.

As we already have several other projects in various stages of completion, we have no way of establishing a time frame for Penumbra.5 progress at this time. But the airframe is pretty much fixed, and construction will begin as soon as the building table is clear once more.

Topic suggestions for future "On the 'Wing..." columns can be sent to us at P.O. Box 975, Olalla WA 98359-0975 USA, or <bsquared@halcyon.com>.

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__. Glyn Fonteneau and Dave Camp's Vitesse. *RC Soaring Digest*, July 2000.

Panknin, Dr. Walter. Flying Rainbows. MARCS Symposium, 1989. Contact Al Scidmore, 5013 Dorset Drive, Madison WI 53711 USA concerning availability of the 1989 Symposium Proceedings.

Thermal-Gromit Works, <http://www.tgworks.com>, 1-866-wlaunch.

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2001
MONTAGUE
CROSS COUNTRY CHALLENGE

Location	Siskiyou County Airport, Montague, CA
Date	June 8th - Practice and LSF Task Days June 9th & 10th - Contest Days
Time	Pilots meeting at 9 am, flying begins at 10 am
Task	Saturday - Free Distance within a prescribed course Sunday – Speed Task, 2 hour minimum, 3 hour maximum
Classes	Open, 3 Function (Rudder, Elevator, Spoiler or Rudder, Elevator, Flap)
Prizes	Plaques will be given to 3 members of the top 3 finishing teams in each class.
Entering	Entry fee is $75 per team, each team will receive 3 event T-Shirts, and 3 tickets to a Saturday night BBQ. All entries must be received by May 8th, 2001. There will be a limit of 20 teams, so don't delay.
Lodging	Camping is available on-site, no services available. Motels are available in Yreka, approximately 12 miles away.
Info	For additional info please call Dean, Scott, or Randy at (541) 899-8215 days, or Dean (541) 899-7034 evenings, or e-mail us at dgair@cdsnet.net.

TECH TOPICS

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Sailplane Polars - Putting the Math To Work

My apologies for dropping out of sight for several months. There's this thing called work that gets in the way from time to time. Putting together a JV company while getting retired from one of the parent outfits can be taxing on everyone's time. For any of you that may be involved in a business merger, my advice would be to just buy (or be bought) outright. It's a lot simpler than merging two corporate cultures. Probably harsher, but it gets it over a lot quicker!

Meanwhile, back at the design forum!

Over the past several columns we've discussed the basic equations which must be satisfied to calculate the overall performance envelope of a sailplane. We've also provided some simplifying assumptions that make the calculation tractable. Not all of those assumptions can be based on hard laboratory data because a lot of that data for RC sailplanes doesn't exist yet. So we'll have to be satisfied with the estimates and trends described in previous columns. As better numbers and equations become available, they can be incorporated in the overall methodology.

We've discussed the general lift and drag equations for stable flight at a constant speed. We've discussed Reynolds number effects. We've looked at drag data and drag estimates for induced and parasitic terms, including tailplane and fuselage 'wetted' area contributions. How do we make it all work together?

There have been attempts at writing user friendly programs in Basic or Pascal under the old DOS PC system. However, I'm not aware of a polar calculation which currently runs under Windows (if someone has such a program available, please drop me an e-mail and we'll pass the word in a future column). So I've resorted to putting my own code together in Visual Basic 6.0. If anyone wants it, I'll be glad to package up the files in a ZIP format (including the source code) and e-mail them to you. I can't guarantee it will work flawlessly but most of the potential errors have been trapped and it's proved to be fairly robust for me.

So how do you perform the calculation? It's actually quite straightforward. First start with a choice for the lift coefficient (Cl). Knowing the wing loading and wing area of your sailplane, you can now calculate the velocity at which the plane must be traveling to support constant, stable flight. Also, knowing the wing average chord, you can calculate the average Reynolds number for the wing.

With the Cl and Re now determined, look up the lift data for the airfoil you've chosen and see if a Cl of that value is available at the Re needed. If so, you can now find the angle of attack at which the wing must be flying to produce that Cl. Knowing the angle of attack and Re, the data for the airfoil will also tell you the profile drag coefficient (Cdp) at that lift, velocity and Re condition.

With Cl known and the planform parameters specified, you can now calculate the induced drag (Cdi) and then use your other planform data, along with the Re, to calculate the tailplane, fuselage and parasitic drag from the mathematical models we've discussed in prior columns.

If the initial choice of Cl is too high, drop it a bit until you start hitting the

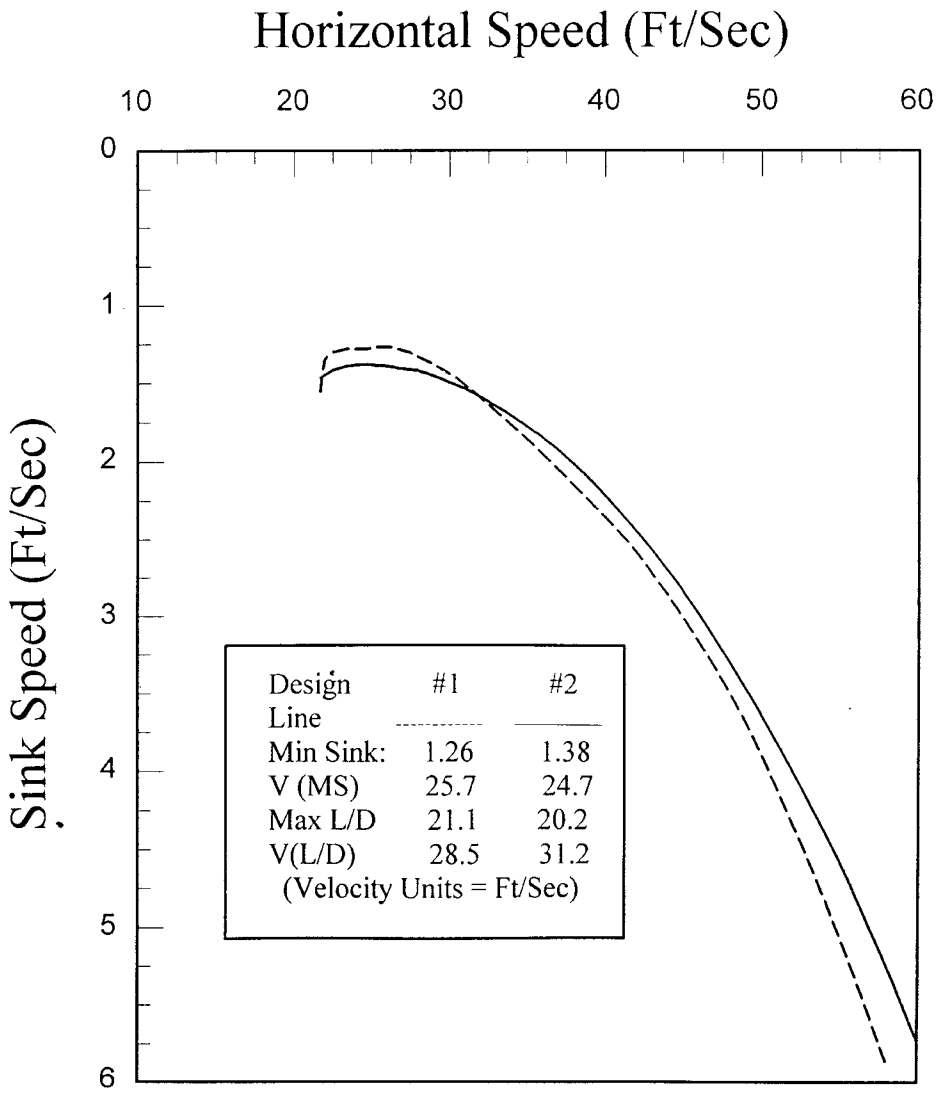


Figure 1: Polar Plot for Design Comparison

data range for the chosen airfoil. Then just increment Cl down a little each time until you've covered the entire speed range of interest. Usually a range of 15 ft/sec to 60 ft/sec is sufficient for most thermal and cross country ships.

With the lift and total drag now known over the speed range of interest, simply take the Lift to Drag ratios to calculate the velocity ratios. This gives you the glide slope angle which allows you to resolve the total velocity into horizontal and vertical components for the polar plot. What could be simpler!

Well, actually, a lot of things in life can be simpler. That's why you've got old geezers like me to write this kind of stuff. Two of the biggest problems in doing these calculations are:

1) Carefully entering accurate and detailed planform parameters, and

2) Interpolating the airfoil data.

The first point should be obvious but the second one arises because most airfoil data (such as the research at UIUC) is taken at a series of constant Reynolds numbers with angle of attack as the variable. It would be extremely unlikely to land exactly on one of the wind tunnel data points by the method noted above. So it's important to accurately estimate what the airfoil data values would be at your flying condition based on laboratory information that surrounds that flying condition but doesn't necessarily match it precisely.

This estimation isn't too bad (using a logarithmic Re interpolation in my case) as long as you're within the laboratory data set. Since most wind tunnel data stops at Re~100,000, and we routinely fly below this value, the low velocity cutoff will often not catch the peak (max L/D or Min Sink) in the polar curves, especially for lightly loaded, high aspect ratio, small ships (the HLG problem).

For today's example, let's compare a couple of 2 meter ships. Our designers have chosen different paths to reach their goals.

Case 1: A high aspect ratio ship with a relatively high lift airfoil to handle the expected higher wing loading. Designer #1 expects the high aspect ratio and wing loading will give good penetration while the high lift airfoil will provide acceptable minimum sink.
Case 2: A low aspect ratio ship with a relatively low lift airfoil. Designer #2 wants good minimum sink from the low wing loading but good penetration by using a low lift airfoil.

In a normal thermal duration event, which ship would you expect to be the preferred performer? Stop for a second and think about it before we look at the conclusions from the polar analysis.

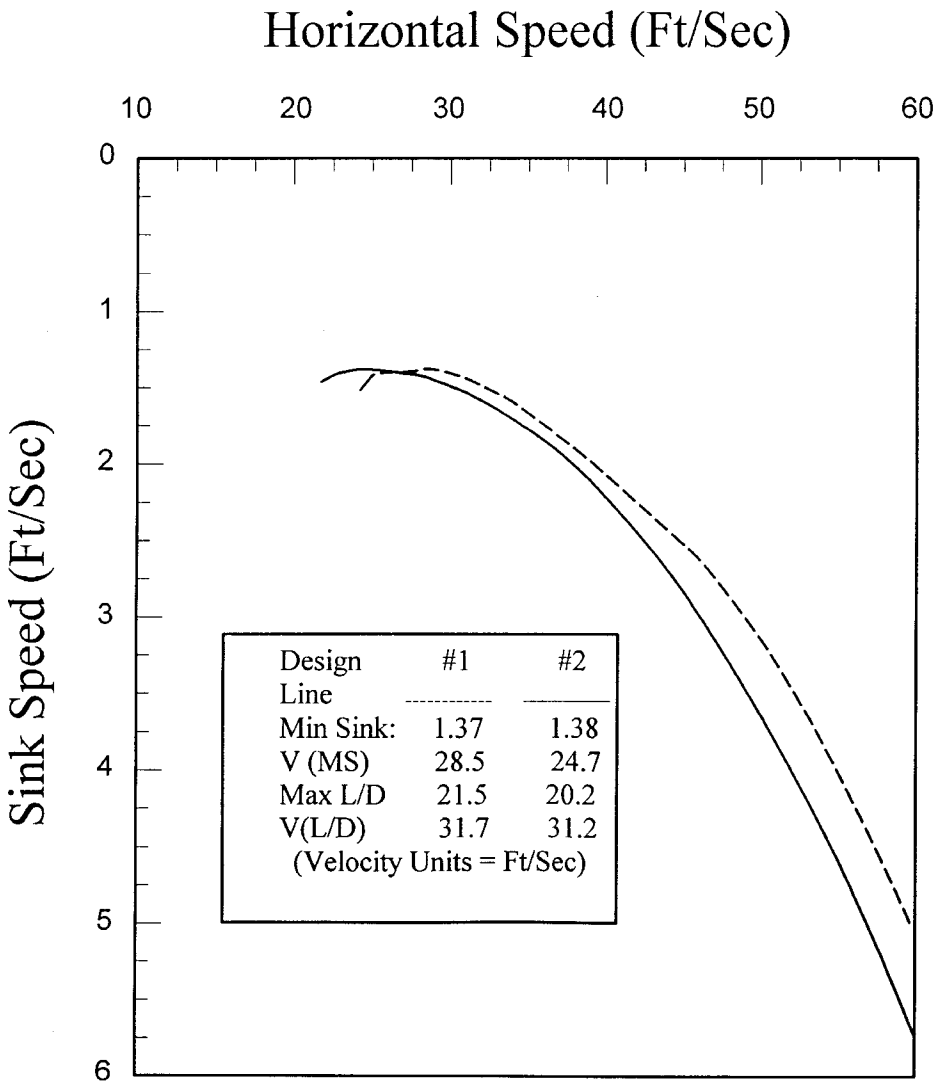


Figure 2: Polar Plot for Ballast Comparison

In both cases we'll use fairly conservative stability parameters for the tail volumes. Both ships will be V-tails with equivalent stabilizer volume coefficients of ~ 0.45 and 0.05 for the horizontal and vertical projections respectively. We'll also use a modest tail moment as expressed in a tail plane angle of 33.5 degrees.

The fuselage areas for both designs will be the same, as will the radio weights (6 servos, 500maH battery, 8 channel FM Rx). We'll assume that both Designers are using foam/composite construction so their wing weights will scale approximately with area (less the servos, of course). We'll use the RDS system to keep parasitic drag to a minimum. Finally, keep in mind that the tailplane areas will also scale with the wing area so that changes the weight as well.

Designer #1 has chosen the SA7038 airfoil (highest Cl of the SA70XX series) and an aspect ratio of 14. Designer #2 has chosen the RG15 airfoil and an aspect ratio of 8.

Based on the above choices Design #1 is estimated to have:

All-up Weight:	35 oz
Wing Area:	445 in^2
Wing Loading:	11.3 oz/ft^2
V-Area (Total):	78 in^2
V-Angle:	97 degrees

Design #2 is estimated to have:

All-Up Weight:	46 oz
Wing Area:	780 in^2
Wing Loading:	8.5 oz/ft^2
V-Area (Total):	192 in^2
V-Angle:	113 degrees

The polar calculations are shown in Figure 1. Both Designers have come up with good performance for their respective ships but each emphasizes a certain area of the performance map.

Design #1, in spite of the relatively high wing loading, has the better minimum sink. However, it's high speed performance suffers somewhat. The higher lift airfoil carries the weight reasonably well but the low induced drag from the higher aspect ratio is probably what really gives this ship the better low end performance.

Design #2, in spite of the lower wing loading, has the better high speed performance. This is due to the low drag airfoil in a region where induced drag is low. However, even with the light wing loading, the induced drag at high Cl (a point at which the RG-15 does not excel!) gives poorer minimum sink.

In a normal thermal contest, which of these ships is most likely to be the better performer? Personally, I'd choose design #1. For light air, I've got better minimum sink. If I need to cruise a bit, my max L/D is also better. It's only if I've got to move out like a scorched cat that I'm at a disadvantage. About the only conditions that warrant that approach is if the wind is up. At that point, I'd add ballast.

Take a look at Figure 2 to see how the polars would work out for 8 oz of ballast with design #1 while Design #2 remains unballasted. At this point, I've roughly matched the minimum sink values for the respective ships while attaining a decided advantage for Design #1 at the high speed end. If I ballast Design #2, I may get back some of the high speed end but minimum sink will suffer.

So overall in this analysis, the high aspect ratio ship comes up the winner on paper. Was that what you expected? In most areas of the country where I've flown, most pilots feel that wing loading is the key to improved minimum sink. Based on what we've learned here, it really isn't the only variable. Wing loading and induced drag (Aspect ratio) trade off with the airfoil capabilities to give you the total performance.

We can see this a little better by looking at the data in figures 3 and 4. Here we've plotted the total drag contributions as a function of lift coefficient for the two initial designs. The drag summary is added up in the following order: profile, induced, tailplane and (fuselage+parasitic). The total has to equal 1 (or 100%) for all conditions.

A comparison of the two designs

Figure 3: Drag Contributions for Design #1

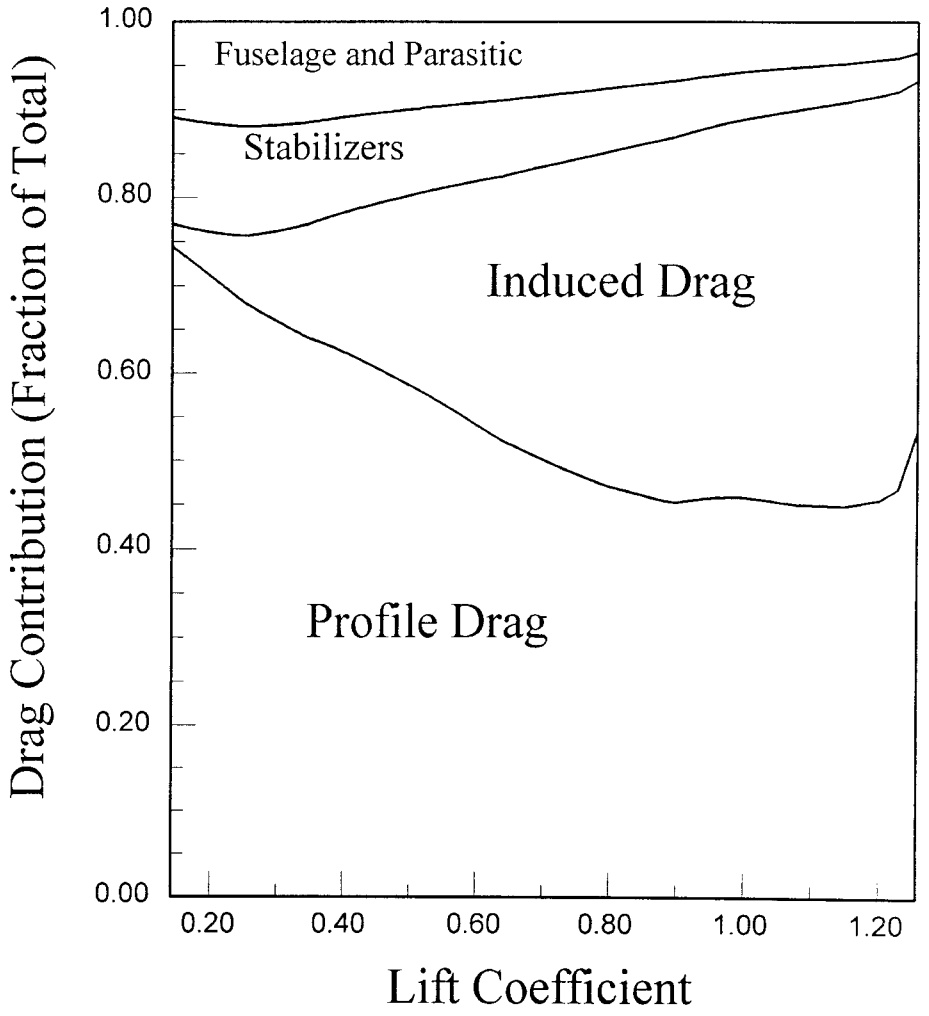
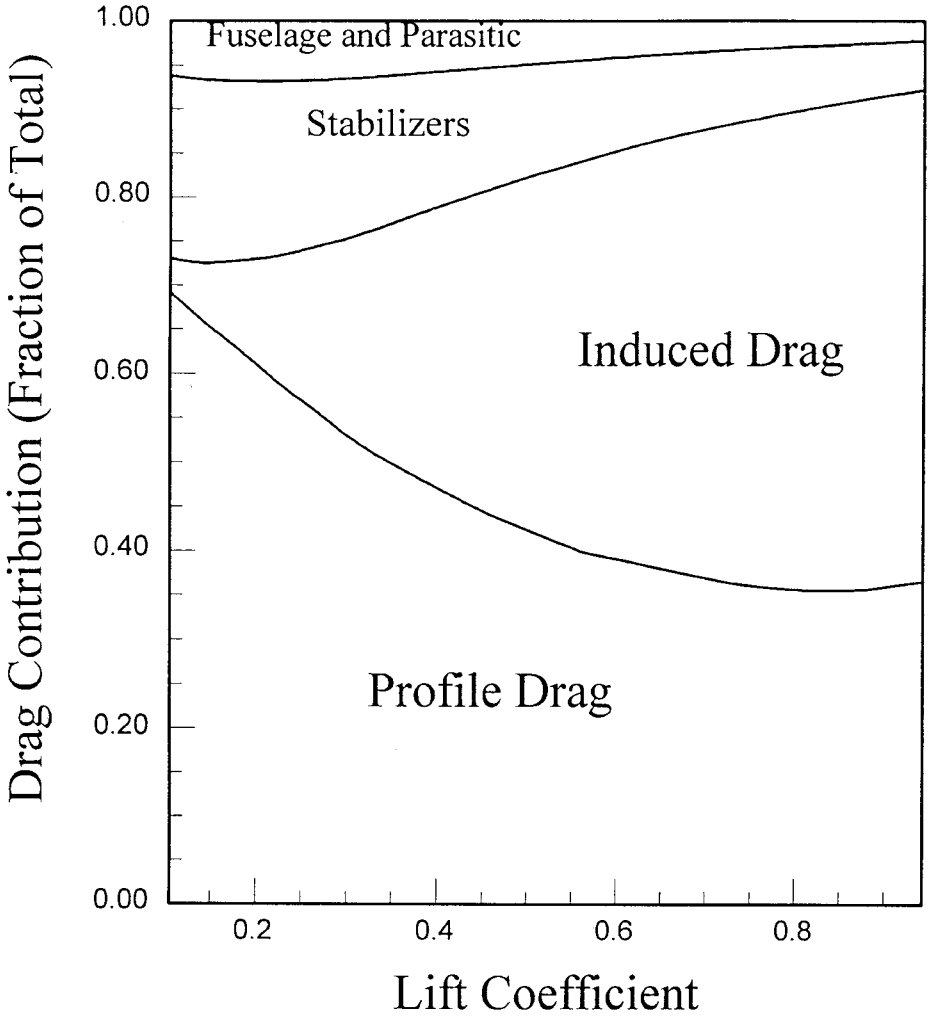


Figure 4: Drag Contributions for Design #2



indeed shows that induced drag for Design #1 is appreciably lower in the high Cl range than for Design #2. At low Cl, induced drag is low for both designs but Design #2 has slightly lower profile drag.

Another interesting point comes from this type of data presentation. Notice that the fuselage and parasitic contribution is typically the smallest term. However, for Design #2 note that the Stabilizer contribution is significantly larger than for Design #1. If you recall from the design summary, the area of the stabilizers for Design #2 was over twice the value for Design #1.

When we kept the stabilizer volume coefficients the same for both designs, the stabs had to scale with the wider chord and increased wing inertia for both pitch and yaw axis control. It's possible to cheat this down a bit for Design #2 but there isn't a lot of room here if one really believes in volume coefficients and the neutral point as a means of estimating control stability.

Hopefully this gives a hint of the utility of this design tool. Next time, we'll tackle the HLG optimization problem, which was the basis for my original T2GF design about 2 years ago. But here we have to look a little closer at the high speed end of the curve since that's the area the plane experiences during launch. We'll also need to look closely at optimizing the airfoil selection using the UIUC database. The results of the analysis are quite interesting in that it suggests a need to look at higher aspect ratio designs than we might normally consider.

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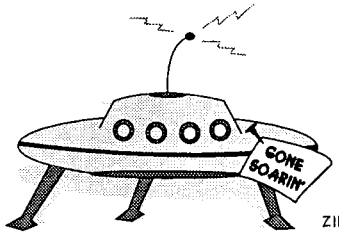

GORDY'S TRAVELS

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New Receiver Technology Is Here! And It's FMA's Fault!

Radio receivers (RX) have been the bane of sailplaners since the beginning of RC Soaring — too big to fit the fuselage, not enough range or glitchy from long servo leads.

We started with AM, then switched over to FM, yet that didn't help much. Then we threw in some PCM, a sort of gimmick that was supposed to make everything okay, but didn't (too much current drain, expense and other things). Then back to just FM.

The size thing changed substantially which was helpful; FMA Direct had a huge impact on that, or I should say Fred Marks of FMA.

Fred has been one of our original pioneers in current receiver technology. You might say he's fought the good fight along side others and the AMA.

So what's the 'new thing'? 'Signal processing' is the answer. It's a smart chip that is programmed to weed out bad bits of information and ushers in the good bits, unlike PCM which piggybacked a servo controlling code on top of the transmitter's FM signal. If the signal got there and the code was compromised then the servos couldn't move. This is referred to as 'failsafe hold' and while settings could be programmed to happen in the case of a 'hold' situation, like initiating crow or up elevator, this turned out to be a feature that sounded better than the value it actually provided. Something else was needed.

Along comes FMA with the Extreme receiver and its first offering of a "microprocessor-controlled decoder" which provides "digital filtering" to further improve noise rejection. (To be fair, the Extreme isn't the 'first' RX to feature a digital processor control, there are others, but they have been less than exciting due to the programming of the 'smart' chip.)

Five channels in a package the same size of a 5-stick pack of gum, but only half the length!

Here's the dimensions:
1.67"L x .80"W x .58"H
Weight is .4 oz (11 grams)

Okay, not only does this little RX have this new digital filtering thingee, but it also meets AMA's 1999 Guidelines and is Dual conversion. So what, you ask? Well that means it's not 'just' a little RX suitable for some tiny electric plane always flown in close, or a Hand Launch competition sailplane flying in the congestion of 40 other planes with TX's right on top of each other. No, it is suitable for IMAA Giant Gas planes, or Helicopter or well anything, because not only does it reject more bad things than previous RX's but it does it as far away as ANY RX made today, maybe better.

So how does it work? Here's what Tim Marks (Fred's son and designer) has to say about it:

> "Range is essentially the same. The Extreme might actually outperform our other receivers a bit in terms of interference rejection or "masking" actually because of the microprocessor. In addition to simply decoding the TX output to the servos, its job is also to analyze the incoming frames and check for noise. If the noise is not too severe, it will simply ignore it. If it gets too bad, it then failsafes to no servo output much like a standard FM

receiver except it does it with much more grace. It has what could be termed graceful degradation. It is really neat to see how it squelches compared to a normal FM receiver.

"An analog decoder will decode every single piece of garbage that comes through. The squelch point is determined by either sampling the IF and then determining that there is too much noise present for useful operation or by detecting the signal strength at IF and determining that it is too low on amplitude to decipher the FM information. The result in either case is that you flip a switch and turn off the decoder chip in effect. No matter what, you either squelch at too strong a signal level, or you end up getting violent chatter at the servos before they shut down. It's always a compromise. With the Extreme, as you take the signal level down lower and lower, it starts to jitter a little, then it might stop, and then come back on until there is nothing left. There is no violent chatter. The code for this chip was written by Sergio Zigras of ZTron. I imagine you probably know him. He is quite a talented programmer. The chip works fantastic. Eventually, we'll probably work this technology into all of our receivers."

I mention that this new RX is really inexpensive? Yep! More features, better performance, lighter, smaller AND less money. Now that's a prescription my hobby can live with!

Good news to the 'super light' community is that its operating voltage range is 3.5v to a whopping 26 volts. That means 3 cells will work fine, still depending on the servo loads as far as how long it will work on 3 cells.

The 5 servo lead connections are placed on the end but plug in vertically. They are compatible with positive shift (Airtronics/JR) or negative shift (Futaba/Hitec); you have to specify which shift version you want.

The bottom-line? Better noise immunity, a more reliable TX to RX connection. FMA Direct, Fred Marks and his sons, aren't done innovating receivers or other goodies for our hobby, they have lots of neat things coming... like a "Flight Stabilizer" - no, not just another Gyro. An infrared sensing device (very tiny and inexpensive too) that can tell the difference in the ground and the sky, even in overcast conditions, that will hold the plane in an activated attitude!

You can find FMA's new Extreme RX on their Web site at WWW.FMADIRECT.COM, or e-mail Fred at Fred@FMADIRECT.com.

Go take a look yourself. I'll be on the road, looking for more neat stuff to share with you, and flying RC sailplanes, of course!

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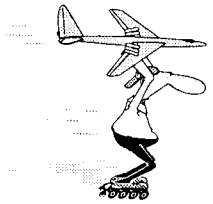
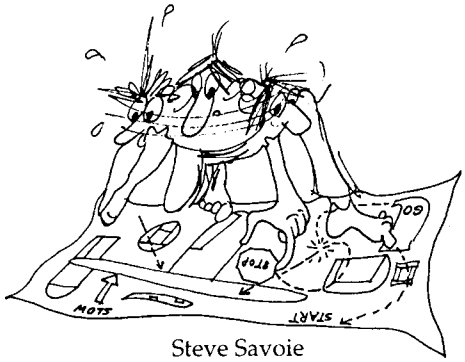


Aerospace Composite Products booth.

"SHORT CUTS"



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Toledo 2001 Model Expo

Just back from and exciting April weekend attending the Toledo Model Expo. I was an invited guest of George Sparr of Aerospace Composite Products and worked the booth to experience the show from both sides of the isle. What an experience it was! The first day of the show (Friday) was wild. This is the day the hard core modelers show up with the kitty money and buy the place out, looking for those discount purchases or new products just released this year. At the ACP booth folks were buying handfuls of carbon fiber products. Especially noteworthy was micro carbon fiber rods in sizes down to .020". These were selling by the dozen and we were almost completely sold out in some of the sizes by the end of the day on Friday. Other hot items were pultruded carbon fiber T sections. These caught everyone's attention and were soon gone along with some new sizes of rectangular rods. By the end of the first day my hands were black from handling so much carbon fiber.

(Below) Matney's Models "Project X."

Several times during the day I was distracted as some of the large 1/3 scale power planes were rolled by on their way to static display. Most noteworthy was a beautiful Hellcat with R/C controlled folding wings, the internal structure detailed to a pin, including hydraulic lines. An 18' (that's right, FOOT) aircraft carrier was wheeled by with working elevators and all the fixings. I was told an interesting story about the first time they had it out for SEA TRIALS. The Coast Guard came by asking to see registration documentation (powered and over 10') as well as a license for the operator. Eventually the owner was relieved when the Coast Guard asked if a life jacket was on board for

Rich Burnowski holding "Graphite" TD, with Chicago Style in background.

each crew member and then broke out in a smile. It must have been funny seeing this 18' model driving around the bay with a bunch of R/C enthusiasts tagging behind in a 15' runabout.

Well, I'm sure most of you don't want to hear about boats but I just had to share the story. So, what did I see new in gliders? I swung by the NSP booth and found it swarming with those little electric park fliers. They don't do a thing for me and it appears that they have taken over the NSP product line based on the appearance of the booth. Not much traditional R/C glider aircraft was on display.

Next on my journey was a visit to the LSF booth where I met Ed Wilson, and Tom and Betty Meyer. I've always supported LSF and it was nice to meet and chat with those putting so much of their time into maintaining this great organization. They did mention a renewed interest in cross country as well as some disappointment that the scale enthusiasts are not participating as much as expected in the NATS, risking the loss of frequency numbers for these events. They were also running a raffle to support the cause of LSF. Tom was modeling one of the LSF Jackets at the booth.

My next stop took me to the Sobox booth. These folks specialize in the import of European F3J, electric and semi scale models ranging in size from 1.5 through 3.6 meter. These kits could be categorized as almost ARF. I did see a nicely crafted wing panel for an "Elf" sheeted with black poplar — it was beautiful. Very nice craftsmanship was obvious on all the models they had on display.

From there I moved on to the Chicago Sky booth run by the Burnowski family. I met Rich in 1988 when I first joined the SOAR club out of the Chicago area where I learned to fly. Seems that Rich is importing some of the high performance European models as well and kitting some of his own. I wanted to see his new RES model as well as his imports. A picture of him holding the "Graphite" TD is included with this article. There was a lot of activity around his booth throughout the event. He did have the largest selection of TD gliders at the show.

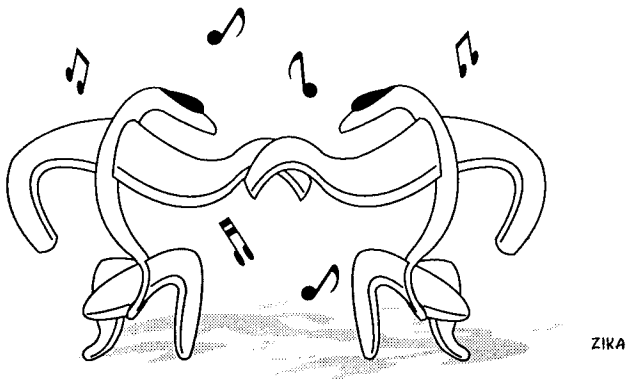
Just past Rich's booth was the Trick R/C booth run by Jerry Teisan. Jerry is in the process of unveiling the new 60" ZAGI TWIN with two 400 motors. I watched the video tape with amazement as this little speedster zipped around a small field. This will likely be a sought after item when it's released for full production.

One pricey little item I saw was a small CNC controlled router system. Granted that at $2300 to $3200 not every hobbyist would have one in their basement, but I'm sure that a few will find themselves into a few kit builders inventory. They are originally fitted for a high speed router head (a dremel on steroids). I'm sure a few will begin showing up soon. They also had a hot-wire variant that was listed at $1200. These products are made in Holland and imported to the US by Bill Griggs Models. You can find them on the net.

My next stop was a bit unexpected when I turned the corner and went by the Matney's Models booth. They specialize in small electrics, epoxy and glass systems. What I saw really got the slope blood in me pumping. It's called Project X and they had a few on display as well as a couple of glass fuselages, or should I just say moldings. This plane is an all glass delta wing which blends into a lifting body forward section nose and canopy. It has two fixed vertical fins angled outward at about 15 degrees and separated by 2 inches with an electric ducted fan unit mounted between the fins. So, who needs an electric fan when you have a slope? Well I walked away with the "Show Special". No one has sloped one yet so I plan to build the balsa fins and vacuum bag them over with a Kevlar/CF hybrid. I may do the same with the glass canopy. As if I don't have enough to do and build, now I go ahead and add to the list. Oh well, I know I'm not the only one.

So, that's a quick summary of the show. If you can get out to Toledo to attend the show some year, do it. It's much larger and less crowded than the WRAM show and the models on display as well as the vendors are some of the best in the US. It's an experience every modeler should have.

And as for new experiences, it looks like I'll be making another move in May and going back to Maine, so there will be a short period of time that "Short Cuts" will not be running. I hope it's not too long. ■



Please send in your scheduled 2001 events as they become available!

SCHEDULE OF SPECIAL EVENTS

June 9-10, 2001
Montague XC Challenge — Montague, CA
Dean/Scott/Randy, (541) 899-8215 Days
Dean Gradwell, (541) 899-7034 eve.
dgair@cdsnet.net

June 9-11, 2001
CANAM Aerotow — Ontario, Canada
Bill Woodward, (519) 653-4251
woodwab@mail.mohawkc.on.ca

June 22-24, 2001
Mid-South Soaring Championships — Huntsville, AL
Ron Swinehart, RSwinehart@msn.com
(256) 722-4311 days, (256) 883-7831 (eve)

June 30 - July 1, 2001
SKSS UNL Thermal Duration & RES (Aerotow & BBQ on Saturday) — Newark, DE
Jim Faassen, (302) 239-4923
jfaassen@dca.net
http://www.silentknightssoaring.org

July 7-8, 2001
CRRC RES Contest — Sudbury, MA
http://www.charlesriverrc.org
Pete Young, (617) 484-0640
pwyoung@ix.netcom.com
Dick Williamson, (781) 981-7857
williamson@LL.mit.edu

July 21-22, 2001
Gerry Knight Memorial Scale Aerotow Rally Y2001 — Ontario, Canada
Phil Landray, (905) 468-3923,
linden@niagara.com
Don Smith, (905) 934-7415,
donsmith@mergetel.com
Charlie Rader, (905) 563-4108

July 28-29, 2001
Rosebowl Soaring Festival — Pasadena, CA
Richard Burns, (626) 857-0024

August 11-12, 2001
Pacific Northwest HL Regional SASS R/C HLG — Redmond, WA
Adam Weston, (206) 766-9804
red@tgworks.com
http://www.reddata.com/SASS

August 11-12, 2001
CRRC Soar-In Contest — Sudbury, MA
http://www.charlesriverrc.org
Dave Walter, (978) 562-5400
dwalter@ultranet.com
John Nilsson, (978) 368-7136
nilssonj@rd.simplexnet.com

September 14-16, 2001
Last Fling of Summer — Broken Arrow, OK
Dave Register, regdave@aol.com

International Scale Soaring Association

There is a growing interest in scale soaring in the U.S. We are dedicated to all aspects of scale soaring. Scale soaring festivals and competitions all year. Source for information on plans, kits, accessories and other people interested in scale. For more information, write to:

International Scale Soaring Association
37545 Oak Mesa Drive
Yucaipa, CA 92399-9507
e-mail: 70773.1160@Compuserve.com
web site: www.soaringissa.org

Reference Material

Summary of Low-Speed Airfoil Data - Volume 3 is really two volumes in one book. Michael Selig and his students couldn't complete the book on series 3 before series 4 was well along, so decided to combine the two series in a single volume of 444 pages. This issue contains much that is new and interesting. The wind tunnel has been improved significantly and pitching moment measurement was added to its capability. 37 airfoils were tested. Many had multiple tests with flaps or turbulation of various configurations. All now have the tested pitching moment data included. Vol 3 is available for $35. Shipping in the USA add $6 for the postage and packaging costs. The international postal surcharge is $8 for surface mail to anywhere, air mail to Europe $20, Asia/Africa $25, and the Pacific Rim $27. Volumes 1 (1995) and 2 (1996) are also available, as are computer disks containing the tabulated data from each test series. For more information contact: SoarTech, Herk Stokely, 1504 N. Horseshoe Circle, Virginia Beach, VA 23451 U.S.A., phone (757) 428-8064, e-mail <herkstok@aol.com>.

BBS/Internet

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

Classified Advertising Policy

Classified ads are free of charge to subscribers provided the ad is personal in nature and does not refer to a business enterprise. Classified ads that refer to a business enterprise are charged $5.00/month and are limited to a maximum of 40 words. *RCSD* has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs. Personal ads are run for one month and are then deleted automatically. If you have items that might be hard to sell, you may run the ad for 2-3 months.

For Sale - Business

PARACHUTES: $12.50 (includes S&H U.S.A.) Send check or money order to Dale King, 1111 Highridge Drive, Wylie, TX 75098; (972) 475-8093.

FENDERS! Cover your aileron and flap pushrods with a set of fenders, to help protect bottom of wings & control horns. Price (check or money order): $5.95 (set of 4) + $3.50 S&H USA. (Texas residents add 7.250% sales tax.) Viking Models, U.S.A., 2 Broadmoor Way, Wylie, TX 75098; (972) 442-3910.

DesignAire: EASY TO USE AIRCRAFT DESIGN SOFTWARE (PC). 3-D sketch, performance, Wt/Bal, inertias, color graphs, panel analysis, static stability, airfoils, FAR 23A loads and envelope. Runs "airfoil ii". $119. JammAero POBox 69, Wallops Island VA 23395. www.jammaero.com.

BUZZ WALTZ R/C DESIGNS: Kits & plans. www.buzzwaltzrc.com or phone: 760-327-1775.

For Sale - Personal

RnR XBSC cross country ship with low milage. Install receiver, trim and fly. Includes 6 Airtronics servos and battery pack, plus original RnR shipping case. $550 UPS COD. Bob Sowder, Memphis, TN, 901.751.7252 eve., or e-mail <bsowder@wmctv.com>.

Father retiring from sport and my wife will kill me if I don't clean up my shop. Built models are outstanding craftsmanship and in mint condition. Price listed or P.O., plus shipping cost. Sagitta 900 built with spoilers and Futaba radio... $300.00. Pulsar 100" w/S3021 w/5 servos... $300.00. Gentle Lady w/Futaba radio... $200.00. Windspiel Kestrel 19 kit in box, glass fuse., 134.5"... $200.00. Electra kit in box w/elec. motor... $60. John, (860) 651-9126, Connecticut.

T.W.I.T.T.

(The Wing Is The Thing)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $20.00 (US) or $25.00 (Foreign) per year for 12 issues.

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

The League of Silent Flight (LSF) is an international fraternity of RC Soaring pilots who have earned the right to become members by achieving specific goals in soaring flight. There are no dues. Once you qualify for membership you are in for life.

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

Send for your aspirant form, today:

League of Silent Flight
c/o AMA
P.O. Box 3028
Muncie, IN 47302-1028 U.S.A.

http://www.silentflight.org

Sailplane Homebuilders Association (SHA)

A Division of the Soaring Society of America

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

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

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

The Vintage Sailplane Association

Soaring from the past into the future! The VSA is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. The VSA publishes the quarterly BUNGEE CORD newsletter. Sample issues are $2.00. Membership is $15 per year. For more information, write to the:

Vintage Sailplane Association
1709 Baron Court
Daytona, FL 32124 USA

The Eastern Soaring League (ESL) is a confederation of Soaring Clubs, spread across the Mid-Atlantic and New England areas, committed to high-quality R/C Soaring competition.

AMA Sanctioned soaring competitions provide the basis for ESL contests. Further guidelines are continuously developed and applied in a drive to achieve the highest quality competitions possible.

Typical ESL competition weekends feature 7, or more, rounds per day with separate contests on Saturday and Sunday. Year-end champions are crowned in a two-class pilot skill structure providing competition opportunities for a large spectrum of pilots. Additionally, the ESL offers a Rookie Of The Year program for introduction of new flyers to the joys of R/C Soaring competition.

Continuing with the 20+ year tradition of extremely enjoyable flying, the 1999 season will include 14 weekend competitions in HLG, 2-M, F3J, F3B, and Unlimited soaring events. Come on out and try the ESL, make some new friends and enjoy camaraderie that can only be found amongst R/C Soaring enthusiasts!

ESL Web Site: http://www.eclipse.net/~mikel/esl/esl.htm

ESL President (99-00): Tom Kiesling (814) 255-7418 or kiesling@ctc.com

20TH ANNUAL
ROSEBOWL SOARING FESTIVAL AND TRADE SHOW
JULY 28TH AND 29TH, 2001

2ND EVENT OF THE WESTERN STATES SOARING TRIAD
SPONSORED BY THE PASADENA SOARING SOCIETY
THIS IS AN AMA AA SANCTIONED EVENT. ALL AMA RULES APPLY.

LOCATION: PASADENA'S BROOKSIDE PARK - ROSEBOWL SOARING FIELD

CLASSES: THREE CLASSES THIS YEAR. UNLIMITED -TWO-METER - 3 FUNCTIONS PLUS SENIORS 62 AND OVER AND AMA JUNIORS UNDER 18.

TIME: PILOTS MEETING 8:30am EACH DAY -- FIRST FLIGHT 9:00am EACH DAY

FLIGHTS: THREE ROUNDS OF PRECISION DURATION (3, 5, and 8 MINUTES)
FOUR FLIGHT ADD-EM-UP FOR 26 MINUTES NOTHING OVER 8 MINUTES

TROPHIES: UNLIMITED - 1ST THRU 10TH PLACE. TWO-METER - 1ST THRU 5TH PLACE.
TEAM - TOP FOUR DUES PAYING MEMBERS OF ONE AMA CLUB
SENIOR 1st AND 2ND - AGE 62 AND OVER. RES - 1ST AND 2ND PLACE. JUNIOR 1st PLACE

RAFFLE: FANTASTIC FOLLOWING THE LAST ROUND ON SUNDAY

TRADE SHOW: MANUFACTURERS WILL DISPLAY WHATS NEW IN THE HOBBY BOTH DAYS

RV PARKING: FREE OVERNIGHT PARKING ON FRIDAY AND SATURDAY. NO HOOK UPS AVAILABLE.

INFORMATION:

CONTEST DIRECTOR	TRADE SHOW	SCORING
RICHARD BURNS	KARLTON SPINDLE	AL ZIMMERMAN
(626) 857-0024	(818) 838-6467	(818) 500-9019

ENTRY FEE: $35.00 FOR FIRST ENTRY. $15.00 EXTRA TO FLY TWO CLASSES. ENTRY FEES NONREFUNDABLE.
ENTRY FEES RECEIVED AFTER JULY 10TH ARE SUBJECT TO A $5.00 PER CLASS SURCHARGE.

Submit Entry Form early for best frequency availability. No entries will be accepted at the field this year. Entries will be accepted on a first come, first served basis. List of local accommodations will be supplied with confirmation form.

MAIL ENTRY TO: PASADENA SOARING SOCIETY
AL ZIMMERMAN
1328 BRANTA DRIVE
GLENDALE, CA 91208

ENTRY FORM: PLEASE MAKE CHECKS PAYABLE TO "PASADENA SOARING SOCIETY"

NAME: _____ AGE 62+_____
STREET: _____ RV PARK _____
CITY, STATE, ZIP: _____ 18 or under_____
PHONE NUMBER: ( ) _____
AMA NUMBER: _____ TEAM DESIGNATION: _____
FREQUENCY CHOICES: UNLIMITED 1ST _____ 2ND _____ 3RD _____
TWO-METER 1ST _____ 2ND _____ 3RD _____
3- FUNCTION 1ST _____ 2ND _____ 3RD _____

T-Shirts @ $14.00 ea.
M ____ $_____
L ____ $_____
XL ____ $_____
XXL ____ $_____
ENTRY FEE $_____
TOTAL $_____

WE WILL DO OUR BEST TO PUT PILOTS AND THEIR TIMERS TOGETHER BY SPACING FAR ENOUGH APART.
TIMERS NAME _____ FREQUENCY _____