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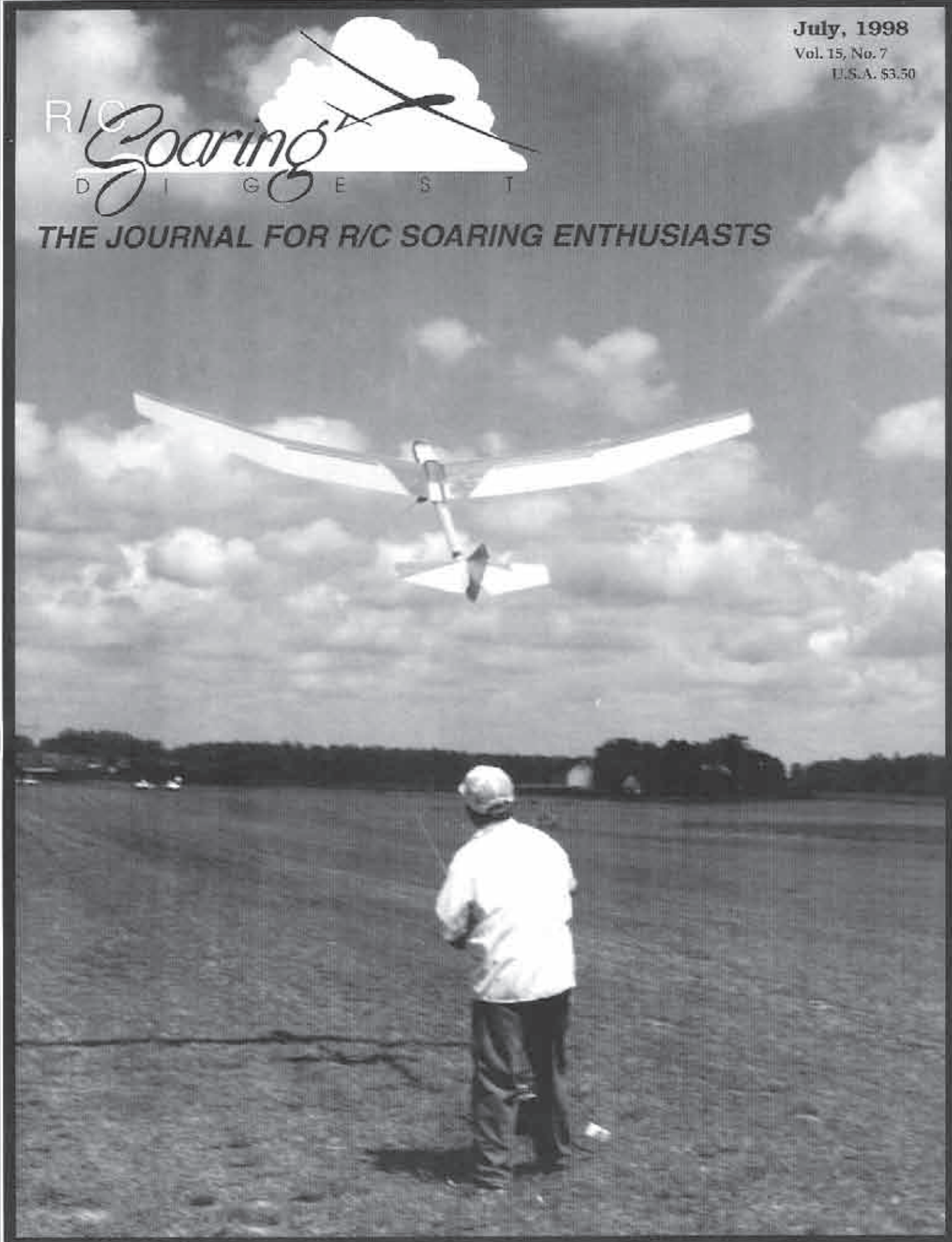
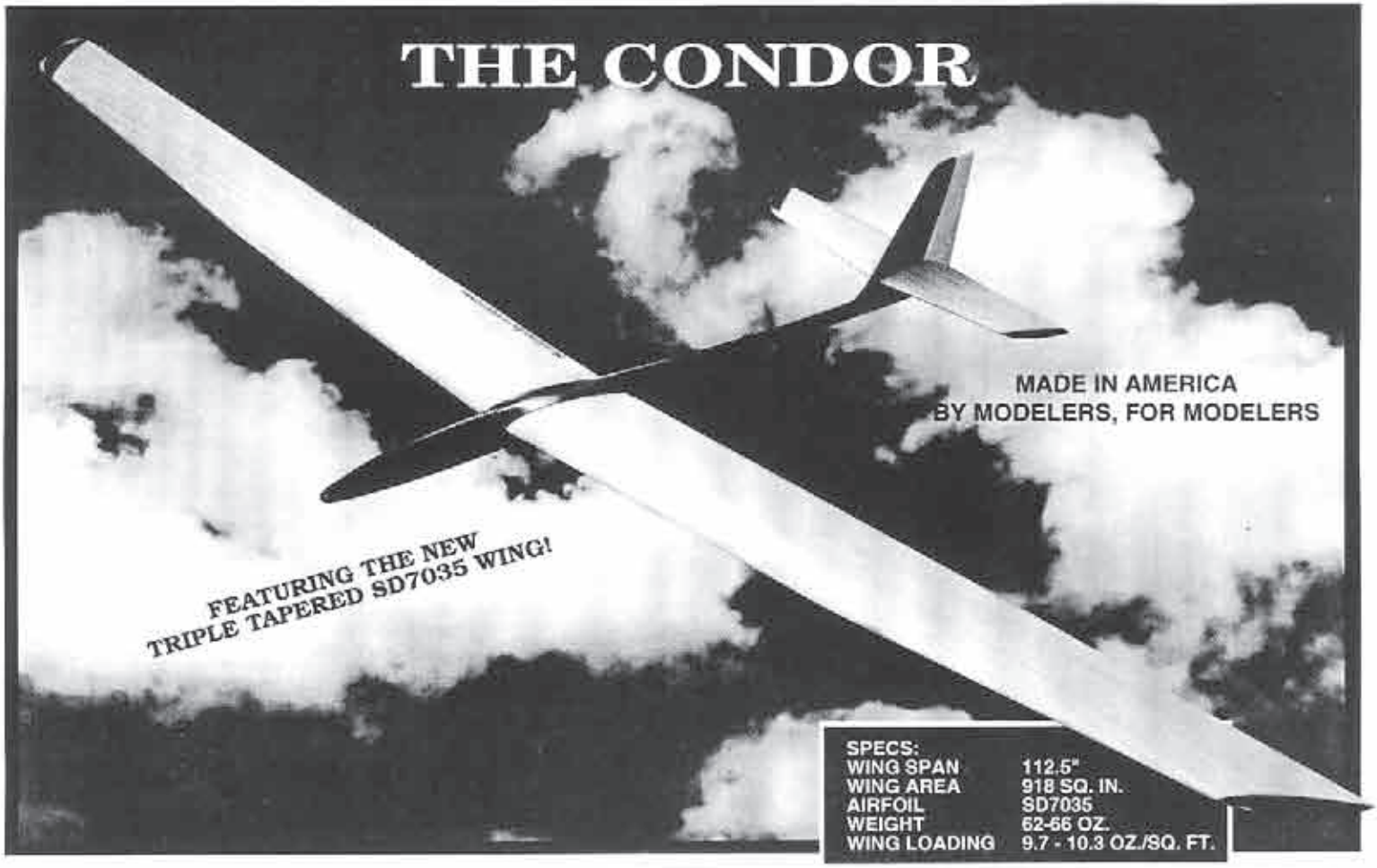
R/C Soaring DIGEST

THE JOURNAL FOR R/C SOARING ENTHUSIASTS





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

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

CONDOR

Tomorrow's Sailplane, Technology Today

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

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

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

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

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

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OTHER GOOD STUFF

R/C Soaring Digest (RCSD) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January, 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of all articles, model designs, press & news releases, etc. are the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author. *RCSD* was founded by Jim Gray, lecturer and technical consultant. He can be reached at: 210 East Chateau Circle, Payson, AZ 85541; (520) 474 3015, <jimpeg@netzone.com>.

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Artwork
Gene Zika is the graphic artist who designs the unique ZIKA clip art.

The Soaring Site

Heat of the Day

Long before the sun throws its rays across the landscape, just northeast of Dallas, here in Wylie, the thermometer already registers at least 80°. It's already hot. Or rather, the temperature was allowed to drop from sizzling 100° plus temperatures down to a more comfortable 80° during the night! And, today, is like yesterday, and the day before... And, the heat index says it's hotter...

Some of you are lucky, and live in an area with low humidity. Perhaps, the temperature hardly reaches 75° for several days in a row. It's comfortable. But, what happens if you are planning to attend another event quite some distance away? What if you're headed for a state that's setting heat records? Have you planned for that?

There are many events scheduled across the country, and most usually draw at least a few folks from other states, both as contestants and spectators. It is well advised for those that attend from long distances, to bring sunscreen, a hat, a source of water (where practical), and shade. If you can't bring it, try to find someone that will have it waiting for you when you arrive.

For those that live locally and are relatively used to the heat, keep a close watch on your friends that are attending from other states. While water and shade are essential, small things like a small electric fan hooked up to a generator may just save the event.

A couple of years ago, at the Mid-South Soaring Championships, they had a R/C pilot who was also a doctor, on hand. He was ready with an emergency kit, just in case anyone got too much sun. That's a marvelous idea, and for any club holding an event, if you haven't already thought of it, check out the club rooster, to see if there's anyone listed that has medical expertise.

Stay cool, and have fun!!

Happy Flying!
Judy & Jerry Slates

NOSTALGIA

Chuck Anderson launches a Sailaire in Nostalgia event at 1996 NATS in Muncie, Indiana.

Photography by David D. Garwood, Scotia, New York.

Jer's Workbench

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A Shopping I Did Go!

Sanding Sticks

The other day, I took the usual drive into town to pick up my monthly supply of tobacco. While there, I noted an interesting shop across the street called Sally's Beauty Supply. Ah, ha, I thought. A bit of browsing is in order, as one never knows what may turn up on the shelf of a supply house - any supply house!

Sure enough, one shelf contained an interesting assortment of finger nail files. "These will make perfect sanding sticks," I thought, carefully studying the selection, which ranged from very fine to coarse. I selected some medium and coarse sticks. The medium ones have 220 grit on one side, and 320 grit on the other. The coarse sticks are 100 grit on both sides. As the sticks are washable, they can be used to wet sand a surface, easily. At 89¢ each, this seemed like a bargain, indeed.

Zurich R/C Sunglasses

Feeling rather pleased with the sanding stick discovery, I headed for the local hobby shop, Texas R/C, my next scheduled stop, before heading home. I sorted through various racks of hardware, accessories and assortments of wood, collecting supplies on my shopping list. Depositing my selections on the counter, another neat discovery caught my eye: Zurich R/C Sunglasses. Having seen their ads in major magazines, I just had to try them on.

I was delighted to find that these sunglasses fit perfectly over my regular prescription glasses. Just to make sure they were right for me, I stepped outside into the hot, blazing Texas sun. The fit was perfect; the wraparound style kept out side glare, and provides protection from wind and dust. If any of you want to give them a try, check out your local hobby shop. But, if they don't carry them, additional information can be obtained from Zurich International at (800) 533-5665.

98-99 Plans Catalog

Another neat discovery this last month is the new 98-99 Plans Catalog from Traplet Publications Ltd. in England. The catalog contains 100's of aircraft plans: power scale and sport designs, scale and sport gliders, PSS and electrics, plus hints and tips on building from plans. The cost is US$8.00.

Traplet Publications Ltd.
Marketing Department

Author with new wrap around Zurich R/C sunglasses.

98-99 Plans Catalog.

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■

Sanding sticks. Medium one on left and coarse one on the right.

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Estimating Altitude

Source Unknown

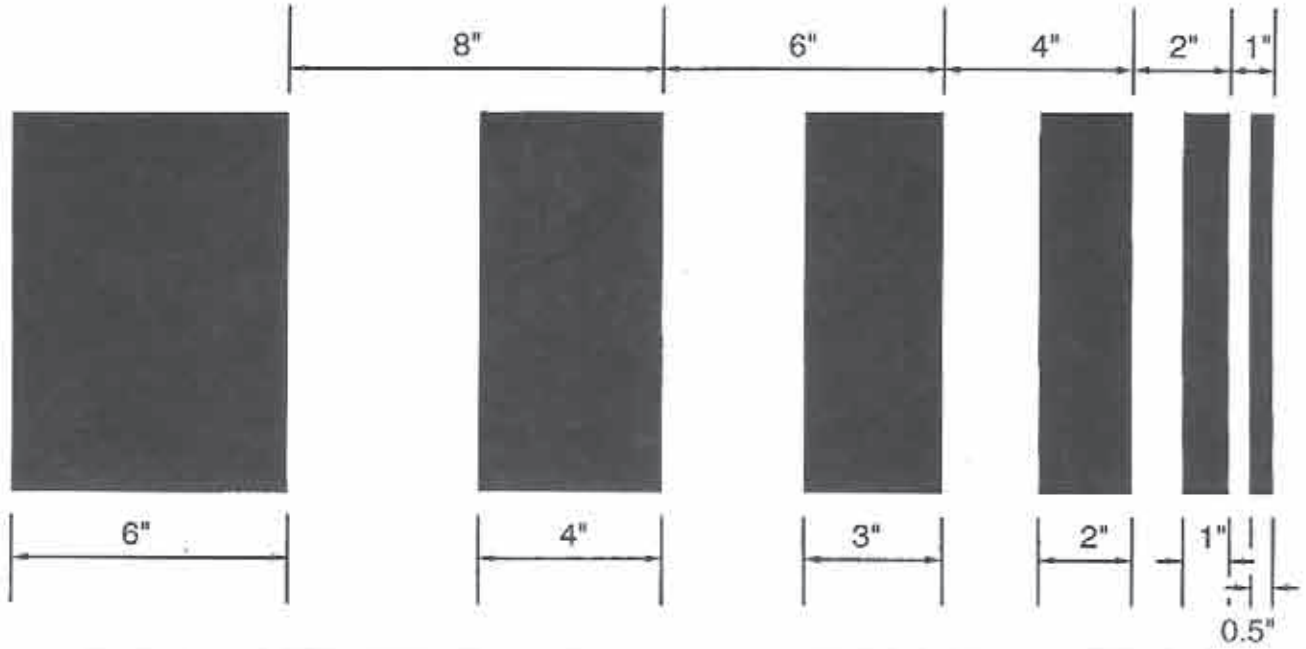
Here's a rather interesting (some might say attractive) method of approximating the altitude of your model.

The stripes are mounted on the bottom of the wing, and they should be of a color which will contrast directly with that surface. In the air, simply see how many stripes are evident and look up the relative altitude range in the accompanying table.

Stripe width and the spaces between the stripes are somewhat critical. Any change from the measurements shown will of course adversely affect altitude estimates.

Smaller models may not have room for the largest stripe, but using the remaining five stripes will give a good estimate of lower altitudes. Just be sure to adjust the table accordingly. ■

STRIPES VISIBLE	ALTITUDE
6	below 200'
5	200 - 400'
4	400 - 800'
3	800 - 1200'
2	1200 - 1700'
1	1700 - 2500'
0	over 2500'



on the Wing

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Steve Morris' Computer Stabilized Flying Wing Project

In our December 1996 column, we included the following quote from Hans-Jürgen Unverferth of Germany:

> "Why do we use radio controls? To build constructions characterized by very high 'own-stability'? It's a joke! We have to be creative; fantasy has to rule our thoughts! Think about the F-16, B-2, all the modern fighters. There is no 'own-stability,' there is a computer! This is the future of model sailplaning. And there is one geometry waiting for this time — the tailless glider!"[1]

In July of 1987, at Dillon Beach California, an actively controlled unstable flying wing aircraft was successfully flown. This month's column is devoted to an in-depth description of the aircraft and systems which made that success possible.

The actively controlled unstable flying wing aircraft project was completed by Steve Morris (mentioned in a previous "On the 'Wing..." column), Rick Miley, and Dave Larkin, collectively called The Palo Alto Shipping Co., under the direction of Prof. Ilan Kroo of Stanford University and Dr. R.T. Jones.

At the time of project inception, Steve had already been involved in the design, construction, and flying of a number of tailless RC models. He had written a rather sophisticated computer program to aid in the design process, and had, in fact, designed, built and flown a preliminary model of the S.W.I.F.T. (Swept Wing with Inboard Flap Trim) rigid wing hang glider.[2]

One problematic aspect of tailless flight which intrigued Steve can be directly related to "planks" and planforms with moderate rear sweep. When the elevator on a plank is deflected upward, it is to increase wing lift. Yet the upward deflected elevator creates a severe downforce which limits overall lift. Additionally, drag increases significantly more rapidly than lift. See Figure 1.

What Steve was looking for was a way to deflect the elevator downward to increase lift. One way of achieving this is to use a swept wing planform in which the wing sweep angle is such that the elevator can be placed inboard and ahead of the center of gravity (CG). See Figure 2. While a standard swept wing with elevator outboard can be envisioned to be similar to a conventional tailed sailplane (Figure 3A), this highly swept configuration with inboard elevator is similar to a canard configuration (Figure 3B) in that the control surface for pitch is forward of the CG.

Moving the elevator inboard normally requires a substantial increase in the sweep angle. In the accompanying diagrams, Figures 2 and 3B, the wing sweep angle is around 45 degrees. It should be noted wing sweep angles of over 30 degrees are not usually considered viable for subsonic flight because of severe cross-span flow and excessive effective dihedral at high coefficients of lift.

An alternate method of solving "the elevator problem" is shown in Figure 4. In this case the CG is placed behind the aerodynamic center (AC). This makes for an unstable aircraft which cannot be flown for a sustained period by a human pilot, but otherwise solves the elevator problem, as well as making for a more efficient airplane. As Hans-Jürgen stated, an unstable airplane requires computer control. This is the route The Palo Alto Shipping Co. chose in order to achieve their goal.[3]

The basic aircraft was designed using a vortex lattice code.[4] This provided stability and control information, and defined an optimal level of instability. The design was formulated to explore flight characteristics at 6.5% static instability in pitch. An overview of the aircraft exterior is shown in Figure 5.

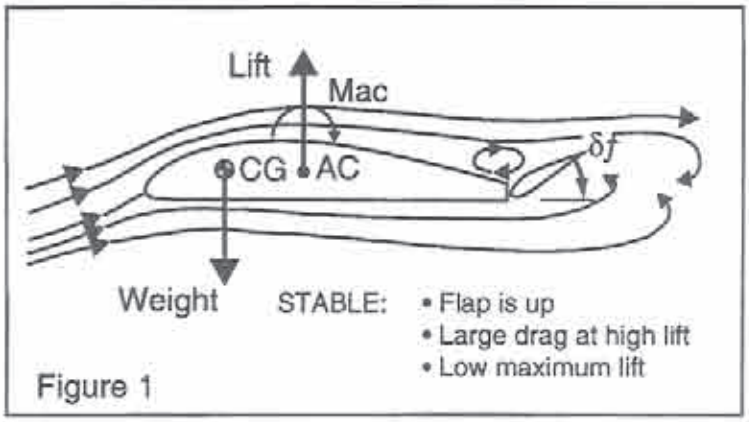

Figure 1

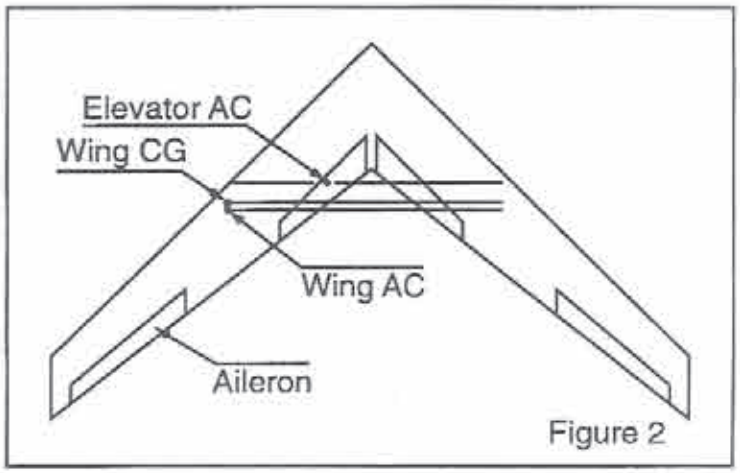

Figure 2

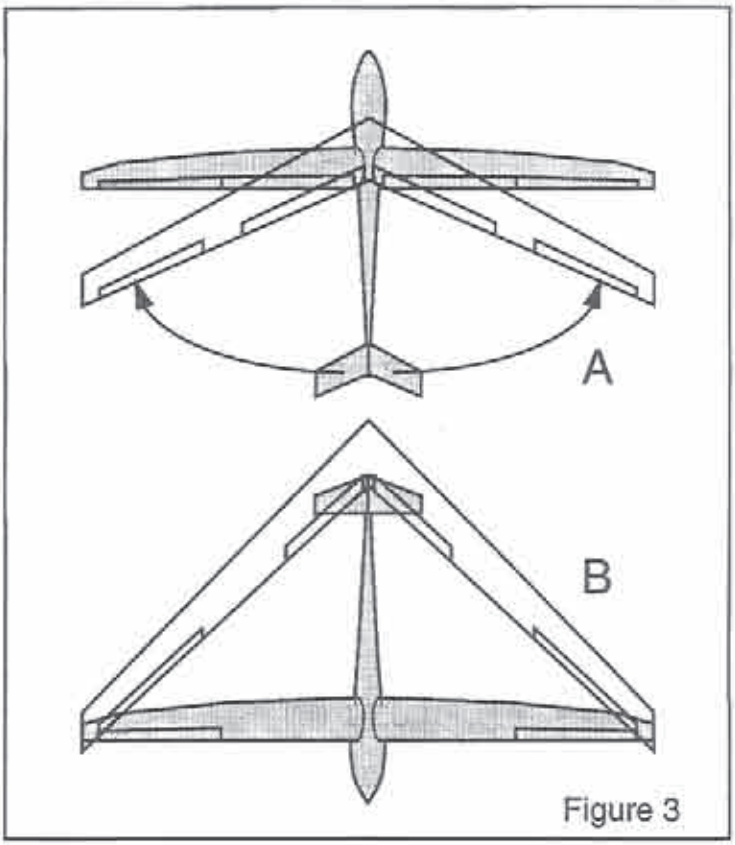

Figure 3

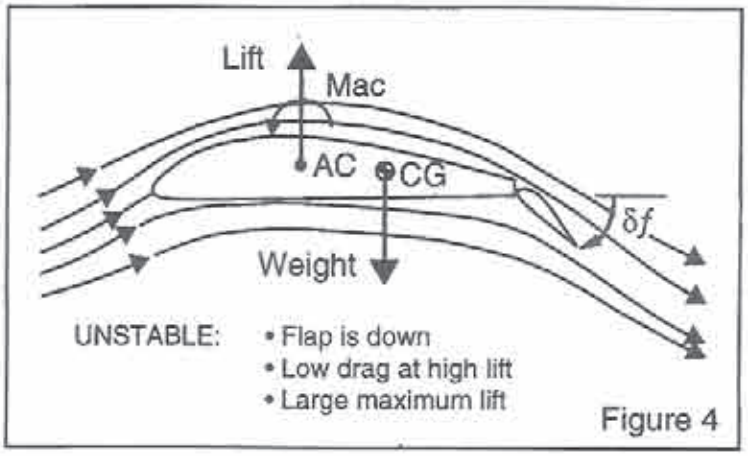

Figure 4

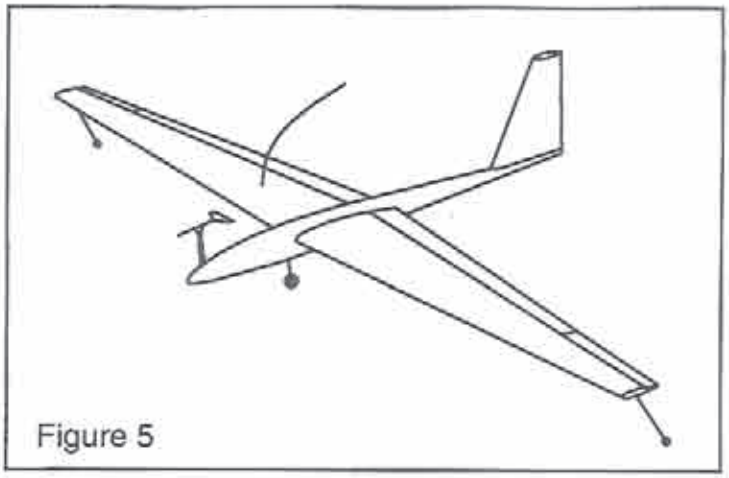
Figure 5

Control of the aircraft was handled by an onboard computer consisting of a Motorola 68000 CPU with a floating point coprocessor — essentially a Macintosh motherboard. The computer combined the input from an angle of attack sensor (a vane mounted near the nose) and a pitch rate sensor (an RC helicopter gyro) with the pilot commands transmitted from the ground, and sent appropriate signals to the flap servos in the wings. The aircraft hardware layout can be seen in Figure 6.

The computer control algorithm was determined by "flying" the wing on a single axis gimbal. The gimbal was mounted on a Jeep which was then driven down a quiet road. Because of the relatively short time to double in pitch, just 0.3 seconds, special high speed servos were needed to keep up with the feedback cycle and avoid unwanted excursions in pitch.

In addition to controlling the flap surfaces, the onboard computer also collected data from eight channels at 20 Hz. and stored the information in RAM for later downloading to a conventional Macintosh computer on the ground. Two minutes of data could be collected before RAM was filled.

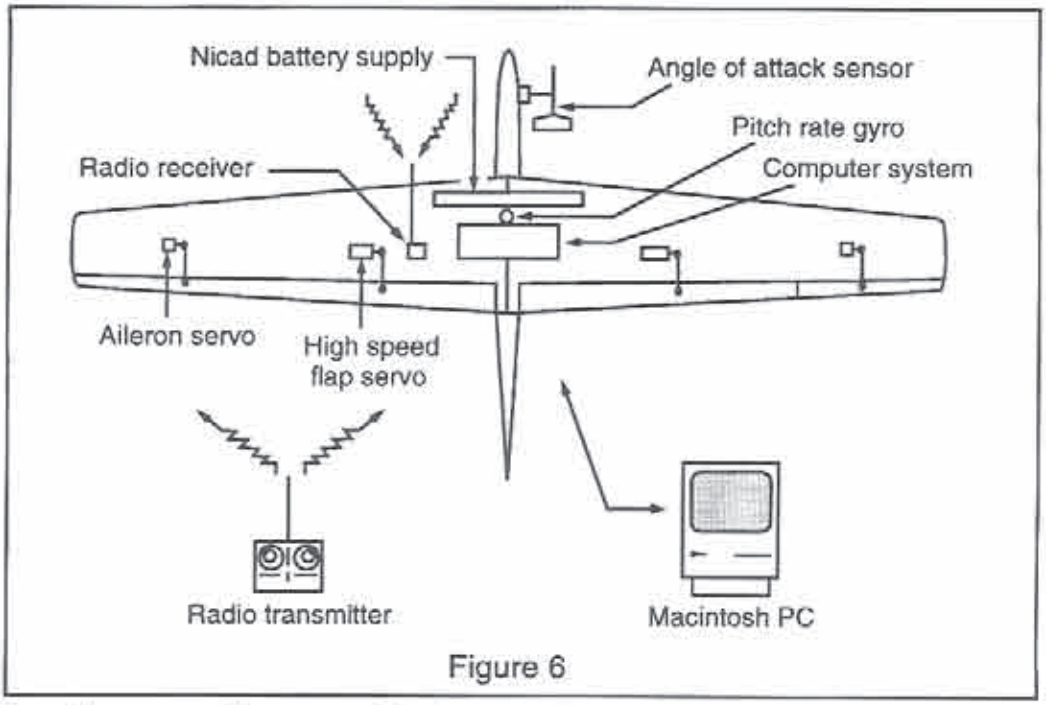

Figure 6

Because of the computer and associated battery supplies, the 12 ft. span glider weighed 20 lbs., ready to fly.

At Dillon Beach, the aircraft was hand launched from the top of a sand dune and directed by control inputs from a standard RC transmitter. The first flight was made with the CG forward of the aerodynamic center; the CG was moved rearward for subsequent flights.

After launch, the glider was flown through an "S" turn and flared for landing. Collected flight data indicated that the time to double in pitch was 0.298 seconds when the aircraft was 6.5% unstable. This closely matched the data collected during ground testing. Yet the flight characteristics were so unremarkable the videotape retains the comment, "Boy, if you didn't know that thing was unstable... you wouldn't know!"

The aircraft was finally flown at 9.0% static instability, well beyond the design instability point of 6.5%. In this condition, flap deflections were extreme while turning and during the flare for landing, and flight data showed a marked decrease in performance.

Given the low cost of small computers and the ease with which various peripheral data acquisition devices can now be constructed and connected, we anticipate similar and more advanced experiments involving unstable tailless sailplanes in the near future.

Since that successful series of flights at Dillon Beach, Steve has been involved in a number of other tailless projects:

• As previously mentioned, Steve is co-designer, along with Ilan Kroo, of the S.W.I.F.T., a foot-launchable flying wing sailplane now being produced by BrightStar Gliders of Santa Rosa, California. Steve was involved in the Doctoral program at Stanford University at the time.

• In 1990 he created an autorotation system for swept wing tailless aircraft for use in vehicle recovery.5

• Developed an oblique wing demonstrator, powered by a standard model airplane engine and propeller combination. The wing-fuselage angle was not adjustable. CNN carried a news story on the model in 1991, complete with commentary by Dr. R.T. Jones.5

• Steve designed, built and flew an oblique wing demonstrator aircraft for NASA in May 1994. The wing sweep angle varies from 35 degrees at takeoff to 68 degrees at cruise, necessitating rotating the pylons on which the two Viojett ducted fan engines are mounted. The model has a span of 20 feet and weighs 80 pounds. It is constructed of a foam and Kevlar sandwich, and has an aluminum spar and steel landing gear supports. There are ten trailing edge control surfaces and two moveable fins. Eighteen servos are required to fly the airplane and steer it on the ground. (Yes, all four landing gear struts are steerable as well.) An onboard com-

puter system reads the pilot's radio commands and combines this information with data collected from six onboard sensors. Eleven data channels are recorded in RAM for downloading after landing.6

• Steve is currently involved in the design and production of several "spy planes," including the winner of the first University of Florida Micro-Aerial Vehicle Flyoff. A more recent design, The Bat, an 18 inch span, 16 ounce swept wing aircraft, is powered by a small off-the-shelf internal combustion model airplane engine. Able to carry two video cameras, this small aircraft is currently undergoing study as a viable surveillance vehicle.7

If you have comments or suggestions for future "On the 'Wing..." columns, please contact us at P.O. Box 975, Olalla, WA 98359-0975, or at our e-mail address, <bsquared@halcyon.com>.

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■

Buzzard Agreement

By William G. Swingle II
Pleasanton, California
bill_swingle@electro-test.com

Nearly every day I see buzzards thermaling directly over the freeway on my way home from work. In the past, I thought they were taunting me. I was sure of it, in fact. I whined and complained to them (and others), but the buzzards just kept flying and laughing. The fiends!

I wrestled with the anguish for a long time, but did eventually find a way to over come it! The buzzards and I came to a mutual agreement. They promised not to fly before 8:00 in the morning and to stop laughing loud enough for me to hear them from my car while I'm driving. This way I wouldn't have to see them more than once a day nor endure their taunting laughter. In return, I promised to stop complaining and simply smile and wave as I passed each day.

It was an equitable agreement. I actually began to enjoy (somewhat) seeing them in the afternoons. At least someone was enjoying the air instead of it going to waste.

Then the buzzards broke the agreement. On my way to work today, long before our agreed time of 8:00 a.m., I saw them. Straight over the freeway, in plain sight of everyone, they were coring a thermal! There they were for all the world to see. They weren't even trying to conceal their betrayal! I was shocked at their brazenness. How could they do this? Wasn't the harmony of our agreement worth anything to them? My anger was building and may have gotten out of hand, but as luck would have it nature was on my side. One of the treasonous buzzards began to flap his wings! The lift died and they had to disband and look elsewhere for lift. I felt relieved. It's selfish; I admit it, but I was glad their thermal died.

However, in hindsight, I'm ashamed of my reaction. I'm thinking our agreement should be dissolved. Good lift is a treasure and I'd hate to force my feathered friends to pass it up just for my sake. Ah, the heck with it; go for it my friends! I'll just stick to smiling and waving.

■

KIT REVIEW

RnR's New Synergy 914 Design

By Ron Swinehart
Huntsville, Alabama

The photograph gives a good overall view of the really nice layout of RnR's latest creation, the Synergy 914. This plane is a derivative of the Synergy V, designed by Rich Spicer in early 96. What this means is that the wings have been fitted to the fuselage of a Synergy 91 while the airfoil is an RG-14; thus the name, Synergy 914. The wings on this plane are identical to the Synergy V design, in that they are hollow, all molded, two piece wings that plug into the fuselage using the basic Synergy 91 rectangular carbon joiner rod, combined with the original wing's terrific spar system. The basic wing section is designed to approximately 30 g's, which means they don't flex much on any kind of launch you want to make.

The airfoil on this machine as stated above is a RG-14, which means it is a whole 8.47% thick with a whopping 1.58% camber line. What this leads to is that at about an 82 oz. flying weight, with a wing loading of 12.4 oz/ft^2, this bird will really scoot. The wing span is 117 inches, with a wing area of 975 sq. inches, which gives it an aspect ratio of 13.9/1. Of special note is the fact that the stab area is 102 square inches or 11% of the wing area. With these design aspects the plane will come in on final glide slope just about as slow as you want to go, and the stab will not stall out on final. The rudder fin has also been extended approximately one inch higher than the normal Synergy 91 fuselage fin; therefore, this plane has a much better yaw control response while on final landing approach. (No tendency to deviate from original heading.) The reason I place so much emphasis on these two points is that a lot of you out there may not have taken the time to learn how to land the old Synergy 91's or the 91 SE.

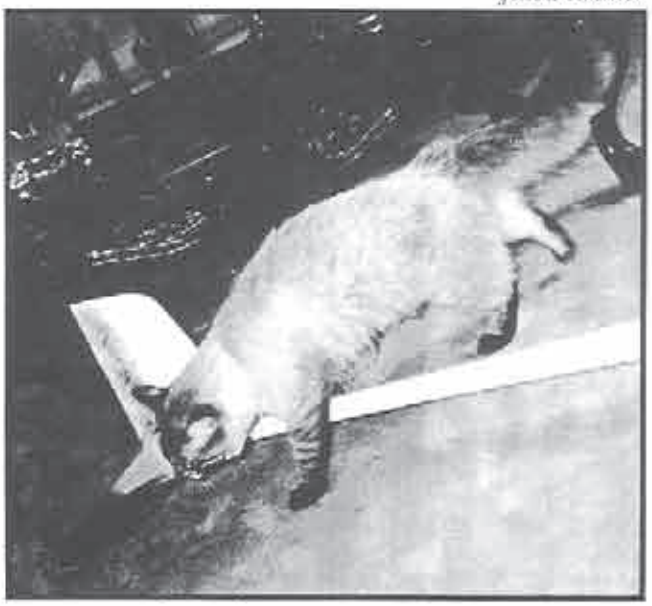
I have flown several of both of these planes since early '92, and will admit that they take some getting use to, but I have managed to earn two of my three LSF level V wins flying one of these planes. The most notable being the High-Over-All trophy at the '97 Mid South Championships. The 91 SE is easier to land than the 91, partly because it is 10 to 12 oz. lighter than the old 91's and it also has approximately 12% more flap area; but even this plane, in my opinion, does not hold a candle to the landing capabilities of the new 914 bird.

An additional unique point that I want to bring out about this design is the special treatment given to the wing tips. Yes, the colors are really nice. (special touch produced by Scotty Meader), but that's not what I am talking about. The two things that have been done to really enhance the overall flight characteristics of this plane are as follows. The aileron's outboard edge has been pulled in approximately six inches from the wing tip, in addition to the fact that the trailing edge of the wing tips has been rolled up about four degrees. (That's called wash-out.) The first of these two design modifications tends to keep the tip vortices off of the aileron control surface, thus reducing the overall wing drag, while the second feature makes this wing planform very forgiving when it comes to stalls, either on final landing approaches or during launches. Even at this flying weight, the plane will slow down to a crawl on final approach to landing with no indication of any stall tendencies.

In conclusion, this plane will launch as high as any plane on the market, with no wing flex, and believe it or not, with decent flying skills, it will thermal with the best of them, partly because you can count on no stalls when you have to slow down to work those really low, tight thermals. Landings? Need I say more? I averaged 92.5 points for five rounds of precession thermal duration last weekend, with two of these landings being within one inch of the 100 point mark, in addition to a 100 pointer on the AMA L4 landing tape. If this is not enough, this plane, like all of the RnR products, will take the abuse of contest flying. The quality of the final product has to be seen to be believed. The wings are almost flawless, extremely sharp trailing edges, with a straightness of this trailing edge that is nearly perfect. RnR products do not take a back seat to any European product when it comes to overall quality of the finished product. ■

Ron Swinehart with Synergy 914, built by Scotty Meader. Color work on wing tips and stabs is really nice. Done in molds. Bottoms of wings and stabs are black with matching red tip work. Photo by Steve Siebenhaler.

Booger inspects Ron's plane, wing tip to stab. Quality counts! Second Synergy has blue wing tips, with white and yellow slashes.



TECH TOPICS

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A little while back, Judy Slates graciously asked if I'd like to be a regular contributor to *RCSD*. While accepting her invitation, she warned me that the toughest part might be picking out a title for these adventures. She was right!

If you've read this far, you can see its called 'Tech Topics'. That's partly because I've used up most of my clever by-lines as newsletter editor for different clubs. But it also reflects (I hope) that I do this for fun and two subjects have captured my interest over the past 25 years: soaring technology and soaring technique.

Technology is the appropriate use of design and materials to reach a desired objective. Technique is the development of the appropriate skills to take advantage of the available technology. Anyone who has been in this sport for a number of years has seen both of these change significantly. Anyone who's just getting into the hobby is reaping the harvest of those who went before them.

With that said, many folks are put off by these terms. It's for the 'hot pilots', not for the fun fliers, 'too complicated for me to understand', etc. I hope the tone of this column will convince you that 'Tech Topics' applies to everyone. You don't need to be a contest flier to enjoy a great flight on a summer evening. The topics we hope to cover apply as much to fun flying (and building) as to competition.

We'll cover some different ground here - special projects such as winches, flying techniques, custom wings, design approaches, etc. Hopefully some of it will appeal to part of the group each month. It will have a mid-western flavor since that's where I live and fly. Contrary to popular opinion, there are life forms between the left and right coasts other than cows and corn. And some of them are pretty good builders and fliers. We'll solicit opinions, hints and tricks and try and share as much as we can.

So, as an example of what this is all about, let's stop the philosophy and get down to business. This month it's 'technology' and we'll continue the theme of the May and June articles by tackling some design considerations for R/C HLG. After we struggle our way to the end of the design ideas, we'll build one and see if it comes anywhere close to expectations.

Design Considerations for R/C Aircraft

One of the flaws in designing model aircraft is that we think of a parameter as an independent variable. That is, we can change it and nothing else happens. Ain't so. If you want to change aspect ratio, for instance, then either your span or your average chord are going to change. That means you'll be changing the weight of the ship, which will affect the wing loading. That will affect its flying speed and the overall flight envelope as well as the Reynolds number at which it will be performing. Quite a mess.

Obviously, the proof of your genius lies at the flying field. But there is a lot of work to get your concept in the air. So, can you do some 'paper designs' to get a feel for things? This won't necessarily pin the last decimal point on performance but it should give you a look at trends to narrow your selection.

I certainly believe you can do that. Otherwise I wouldn't be wasting your time this month. The design tool we'll use is a polar plot for the estimated performance for your ship. We won't go into details of the math for awhile. Suffice it to say that all of the information you need has been presented in Martin Simons' excellent book, "Model Aircraft Aerodynamics" and in the many informative columns he's written for *RCSD*. Bill and Bunny Kuhlman also have an excellent text, "Understanding Polars Without Math", as well as several other great references available at their website (http://www.halcyon.com/bsquared/).

Since representative airfoil data is now available from Prof. Michael Selig's group at the University of Illinois (http://amber.aae.uiuc.edu/~m-selig/), we have all the tools we need to make our performance estimates. (Contact Herk Stokely at Herkstok@aol.com for availability of these invaluable reports.)

If we properly account for airfoil effects (UIUC database), induced and parasitic drag, and make realistic estimates of our building skills (weight of the finished product) then we can review how our design approach will look relative to other ways of laying out the ship. After that, you've just got to go fly to see how it really works.

The best place to start is with something that already performs reasonably well. You know how it flies and what it weighs so you've got a real solid reference point. Since Joe Galletti introduced me to the 'BOB' approach to building, I've put together two new HLGs that weigh between 10 and 10.5 oz. each (check the

Figure 1: Aspect Ratio Study

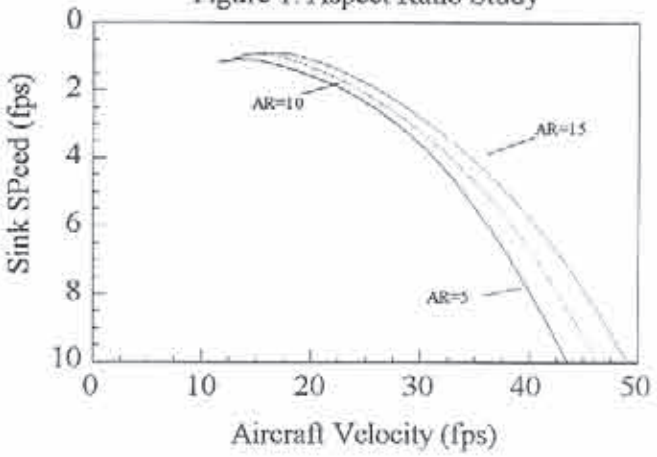


Figure 2: HLG Airfoil Comparisons

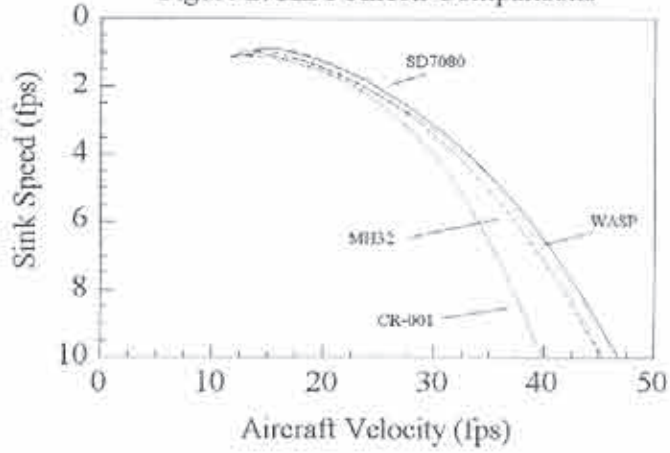


Figure 3: HLG Airfoil Comparisons

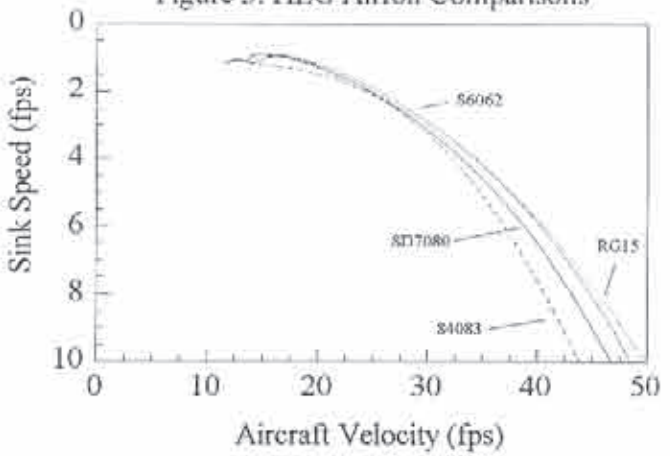


TABLE 1- Tahlequah HLG

Wing Area	345 square inches
Wing Weight	3.65 oz.
Battery Weight (225maH)	1.6 oz.
Receiver (RCD 5 ch)	1 oz.
Servos (2 S-90)	1 oz.
Total stab area	76 square inches
Total stab weight	0.75 oz.
Fuselage	2.25 oz.

TABLE 2 - Design Targets

Case	1	2	3	4	5
Span	60	60	60	60	60
Aspect Ratio	5	7.5	10	12.5	15
Wing Area	720	480	360	288	240
Average chord	12	8	6	4.8	4
Total stab area	159	106	79	63	53
Total weight	15	12	10.4	9.5	8.9

TABLE 3 - Performance Results

	Min Sink	V(MS)	Max L/D	V(L/D)
Case 1	1.09	13.5	13.5	16
Case 2	0.97	14	15.5	16
Case 3	0.93	15	17	16.5
Case 4	0.91	15.5	18.2	17
Case 5	0.90	16	19.2	18

TABLE 4 - Design Comparison for Different Airfoils

Airfoil	Min Sink	V(MS)	Max L/D	V(L/D)
S4083	1.11	13.5	13.5	19.0
WASP	1.07	13.5	14.6	18.5
MH32	0.97	14.5	15.6	15.5
CR-001	0.94	13.5	14.5	14.0
RG15	0.98	16.0	17.0	17.0
S6062	0.94	16.5	18.0	17.5
SD7080	0.92	15.5	17.4	17.0

BOB website at: http://www.world-quest.com/bobplane/). So, I can use those as a realistic starting point for figuring things out. Table 1 gives the actual weight of component materials for this design.

I'll assume (since this is a poly ship) that any changes in wing weight will scale with area. I'll also change the weight to reflect changes in the total stab area using the RVC and TVC values developed in previous articles in *RCSD*. That lets me run through a design series where I want to look at Aspect Ratio and other effects on the overall performance of this general design. To cover a wide range of parameters, we'll let aspect ratio vary from a very low to a very high number to see what happens. See Table 2.

To run polar calculations on these designs, we need to pick an airfoil. I like the SD7080, and wind tunnel data is available, so we'll go with that for a start. Other assumptions are:

1) Parasitic drag is relatively constant across these ships. The parasitic drag coefficients I'm using were ones obtained from fitting the Beron-Rawdon data for measured polars from many years ago. We can discuss that sometime if anyone really wants to get deep into techno-geek speak.

2) Induced drag can be approximated by the familiar Cl*Cl/(Pi * Aspect Ratio).

(Yes, I know, there are short comings and limitations to all of the above. But remember, we're trying to get in the right ballpark so we can get to the field and check it out!)

Finally, let's put some expectations on how we want this ship to perform. That will play somewhat into the airfoil selection, but it's also affected by the planform options.

First, I'd like to have a minimum sink velocity less than 1 ft/sec. Why? Because I'm approaching geezerdom and can't throw real high, but I bet I can hit at least 30 ft. most of the time and some contests require a 30 second event.

Next, I'd like to hit minimum sink at a speed of ~ 14 to 16 ft/sec. This is a comfortable speed range for working low, tight thermals (my experience). Flying much faster than this at low altitudes gets a little dicey in my book.

Finally, I'd like to have a maximum lift to drag ratio somewhere in the 15 to 18 range. That gives me a cruise range (from my feeble 30 ft. launch) of somewhere around the length of a football field and part way back. Maybe all the way back with just a hint of lift.

In order to look at this data (graphically) we plot the sink speed of the aircraft (vertical axis) against the horizontal speed. The peak in the curve is the minimum sink point. The maximum Lift to Drag ratio can be found by drawing a line from the origin of the axes to a point that just touches the curve (tangent). This is always just a bit farther out than the minimum sink condition and represents the most efficient attitude for flying your dream ship.

So let's run the cases we put together in Table 1 and see if we're just completely out of luck here. The numerical values are summarized in Table 3 but cases 1, 3 and 5 are shown in the accompanying plot (Figure 1) so you can visualize the trade-offs.

Based on this simple analysis, a real low aspect ratio ship just isn't where you want to be in the HLG class. Flies slow but sinks fast! At the high aspect ratio end, the velocity for minimum sink is getting right at the upper end of where I want to be for good light air thermaling with this airfoil. But the analysis clearly shows that the performance targets are attainable within the 10 to 12 aspect ratio region.

Now we've also included Reynolds number affects so we've accounted for the fact that we'll be using relatively small chords. In the limiting case (#5 - a 4 inch average chord), we really don't see any 'bad' characteristics showing up for the SD7080. So I'd infer that no matter how I lay out the design, a minimum chord of 4" won't get me in too much trouble. Although I'd shoot for a more modest aspect ratio (due to speed considerations), a 4" tip chord, for instance, shouldn't worry me too much.

Just for the fun of it, I also ran this same analysis for some of my earlier 'Godzilla' creations. Sheeted wings, larger servos and other things that came in around the 14 oz. range. The same general trends can be concluded, but with the proviso that I can only come close to my minimum sink and velocity targets around a 10:1 aspect ratio.

Airfoil Selection

Based on everything we've got so far, I'd pick an aspect ratio ~11 as a good starting point for finalizing a design. The tail moment and stabilizer areas were covered in the June issue so, with this choice of aspect ratio, the tail group is now defined, as well.

With a 4" tip and a 5.5" average chord, I have a maximum root chord of 6.5" (constant taper), or a 6" root with a constant chord center section out to half the span. Or any other combination I like, based on my personal sense of aesthetics. So far this design stuff is pretty flexible.

Now I want to use this planform and see what effects airfoils may have on the final result. Again, we're looking for trends and not an absolute number since you can only get those by actually getting out to the field with your pride and joy. What we're simply trying to avoid here is having your pride completely shattered and your joy splattered in little pieces all over the field.

Fortunately, there is a wide range of airfoils that have been tested under the UIUC program. Now some of us aren't going to like the results of this analysis, but this is the data we've got to work with right now. So if the outcome we're going to show doesn't fit your idea of how things really work, I'd suggest building a bunch of wings and trying them side by side on the same ship to prove I'm wrong. In several of the cases, I've 'been there, done that' to back up the results.

Back to business. The base case is the SD7080. We also have data on the following sections (among others): MH32, WASP, CR-001, S4083, RG15 and S6062. There are a lot more in the UIUC database, but these are some of the ones in current HLG use. I've summarized the results of the polar analysis for all of these sections in Table 4. These are also presented in two plots to compare against the base case (since it gets too busy with them all on the same graph).

Now in addition to the numbers in this

table, the high velocity end of the graph should be studied a bit. In Figure 2, note that the SD7080 not only exhibits the best minimum sink, it also has improved high speed efficiency. This should be an asset in the launch phase for this type of ship. The larger than expected velocity separation between min. sink and max L./D in some of this group of airfoils is due to separation effects, which can be seen in the airfoil data.

This is why I gave up designing my own airfoils years ago. 'Shaving a little off the top' works great for the marines, but it leads to unpredictable results with airfoils. Heck, anyone that's tossed a balsa glider knows that even a flat plate flies pretty good. These days it's not simply a question of being able to fly, it's how efficiently an airfoil flies; it's hard to beat some of the design work that Prof. Selig's group has done.

Finally, in Figure 3, we compare the SD7080 and some of the Selig designed airfoils. The real surprise (for me) is that the best of the lot appears to be the S6062. Good minimum sink, with the best max L/D. The RG15 has been a popular HLG airfoil for light, fast ships, and this analysis seems to indicate that the S6062 might be a slightly better choice. The S4083, which was intended specifically for HLG applications, would not appear to be as good as the SD7080 from this analysis.

So, here are my conclusions thus far:

1) For general light air performance, the SD7080 looks like an excellent all around airfoil.
2) For higher speeds, and possibly better launches, the S6062 and RG15 look very interesting.
3) An aspect ratio of around 10 to 12 is optimum for a 60" span at a 10 to 11 oz. total weight.
4) The tail group can be designed as indicated in the May and June articles.

Now I can't guarantee that putting an SD7080 or a S6062/RG15 on a ship like this will be better than anything else on the planet. On a relative basis it looks pretty good and this is the best data we've got right now. I'd certainly be confident that the SD7080 is usually going to beat the S4083 and most likely the CR-001 airfoils. But pilot skill and a lot of other things come into play as well. But if I'm going to have the satisfaction of knowing I designed it and built it and flew it, this analysis has given me all the guidelines I need for a start.

The upshot of all this is a simple pod and boom design I've called 'Tahlequah' for reasons to be explained later. It's been built to all of the above specifications and flies quite nicely. For serious competition, I'd suggest going with CR or DJ or Maple or any of a number of very fine high performance ships. After all, these guys do this for a living so they've got to be good.

But for messing around with a platform from which you can experiment quite a bit, I'd suggest following along through the next time.

Besides, I've plagiarized every idea on this ship and will gladly give credit to everyone's ideas that have been used. And if an old klutz like me can do it, just imagine what you can design with the keen insight and killer flying skills you've gained from tossing the old Skeeter around all these years. (Gadzooks! He said the flame word again!)

■

Aerotowing Is Alive and Well In Eastern Maine

By Robert Harvey
Cherryfield, Maine

Here in southeastern Maine, the wind usually blows fairly hard, restricting us to one good and several, waiting for a lull, flying days a week. Through July, August and early September the afternoon sea breeze comes off the nearby ocean, cool and damp. At my limited thermalling skill level, the best way to get a decent flight is to get up fairly high, and hope to find an area of lift. Occasionally, one can get a low altitude "nudge" to ride up, but most of the time, things are better at a thousand feet, as opposed to a hundred feet.

Dana Bartlett, my power flying buddy, and I rigged up a Pussycat to fly up piggyback on Dana's Robin. After a bit of debugging, this proved to be a reliable way to get the sailplane up high enough to find lift. By the end of the flying season, this became so routine that we started hunting for a new project. I had read about aerotowing in *RCSD*, and Dana thought this should be challenging enough to keep us busy through the '96 flying season.

Before this year's flying season, Dana put a tow release ahead of the trailing edge on his Robin, and I whipped up a Bobcat with the following changes:

1) Tow release

   The servo was mounted upside down on the fuse side between the rudder/elevator servos and the battery. (As shown in *RCSD*, July '96, page 33.)

2) Belly wheel

   Since we fly off a macadam surface, this was a necessity. A 1 1/4" tailwheel from Dana's parts box was mounted on a piece of 1/16" ply, with pine fairing blocks, and screwed into the tow hook mounting block. This was worthwhile, since the takeoff run, lift off, and good rollout after a clean landing are some of the more pleasurable aspects of aerotowing

3) Wing tip skids

   We used weed wacker sized nylon monofil, glued into the wing tip blocks, pointing aft at about a 45° angle. We also tried loops of monofil, which were not as good as the open ended skids, as they would sometimes catch on small stones and skew the sailplane badly on takeoff.

Our tow line was about 100' (later shortened to 60') of nylon chalk line from the hardware store. This stuff is quite stretchy, so we left out the shock cord section. At the towplane end, we have a length of fly fishing line, which is fairly stiff, and thought to be less likely to interfere with the control surfaces. The loop to the sailplane is 40# nylon covered steel leader wire, with crimped sleeves fastened to the towline with a large fishing snap swivel.

The Bobcat flew well under tow. The rudder kept it lined up while on the ground, and at towing speeds the ailerons were quite effective in keeping the wings level with the tow plane. Being towed is very much like three-dimensional water skiing, and the same rules apply; try not to get caught on the inside of a turn. After this got to be routine, we loaded the Pussycat and its saddle onto the Robin and were soon filling the sky with sailplanes.

Obviously, it was time to seriously raise the ante. Dana had been R/C flying and full-scale flying for so long that he needed an almost continual challenge to keep his interest. This is my third season in the present incarnation (I had flown escapement equipped A-1 Nordics, and a manually-pulsed Super Sinbad in the early 60's.); each flight is still a rush. However, I think that helping Dana with his projects has upped my learning curve.

So, we picked up a Bird of Time kit, and whipped it up during the Atlantic salmon fishing season. I built the wing and Dana built the rest. It didn't seem too long before we were hooking it behind the Robin.

It was a quiet morning; the first tow went off real well. The B.O.T. looked real stately in the air. Then, the wind picked up to more than we were comfortable with, so we decided to quit while we were ahead. We packed the wagon and headed down the road, thinking, "This is a lot easier than I thought it would be."

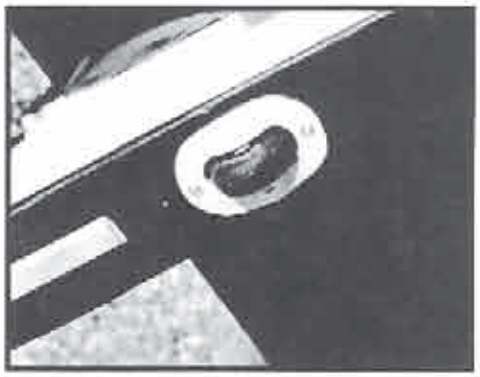
And then, we went on to aerobatics, unintentionally it would seem...

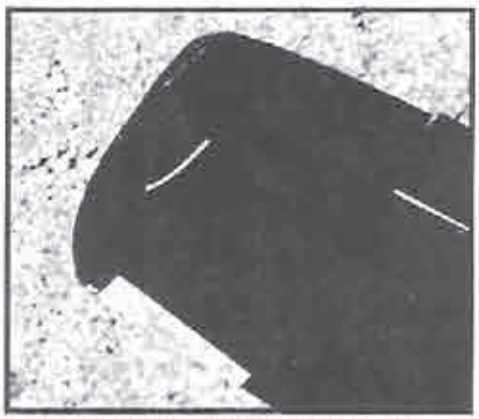
Another pilot with a lot of flying experience was enlisted to tame what we called "The Wild Ride". His findings were similar to mine: knife edge and inverted flight - sometimes not in the same general direction as the towplane. We broke a towline, crumpled a bit of the B.O.T. leading edge, and generally had a great hassle trying to repeat our first flight. We tried the Pussycat wing on the Bobcat, poly vs. aileron, with another experienced pilot at the controls. This effort caught a gust at the wrong time, resulting in an inverted takeoff. All the while, after going a few rounds with the B.O.T., we would have 4 or 5 uneventful flights with the Bobcat, under the same conditions.

Armed with this data, Dana had me replace the trailing edges in the center sections, with ailerons driven by servo, set in the center joint through torque arms. Since Dana's wagon was brought to accommodate several rigged, nine foot fly rods, there was no problem transporting the fully assembled B.O.T. wing.

The first flight with these changes went off smoothly. An unscheduled tow plane turn on the second flight brought on some severe whoop-do-doos that resulted in another crumbly section in the leading edge sheeting that Dana repaired with a light fiberglassing. The wind never let up, and Dana left for Florida with a wagon full of aircraft, looking forward to rejoining the fray down there.

What did we learn? Given a tow plane of sufficient power, and an aileron equipped sailplane, aerotowing is a reliable way to get the sailplane to altitude. Towing with poly wings is possible, but it's a lot easier to keep the sailplane out of trouble with roll control separate from yaw control,





aileron rather than rudder. I think that part of the problem with the B.O.T. was due to insufficient power in the towplane.

During a slack time, Dana built a modified Tri-pacer with twin tails and wing tip slots, powered by a .45 engine, which towed the Bobcat easily, but bogged down with the larger sailplane.

The use of "Skysheen" on the wing tips can save a plane. I got caught in a good thermal, and had to put it into a spiral dive to get it down. Those "flashers" on the tips caught my attention about half way down, and so we got it back in one piece rather than trying to retrieve the electronics from an impact crater.

If things do not look right, release the tow and try again. There is little to be gained and much to lose by hanging in there too long.

I'm going to replace the Bobcat's wing, with one using the S7055 airfoil, in an attempt to get a little better performance in the wind, and am looking forward to doing a lot more aerotowing in the coming flying season. Although we have reduced the size of the sailplane considerably, 2m rather than the 3m or 4m usually towed, I can't see that we have reduced pleasure gained from a good tow at all. There are also a lot of .45 to .60 powered potential tow planes around that can easily haul a 2m sailplane as high as you want to go, providing pleasure to a slightly jaded power flyer and a sailplane flyer eager to get high enough to play with the Ravens.

If you have wondered what it would be like to get right up under the clouds, this is an easy way to do it. We would not hesitate to suggest that you try aerotowing to add a little spice to next year's flying.

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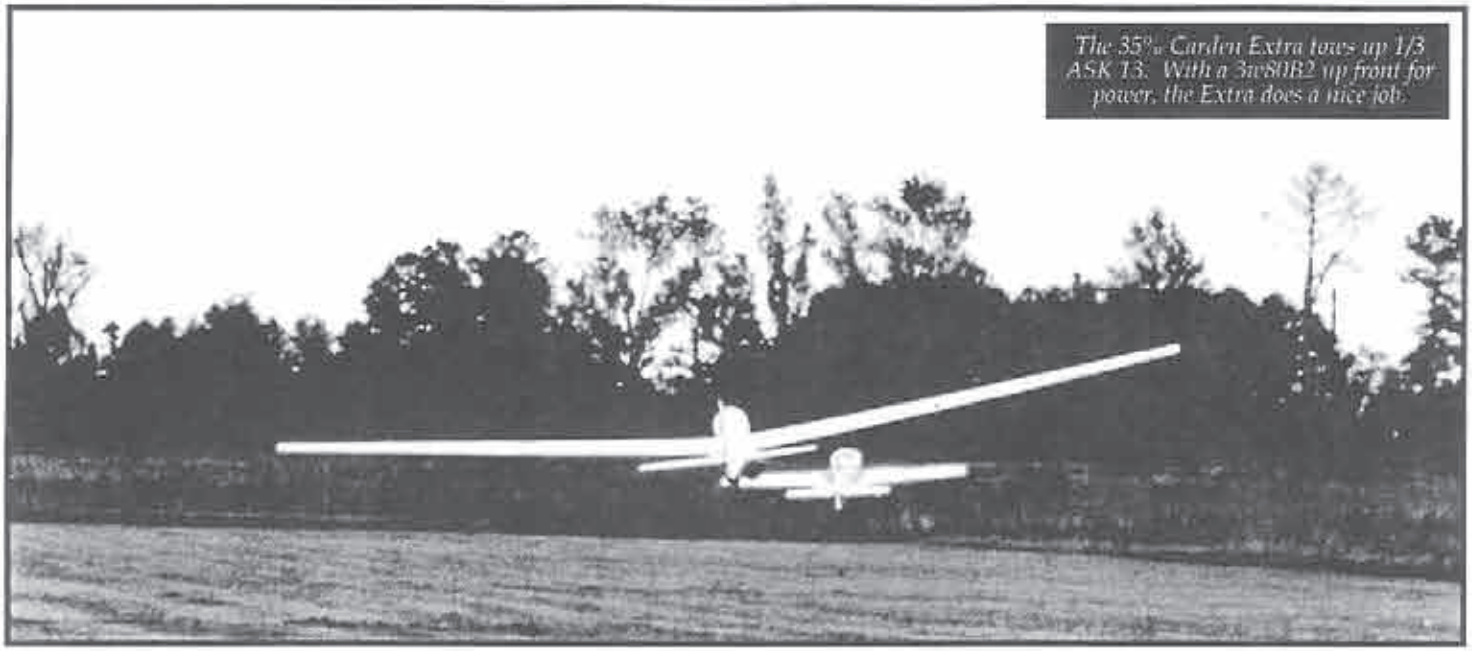

The 35% Carden Extra tows up 1/3 ASK 13. With a 3w80B2 up front for power, the Extra does a nice job.

Fred Hays, taping for ABC, with a 40 lb. video camera

David Derstine drove down from Elmira with his dad. He flew the 8-Ball Special towplane. A generic quick-building towplane, it has a Brison 3.2 up front, and pulls up to 1/3rd sized sailplanes.

FAYETTEVILLE 98

They Came from Far and Wide

Organized by Wayne Parrish, Bernie Coleman and Sam Smith of the Piedmont Aeromodelers, the Fayetteville scale sailplane airtow fly-in was once again a great success. This is a special event, because these guys have been doing this for six years now, earlier than anyone else!

Pilots came from all over the eastern third of the USA. Pete George drove half a day from St. Louis, Missouri; Asher Carmichael and Rusty Rood came from Pensacola, Florida, while John and David Derstine drove all the way down from Elmira, New York to join the rest of us. Pilots converged from the North, South, East and West to enjoy the Southern hospitality and airtowing on this fourth annual gliderfest in North Carolina.

Robin Lehman
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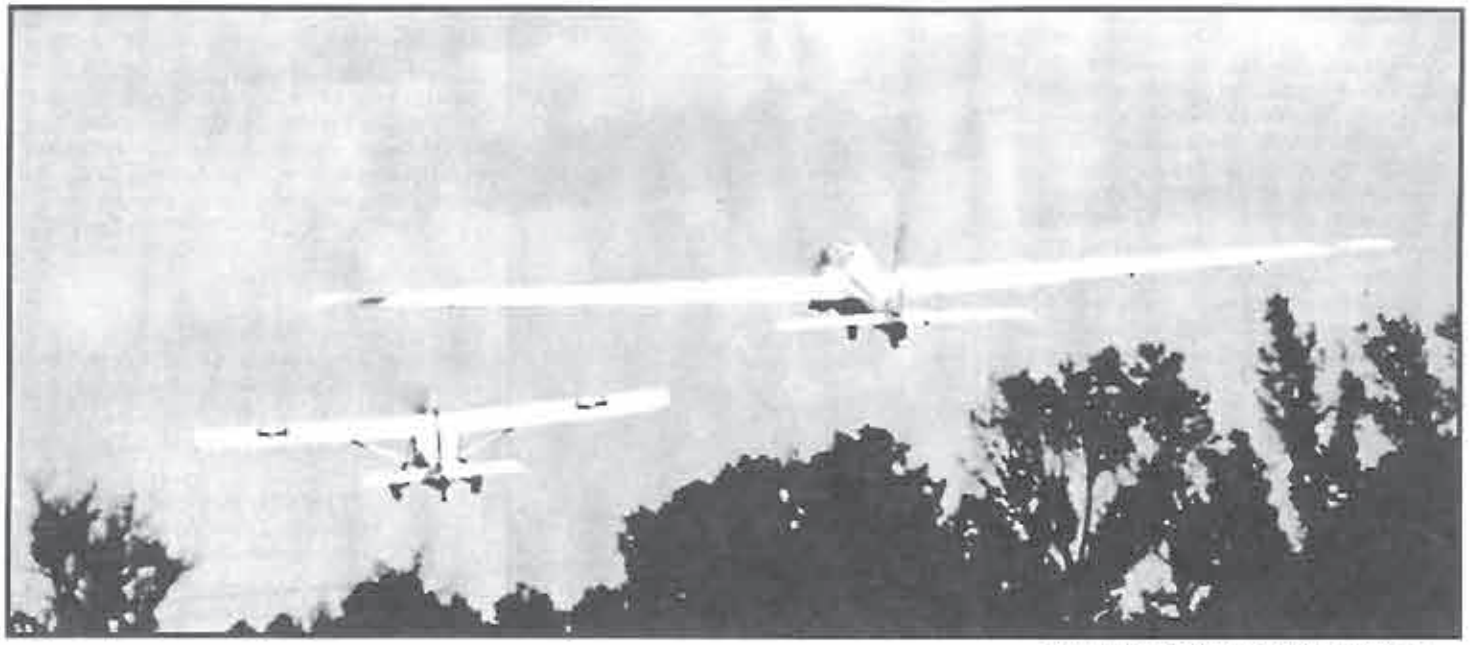
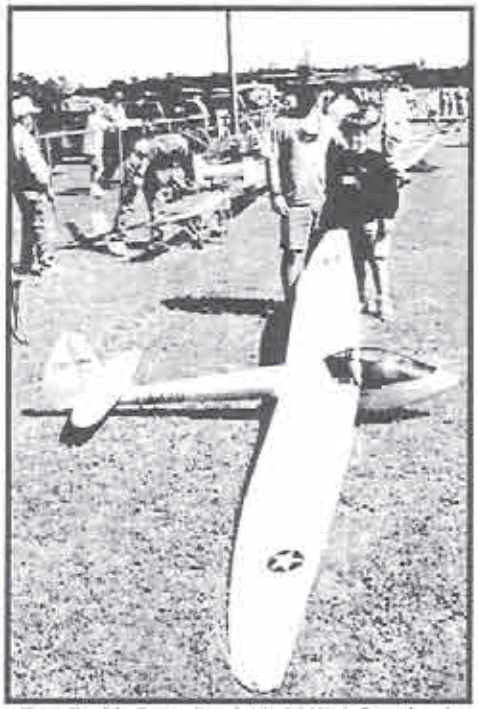
Created from Landon Grindstaff's imagination, this most unique, new towplane had its first flights over the weekend, and proved to be an excellent towplane. It has a G-62 up front, and towed the largest sailplane there.



Wayne Parrish flying the Pilatus Porter tows up John Derstine's 1/3 Fox for another aerobatic flight.



Tom Pack's Pratt-Reed 1/4 LNE-1 flew for the first time at Fayetteville. It's quite a floater.

Eight year old Dan Pack was the youngest pilot there. He's been flying for a year now.

The 1/3 ASK 13 flies exceptionally well. It is also no slouch at aerobatics. Note, it's inverted!

The Weather

Wayne must have had a magic weather wand, for he produced three wonderful days of flying in spite of what the weatherman had planned for the weekend! By noontime Friday, the rain stopped and the sun came out. The airfield dodged thunder clouds in the afternoon on Saturday, while Sunday was beautiful, clear and calm. The amazing thing was that just a few miles north it rained pretty much the whole weekend! Thanks Wayne! Did we ever feel lucky to have been given the three days of flyable weather!

In the afternoon on Friday, fuselages began to appear at the field and soon sprouted wings and were ready to fly. The towplanes were readied, motors were started and off they went! Beautiful calm air! Great for first flights!

There Were Many Firsts

There were many memorable successful firsts - first flights on new airplanes, first introductions to airtowing, and first airtows with new towplanes and new towpilots. There were two first flights on EMS Duo Discuses; Mike Watson found out how perfectly his new 1/3 ASW 19E flew; and there was the first flight of the Phoenix...

Landon Grindstaff flew his most unusual Phoenix. (Do you remember the film, "The Flight of the Phoenix"?) There is no other like it. Weighing in at 22 lb., and powered by a G-62, this twin-tailed bird needed a bit of getting used to; but after a couple of flights, Landon was towing up the largest of sailplanes with this most unusual towplane. The secret of a good towplane is to have plenty of excess power and not to have a lot of drag. Landon's new creation did this job admirably.

Mike Watson produced a unique ASW 19E (6 meters and only 21 lb.) and proved that great minds think alike. He decided to put polyhedral wing extensions on his new glider. His wings look very much like the new Discus 2, which had its first flights in Germany this spring. Judging from the way the ASW 19 floated around, and how easy it was to fly (He let me fly it for a while.), Mike certainly did something right!

Pete George brought his new, red 1/3 Spacewalker and did his first airtows. He became very popular and was much in demand when the word got out that he was such an excellent pilot. Calm or windy, he was always there to lend a helping hand and to share the towing duties. We also found out that red is an excellent and most visible color for a towplane.

There were no fewer than four Duo Discuses there, with two taking to the air on their maiden flights. With a lot of up trim on tow, these 27 lb. gliders are quite easy to tow. Without the up trim however, they presented problems and were difficult to get up. The motto for the Duo is, "When on tow be sure to add up trim and away you'll go. If you don't, you'll have problems, and don't say I didn't tell you so!"

Tom Pack brought his Pratt-Reed LNE-1 (E215, 15 lb.) and had his first flight and then many more! Built by Don Gofer, this beautiful vintage sailplane proved to be a real floater and very easy to fly.

Quite a few other pilots had their first airtows. It sure helps to be towed up by someone who knows how and can give advice!

Aerobatics

John Derstine brought his 1/3 (29 lb. with ballast) Fox and, with many airtows to height, got a chance to really trim out this most aerobatic scale sailplane. With a bit of up elevator coupled with spoilers, and some exponential programmed into the elevator, as well, this Fox was a joy to fly. It's at home inverted and will do every maneuver in the book! Four point rolls, spins, Cubans, Immelmans, stall turns and anything else you can think of can be flown with ease. If the aerobatics are easy to do, it's a great aerobatic bird. The Fox is a great, great aerobatic sailplane! The key is that it's so easy to fly.

Not to be outdone, ever entertaining Wayne Parrish showed us how well his LARGE 1/3 ASK13 performed loops and rolls nice and low to the ground.

The Gliders

There were some really beautiful sailplanes to be seen over the three-day fly-in. The smallest was a 1/6th ASW 20 and the largest was a 1/3 ASK 13 flown by Wayne Parrish. The 1/3rd sized sailplanes seemed to be the most popular with a 1/3 Ka6E, ASW27, ASK 13, Discus, Fox, DG600, no fewer than 4 Duo Discus, ASW 19, ASW 20 and many others. There were a good number of other gliders there also: Schweizers, the Pratt-Reed, ASK 18sa, Ka6E and more. In all there were some thirty to forty scale sailplanes flown by the 26 registered pilots.

The Towplanes

Sharing the towing duties were a Wilga (powered by a Brison 4.2), 2 Telemasters (Saks 3.2 and SuperTiger 3000), a Robin 99 (3w70B2), a Pilatus Porter (King 95), a Spacewalker (Brison 3.2), a 35% Extra (3w80B2), an 8-Ball Special (Brison 3.2) and the most unique towplane of all, the Phoenix (Zenoah G-62). Count them! Nine towplanes in all flown by Wayne Parrish, Trusty Rusty Rood, John Derstine, Bernie Coleman, Pete George, yours truly and Landon Grindstaff! With this bunch of excellent tow pilots, the sailplanes never had to wait very long to be launched. Some of the time, two tugs operated simultaneously for super-quick launches.

Mike Watson's 1/3 ASW 19 has unique polyhedral wing tips. It's a great thermal sailplane.

The Flying

With so many towplanes and pilots ready, willing and able, there was never a very long wait to get towed aloft. Sometimes there were two tugs working simultaneously but mostly one towplane was enough to keep the gliders filling the sky.

All pilots enjoyed the wonderful thermals while a few practiced some aerobatics. We perfected the aerobatic routines which are to be flown at the first scale sailplane aerobatic contest to be held this fall in Fayetteville planned for October 2-4 this year. (The stunt routines and further details have been published in *RCSD*, and can be found on the web at www.sailplanes.com.)

Lift was to be had on all three days, but Sunday proved to be the best of all. Those who could, squeezed out the last few seconds and enjoyed the very best thermal conditions of the weekend. Reluctantly, one by one, the gliders were packed back into the cars, vans and trailers and we all headed home. We all had flown to our heart's content and had a wonderful time in Fayetteville.

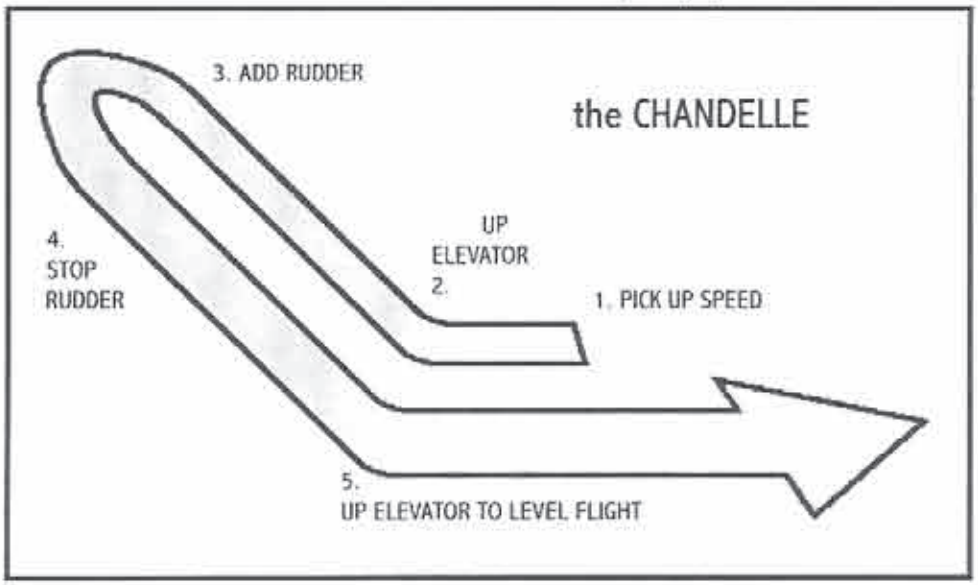
Thanks, Wayne, and the rest of the Piedmont Aeromodelers who shared with us their magnificent field and allowed us have such a wonderful weekend!

Maybe thanks to the Weather gods is in order too!

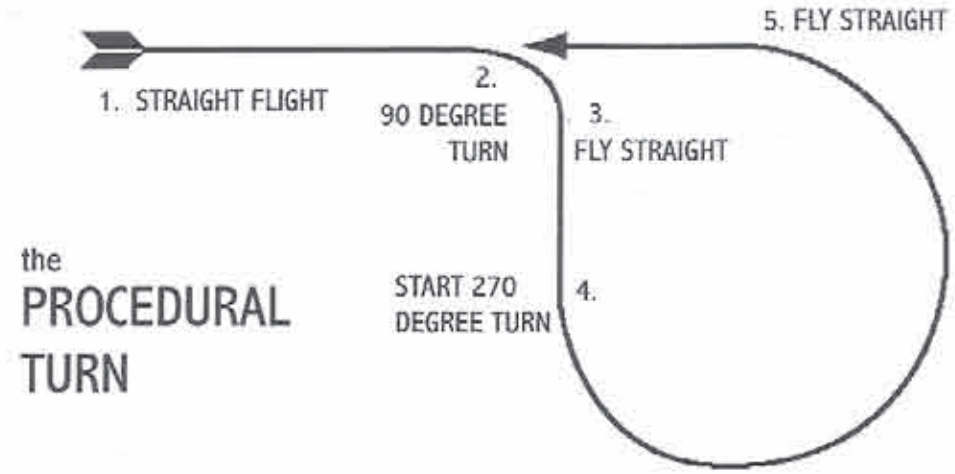
The CHANDELLE
(easy for all sailplanes)
a turnaround maneuver

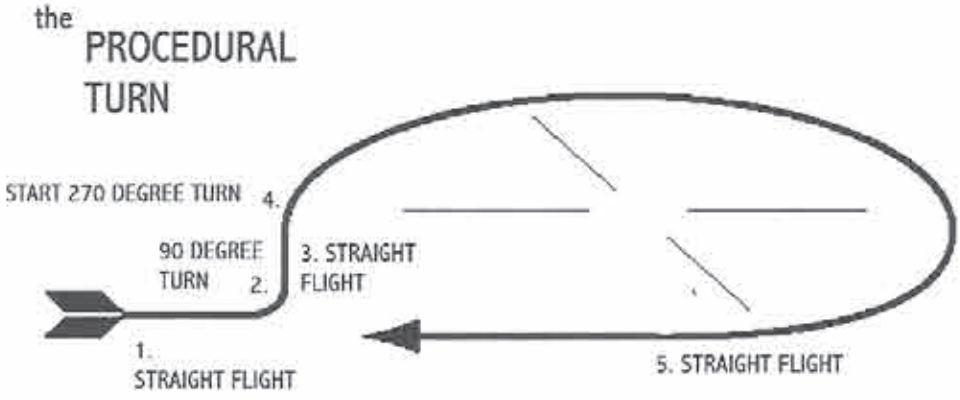
The chandelle is a very gentle and graceful way to do a 180 degree turn. If done properly, it's a very pretty maneuver and is a very nice variation to your "normal" way to change direction. Let's see what the AMA rule book says about the Chandelle.

"This maneuver is an exaggerated climbing turn in which the airplane changes direction through 180 degrees. The model may begin with a shallow dive to pick up speed, the nose should then pull up and the model begins a climbing turn proceeding away from the flightline. The maximum climb and bank occur at approximately the midpoint during the change in direction. The maximum climb and bank may be 45 degrees... As the 180 degree point in the turn is reached, where the aircraft is traveling in the opposite direction from which it entered, the wings are brought level for the completion of the maneuver."



At this point you need to add a little up elevator to bring the glider to straight and level flight.





Aerobatic Flight Plan

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

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

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

January 1998
- Practice the Outside Loop.

February 1998
- Practice the Immelmann and Reverse Immelmann.

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

April 1998
- Practice the Spin.

May 1998
- Practice the Tail Slide.

June 1998
- Practice the Humptybump. (Issue includes Sportsman & Advanced Routines.)

July 1998
- Practice the Chandelle & Procedural Turn.

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

In short, pick up speed, go up at 45 degrees, with the wings level, use rudder and let the glider turn 180 degrees on its axis until the nose is pointed back down, pick up speed and then level out. Does this all sound vaguely familiar? Well, the Chandelle is really a very gentle stall turn where the glider doesn't quite stall, but flies through the entirety of the maneuver.

If you have an aileron ship, you might find that you have to input some aileron control to keep the wings more or less level. The Chandelle is not an aileron turn and, ideally, all you will need is some rudder input to complete the maneuver. However, as I am certain that you've found out by now, every sailplane flies a bit differently and you will have to see how your particular model reacts and fly it accordingly to achieve perfection with this most graceful and gentle turnaround maneuver.

Procedural Turn
(easy for all sailplanes)
a turnaround maneuver

This very easy maneuver is a great way to turn around on a slope or when getting ready to land. It's very gentle, but in order to do it well, you must fly it very precisely. This is how to do it:

> "After straight flight the model must turn exactly 90 degrees to the left (or right), whichever will take the plane away from the spectator line, then exactly 270 degrees to the right (or left) and cross over the point where the first turn commenced." (from the AMA rule book)

What you need to do is turn 90 degrees and fly out far enough so that your 270 degree turn the other way will put you heading back in the opposite direction in exactly the same place where you started. In this case, a picture is worth a thousand words, so if this description is unclear, *do* have a look at the diagram.

For those of you new to sailplanes, this will be a handy way for you to start precision flying. Remember that you should turn *exactly* 90 degrees and then you need to do your 270 degree turn, again, no more and no less. You will have to plan ahead so that your turns will be nice and round and so that when the procedural turn is completed, you will finish (heading in the opposite direction) in exactly the same place where you started.

If you are starting out and want to learn how to *control* your new sailplane, the procedural turn is an excellent place to start. Remember, *you* control it, the glider doesn't *control* you. So if it's windy or bumpy, you will have to steer the glider accordingly so that the maneuver is done exactly right.

On that same subject, you will notice that the better pilots always admit to their pilot errors; the rest of the gang are always telling you that, "The wind got under the wing," or, "It fell out of the sky when it turned downwind," or, "It stalled," etc. You are flying that sailplane and you have control of it. Take responsibility and fly that thing! For starters, try the procedural turn; you might like it a lot! ■

Elmira Aerotow '98

By Asher Carmichael
Spanish Fort, Alabama

I was fortunate to be able to attend the 1998 aerotow event in Elmira. Combined with a family vacation, this trip to the historic Harris Hill proved to be a scale modeler's dream come true. The area around Elmira is one of America's most beautiful vacation destinations and the added bonus of seeing 70 modelers talking, flying — living and breathing — scale sailplanes for 4 days was justification enough for the family to pack up and head to upstate New York.

The weather is generally cooperative in June, but the late spring front that decided to stall over the area brought unseasonable weather this year. Thundershowers, fog, strong and light winds, brief periods of blue skies, and cool temperatures all marked this year's event.

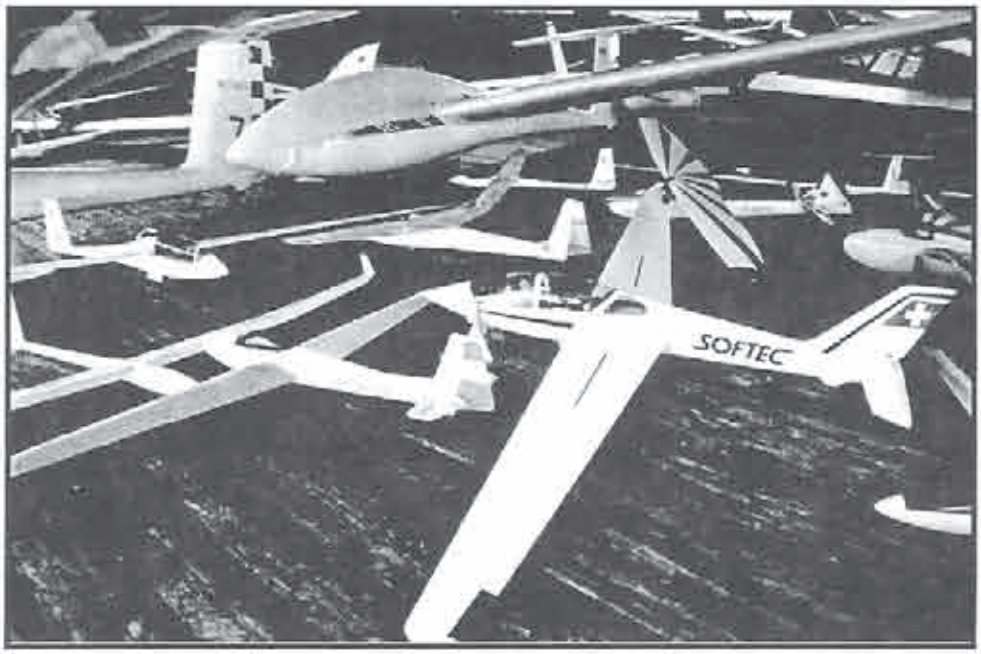
I arrived on Harris Hill at midday on Thursday, June 11. A low ceiling with generally cloudy skies was the order of the day for the 25 pilots who had arrived early for a relaxed day of aerotowing. Most of these pilots had attended in previous years and knew that the days preceding the main event days of Saturday and Sunday were the best opportunities to get in some serious flying.

Registration was the first order of business for arriving pilots and it was held in the lobby of the National Soaring Museum. Walking into this facility generated a real quandary for me. It was obvious that there were some historic gliders and sailplanes hanging in the main hall and my first inclination was to abandon the registration line and meander through the museum, but purpose focused again. Besides, there would hopefully be plenty of time later for looking through the various displays. I completed registration with the help of Deb Conover of Sailplanes Unlimited, Ltd. Many thanks to Deb for her efforts on the administrative side of the event. She obviously made it a lot easier for the event CD and organizer, John Derstine, to focus on his primary responsibilities.

When the sun came out on Saturday, there were some 50 gliders lined up for tow; often, there were over ten up at once. Photography by Robin Lehman.

The flightline was buzzing with activity as I crossed the parking lot and entered the pit area. The German contingent had already arrived and their "camp" area was set up around the EMS model company flag. Robin Lehman was towing with his Extra 300s and there was a line-up of beautiful gliders awaiting their turn. The low ceiling made the tows quick so there was a relatively short wait for a "tug".

Several California fliers decided that the medium winds and low ceiling conditions would be perfect for some slope work so they traveled to a nearby hill that was identified in the registration packet as being adequate for the southwest wind direction. Let me say here that John Derstine and the Harris Hill Lift/Drag R/C club (HHLD) definitely did their home-work by planning alternative venues for



Adrian Eggenberger brought his 1/3 Bruckman Fox, and performed some nice aerobatics. Photography by Robin Lehman.

Eric Eiche won Best Vintage and Best of Event with his wonderful 1/4, 4.77m span Wein. Photography by Robin Lehman.

Jeff Koski, a new tow pilot, put in a lot of flights. Here, he checks the batteries on the Extra. Photography by Robin Lehman.

Deb Conover helped out with registration; Pilatus Porter helped with the towing. Photography by Robin Lehman.

this event. It seemed that every possible contingency was covered. Several slope sites were identified for different wind directions, museum and winery tours along with home and professional videos that could be shown in the hanger were arranged in case of rainouts; food was made available for all meals except breakfast. We really can't say enough; thanks to John and the crew for a job well done.

Friday's forecast was for deteriorating conditions and the weatherman proved, unfortunately, to be right. Still, the forecast did not seem to reduce the turnout. The morning was spent in the Harris Hill soaring club hangar, FBO, and the National Soaring Museum. 35-40 pilots and other attendees whetted their appetites with talk of soaring, models and an occasional walk through the museum. There were some really interesting videos, as well. It was good to see that the lack of available flying conditions didn't hamper anyone's spirits. The late afternoon and early evening hours afforded a window for flying; everyone who was willing to brace the high winds jumped in line. The tows were low, again because of the ceiling, and the air was a little tricky because of the gusts. Still, it was good to fly at last.

Friday evening's "picnic" was well attended. A local caterer provided great food and the atmosphere of the youth camp hall was appropriate. The Germans ended the evening with a "traditional" practical joke. Everyone linked arms in Bavarian line dance fashion. We were instructed to kick out one leg, then the other. We were then told to squat and do the same thing. When everyone in the line was balanced on the right leg, Jan Kurt Hoffman, the German DMFV official in attendance, shoved from his end of the line and everyone went to the floor laughing. As we regained our composure Michael Schelling announced, "We are all now friends.... forever".

Saturday was to be the best day for flying. The early morning was foggy with reduced ceiling, but all this changed by mid-morning. Start up was slow but, as blue sky began to appear, the sailplanes in line awaiting tow began to grow. By midday there were beautiful CU's and light winds and thermals were abundant. A frenzy to get into the air began and the towpilots began to feel the pressure as conditions improved. Luckily there were many more towpilots this year. Jeff Koski, a new towpilot in the HHLD club, Jim Blum, John Derstine, Alex Wenzl, Don Smith, Dan Luchaco and last but not least, Robin Lehman, shared the towing duties. Many thanks to you all.

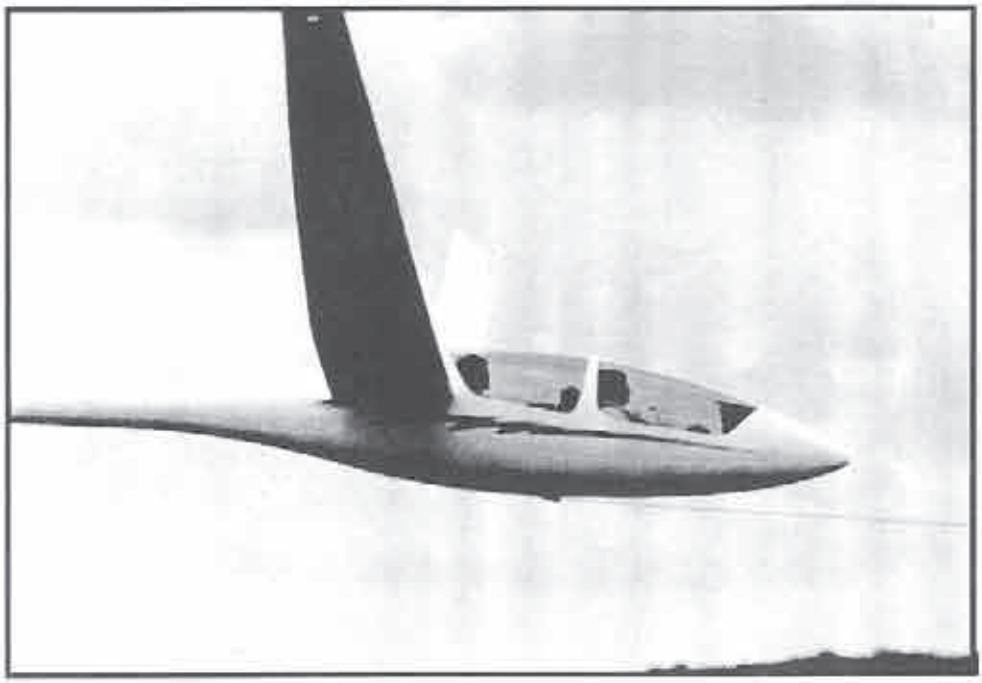
The highlight of Saturday was flying in conjunction with full scale activity. ASK-21's, Schwitzers and an elegant ASH-25 were towed to altitude to work the available lift. There was excellent communication via radio between the FBO, full-size pilots and the model flightline on the ground. All in all, a really interesting combination.

Saturday night's banquet was a mixture of food, presentations, awards and raffle. It was Eric Eiche's turn to win the best vintage award for his immaculate Wein. His model of the classic German built-up sailplane was constructed with spruce, ply and balsa in 1/4 scale. The clear finish and translucent covering on the flying surfaces was stunning. Eiche is a true Craftsman in every sense of the word.

Best modern was won by Rick Briggs of California with his Orfa all-glass 3.5 scale ASW-27. Rich did a great job outfitting this ship with a scale cockpit, pilot and insignia. Rick is an excellent pilot and put on quite a show with his "27".

Pete DeStafano's highly detailed TG-2 won the best Schweizer award again this year. Pete's model is a veteran of many contests and continues to bring home the metal.

The German contingent presented Eric Eiche with its official version of a perpetual



During a few hours of sunshine on Saturday, Heinz Weissenbuehler put on quite a demonstration with his custom 100' span ASH25. Look at those wings flex! Photography by Robin Lehman.

Mathias Haas with gorgeous aerobatic Habicht, which was the heaviest sailplane there. Only the Extra could tow it to height. Photography by Robin Lehman.

1/3 ASK13 was towed by the big Bruckmann Pilatus Porter - a perfect tow combination. Photography by Steve Dentz.

David & Michael Derstine flew their 1/3 Ka6E. Photography by Steve Dentz.

trophy for "best vintage sailplane". The Germans seem to have as much, if not more, interest in vintage as they do in modern sailplanes. They also brought several kits from the DMFV (the model glider association in Germany) and presented them to schools in the Elmira area. The German association presents every 6th grade class in Germany with a "real" model airplane in an effort to encourage interest in modeling. They also presented John Derstine and the National Soaring Museum with plaques for their efforts. Mrs. Derstine was also presented with a gift as a representative for all the wives of model soaring enthusiasts.

The raffle was a highlight as everyone waited to see if they had the winning ticket for their "article of choice". There were some really great raffle prizes supplied by such firms as Sailplanes Unlimited Ltd., EMS, Unbeaten Path Imports, JR Radio, Icare Sailplanes, Flying Circus Tours, Dave's Aircraft Works, Internationalle Forum Modellbau, Gee Wiz Inc., and Multiplex USA. Thanks for supporting scale soaring in the USA!

The presentation by Adrian Eggenberger of his Swiss team's flying of a scale model 10,000 feet down a mountain in Switzerland was spellbinding. He told of the efforts of the pilots and crew who not only flew the sailplanes under less than optimum conditions but also of their "climb" up and then down the mountain, as well. Talk about cross country!

Sunday's conditions began again, with heavy "pea-soup" fog atop Harris Hill which, fortunately, began to clear about noon. Rain showers punctuated the day with modelers moving in and out of the hangar as required. A northwest wind presented a chance to slope off "the hill" later in the day, which brought a fitting end to a weather-swept but wonderful event.

There were several interesting planes at Elmira that are worth mentioning. The EMS 3.5 Duo-Discus is already developing a reputation for excellent flying, thermaling and aerobatic abilities. Its cousin the Duo discus 4D is no less impressive. This 7 meter model has all the "wing motion" a modeler could want and yet it appears to be quite robust. A real crowd pleaser.

Mathias and Angela Haas brought a beautiful LO-100 and a superb Habicht. Gerd Holzner came with his Ripo ASW-27, Adrian Eggenberger had a 1/3 scale Bruckmann Fox and Thomas Schmidt brought his scratch-built 1/3 scale DG-600. A great showing from Europe I'd say. Maybe some of us should think about reciprocating. Anyone for a trip to Fiss?

Robin Lehman's new Brauer Turbo-Porter with a 3W-120 in line twin-cylinder was an amazing tow plane. Big, powerful and amazingly quiet are words which come to mind. This thing flies, sounds and looks like the real thing in the air. It was a real workhorse at this event until it was grounded with muffler problems.

His 35% Extra seems an anomaly as a tug. Seeing a towplane perform Aresti aerobatic manuevers on the way down from altitude after tow is definitely entertaining. There was an abundance of Wilga's, which shared towing duties with a Telemaster, a Super Cub and the "tireless" 8-ball Special.

There were many well-built sailplanes and I suggest that you put Elmira on your list of places to visit if you want to see the country's largest collection of scale sailplanes at one event.

One other thing that shaped my impression of Elmira was how well John Derstine, Robin Lehman, Jim Blum, Jeff Koski and the HHLD club managed and maximized the available flying time. They were always the first to push the pilots and their machines out of the hangar and onto the flight line at the first sign of flyable conditions. Too, the lack of available flying time because of the weather seemed incidental to the pilots. It seemed that "Elmira" had assumed importance as a "gathering" place rather than just an opportunity to fly, fly, fly.

Elmira is truly a scale modeler's paradise. The acceptance and promotion of scale RC soaring by the NSM and Harris Hill Soaring Corporation ensures that this event will continue to grow and attract even larger crowds. It is definitely the premier scale RC soaring event in America and I highly recommend that you put it on your agenda. ■

There's no doubting the name of this model. Below: Mongo beside a 60" slope racer.

MONGO

By William G. Swingle II
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Late one evening, you're in your garage. You're plane gazing and enjoying quality time with your models. You've amassed quite a collection and are pleased by this. But you're getting an itch to build something interesting. Hummm, perhaps it's time for something unusual. Perhaps it's just way too late in the evening for rational thinking, but you press on.

Flying wings are always interesting. A flying wing would be easy enough that several attempts could be made in a reasonable time. Constructing it from foam would simplify the construction even more. The clock chimes 1:30 in the morning and you've decided. Your next project will be a foamie flying wing.

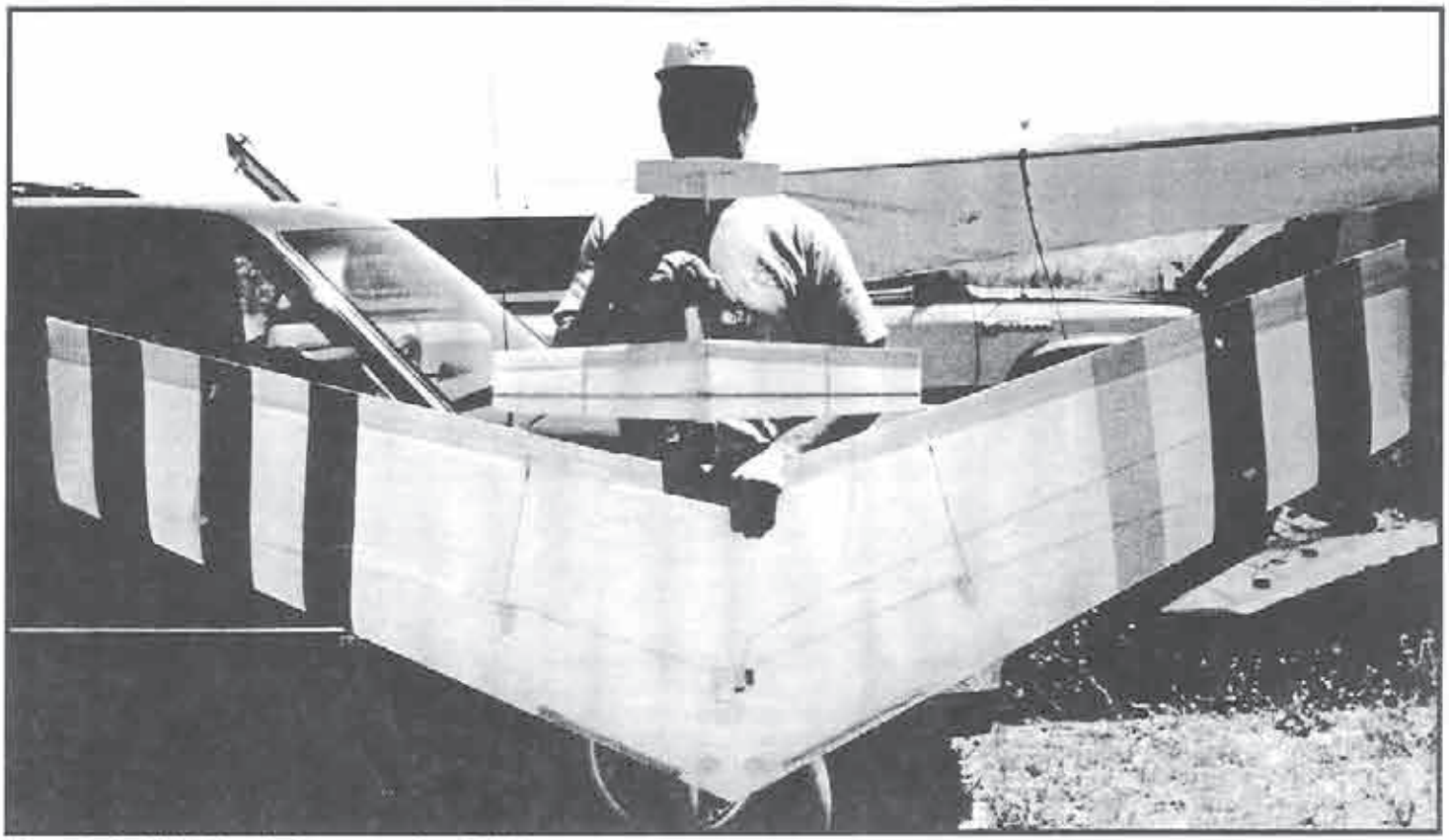
Now that the decision has been made, a minor detail emerges. It has to be unique. With many different planforms and fuselage styles already on the market, another way of distinction should be considered. What about size? The currently available kits have fairly similar wing spans, most being roughly four feet. Bigger would be an easy way to create something unique without creating any undo complications. All right, bigger it is! How much bigger?

Well, gee, that's a good question. What are the boundary conditions? Given the current market choices, four feet is the minimum. The maximum though is not so easily defined. There really is no absolute upper boundary condition! Hey, how about ten feet? Wow, that'd be impressive! Or, maybe twenty! Hoo hee, this is fun! But no, practical issues arise and put an end to the giddiness. A bottom line emerges that can't be ignored. It has to fit in the truck. No use having an airplane that you can't get to the slope. That'd be no fun at all. You conveniently ignore the issue of having sufficient garage space.

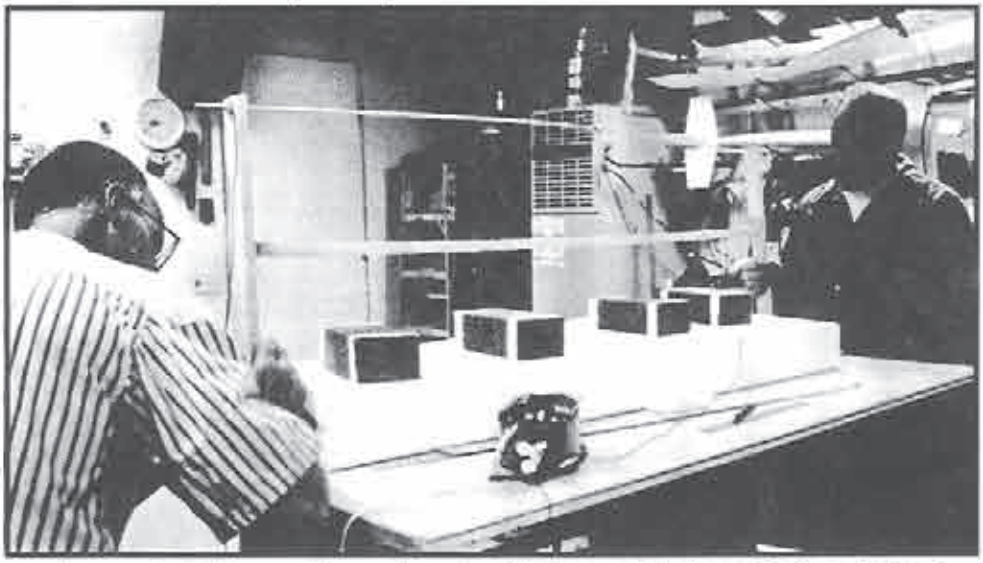
You measure your truck and it turns out that eight feet will fit. The decision is made. Your foamie flying wing will have an eight foot wingspan! The thought of being two times the size of the typical model is appealing. Additionally, the number two is very neat and tidy. It's pleasing in its understated elegance.

The decision of airfoil is daunting. There are many choices. Luckily, a local modeler has built and flown several flying wings with great success and has a real winner of a choice. He used the EH2012 and came up with a good flying plane, so the EH2012 gets the nod.

Foam is wonderful thing. Which type to use? Well, it depends on what can be found and how much it will cost. Foam is used in



Mongo beside MHLG foamie, Dragonette, from DAW.
Below: Mike and Roy cutting the wing core.



nearly every facet of our society, so it must be easy to find and since it's used as a packaging material it can't be very expensive. Right? Wrong on both accounts. You simply can't stroll into the local Walmart and buy a sheet of foam. In fact, it seems there are nearly zero places that sell sufficiently large sheets of the stuff. Luckily some do exist, though, and $70 later you have enough white foam to build two, eight foot span flying wings. The realization hits. Wow, the amount of foam needed for an 8 foot span foamie is huge. Interestingly, this makes the idea even more alluring. You ignore the fact that it will take $35 worth of foam to construct the airplane.

The downside to the white foam is that it does dent easily. An eight foot airplane will certainly have significant inertia, so the leading edge will most likely get deformed quite quickly. EPP foam resists dents very well. So EPP is used for the leading edge. This bumps the cost of the foam to $40 per plane. $40 worth of foam! Seeesh!

A moment before you start cutting your cores you think about washout. On impulse you decide washout would be a good thing. Going only by the "if it looks good, it will fly good" rule, you rotate the tip templates to whatever your eye tells you and begin cutting. White foam sure cuts easy. In a very short time you've got two wing cores and they look good. Hey this is easy!

To spar or not to spar; that is the question. Some of the currently available kits use a spar, some don't. However, an 8 foot span plane means you have 4 foot long levers which are repeatedly bending upon the center joint. The stresses are certain to be high. Of course the wings are super thick at the center which will be beneficial for stiffness. Hummm... The deciding factor is that the plane is just a proof of concept foamie and the spar is left out. The halves are simply glued together. You justify this decision by rationalizing that the structure will be a homogeneous construction with forces being distributed along the length fairly well. The hope is that each section of wing will support itself. The idea of dynamic forces such as impacts and drag are conveniently ignored.

The math tells the tale quite well. You shouldn't be surprised by the amount of surface area that has to be covered but the vastness is still a shock. Using standard foamie taping practice, filament reenforced strapping tape is applied strategically to provide additional rigidity and durability. Then the plane is covered with simple colored packing tape. Lots of it! Wow, this thing takes a huge amount of tape. 24 square feet of it to be exact. You tape for what seems like an eternity to get the thing covered.

All planes should have a name or designation of some kind. But, an 8 foot foamie demands a moniker! On a whim, Mongo is

chosen. Your flying buddies deem it a worthy designation and the model is christened.

Flying is the next step. You proceed to the slope, giddy with anticipation. The first launch of a scratch built model is always exciting but this model is unusual and unique. This heightens the moment even more. A video camera emerges along with a conventional camera. Amazing how cameras seem to emerge out of the woodwork for such monumental events.

Typically maiden voyages of scratch built models are eventful. So many things are usually set empirically. CG, incidence, control throws and neutral points are each estimated on the bench, but often these estimates are only educated guesses. The real test occurs in the air and often unfolds in a very exciting manner. The maiden voyages of Mongo were fairly tame. No surprises were noticed. The plane was initially tail heavy, so some lead was added to the nose. To be specific, a POUND of lead is added which moves the CG about an inch. The pitch throw was reduced by 50% and the roll throw was increased to maximum. That was it. No further changes were needed! Mongo was very happy on the slope and performed very well. A complete success!

The washout used may have been a bit too much. Mongo is remarkably stable and plainly refuses to tip stall. However, no serious drawbacks have been noted so far which could be attributed to the washout. So it can't be too much. The inverted performance is good with outside loops being easy. So far the design seems quite sound.

The unballasted wing loading is 6.7 oz./sq. ft. This is considered quite light for a large model and results in decent light lift performance. However, it's not as good as would be typically expected for this loading. Further experiments may reveal why. Currently, Mongo's light lift performance is typical for a light foamie. A big advantage though is that in bumpy lift, when most foamies are too disturbed by the turbulence to remain airborne, Mongo just sails along unfazed. When the lift increases just a little, Mongo enters his element. The plane is fairly similar in speed to typical combat planes and this adds to the fun factor. If only for general knowledge, ballast is something that needs to be explored. A plane this size could have a large undiscovered envelope. However, additional strengthening will most likely be needed once the homogeneous structure is altered by the additional weight.

Subsequent trips to the slope have allowed Mongo to really shine. Everyone wants to fly the 8 foot flying wing and they don't want to give back the transmitter! Personally, I've always shied away from flying other's airplanes. Always makes me nervous. But even I must admit being quite the transmitter hog for this plane.

The stability and smoothness of Mongo is empowering. Pilots find themselves flying very low to the slope with confidence. Remarkably, even though the transmitter has been handed to total strangers, to date no one has crashed Mongo. The plane has shown itself to have a wide appeal. It's so smooth and easy that most feel it'd be a dandy trainer; yet they can't seem to wipe the smile off there faces while they're tearing around, getting crazy on the slope.

While not legal in the standard combat competitions, no one expresses any reservation when Mongo emerges on the combat slope. All seem excited at the chance to practice carrier landings! Very picturesque formation flying often results as everyone tries for the perfect alignment. Pilots suddenly concentrate much harder upon the precision of their flying. A solidarity between the pilots on the flight line develops that always adds to the moment.

Of course, an airplane with an 8 foot wingspan does tend to stand out from the other planes. Everyone keeps a watchful eye peeled because, even though it's fun to combat against, no one wants a head-on collision with that big an airplane. Mongo is not just a pawn on the slope of life! He commands attention yet does so in the most gentlemanly manner. It's amazing the fun that can be had with just foam and tape. ■

NEW PRODUCTS

The information in this column has been derived from manufacturers press releases or other material submitted by a manufacturer about their product. The appearance of any product in this column does not constitute an endorsement of the product by the R/C Soaring Digest.

Twin Rail Non-Arresting Landing Skid

...from Tim McCann

The new Twin Rail Landing Skid is a general purpose, non-arresting landing skid for use on most R/C sailplanes including slope, electric, cross country, scale, nostalgia, F3J and F3B. The Twin Rail Landing Skid is injection molded of tough polyethylene plastic, the perfect skid and skeg material and is curved to match the contour of the fuselage. The Twin Rail Landing Skid is available for $4.95 postage paid (U.S. funds) along with other skids, skegs, teeth and more (free brochure). Check with your hobby supplier or order direct from: Tim McCann, P.O. Box 2091, Harrison, AR 72602; (870) 365-0023, <tmccann@alltel.net>■

"Old Buzzard's Soaring Book"

...from Soaring Stuff

Back in print, this book is a classic on R/C soaring and thermalling technique by Dave Thornburg.

Cost is $16.95 + $3.00, priority mail shipping. Available from Soaring Stuff, 9140 Guadalupe Trail NW, Albuquerque, NM 87114; (505) 898-8281 (voice/fax), <http://www.soaringstuff.com>. ■

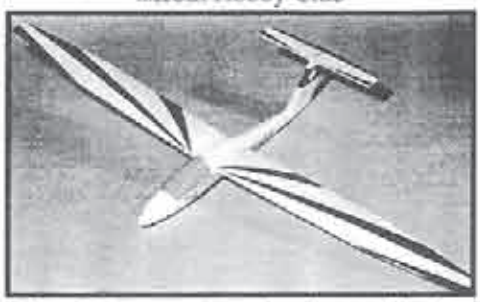
Full Plans Listing

...from Traplet Publications

A full plans listing is now available on web site <http://www.traplet.co.uk>. The guide contains scale plans including sport designs, scale and sport gliders, electric jet plans, PSS, and more. Surfers can access, browse, and purchase plans on-line. ■

Mini Pilatus B4

...from Hobby Club



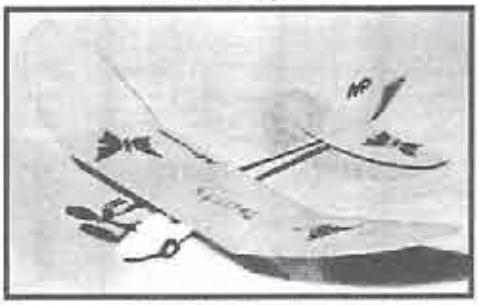
Pilatus B4 is a mini, semi-scale model of a well known, full-size glider. The model comes complete, ready to cover. Fuselage is white molded from fiberglass, with separate canopy hatch. Two part wing is foam and balsa skin with glass reinforcement. Ailerons controlled by mini-servos, installed in wells in the wings. Stabilizer and rudder made of balsa.

Wing Span:	1400mm
Length:	705mm
Wing Area:	18dm^2
Airfoil:	Flat Bottom
Empty Weight:	About 320g
RTF Weight:	From 450g
Controls:	Ailerons, Elevator, (rudder)

Hobby Club, 931 Calle Negocio Suite-F, San Clemente, CA 92673; (714) 498-5377, hobbyclub@earthlink.net, <http://www.hobbyclub.com>. ■

Party

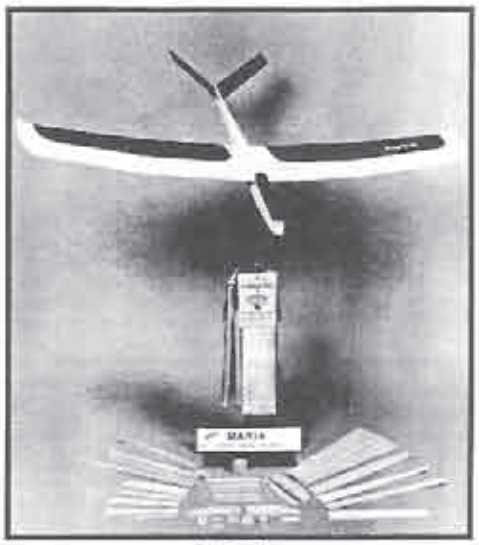
...from Hobby Club



Party, a model of the "garden flying" class, can be flown in limited space. Fuselage is constructed of carbon tube and fiberglass pod. Flying surfaces covered with polyester Litespan. Model sold in ARF version; just the power unit and RC gear must be installed. Power unit consists of 280 size or similar electro motor with gears, 7-8 cells, 110-300 mAh and speed controller. RC equipment should be small and light, but not necessarily of the super-light class.

Wing Span:	950mm
Length:	730mm
Wing Area:	Approx. 17dm^2
Airfoil:	Flat Bottom
Empty Weight:	115g
RTF Weight:	From 290g
Controls:	Rudder, Elevator, Speed Controller

Hobby Club, 931 Calle Negocio Suite-F, San Clemente, CA 92673; (714) 498-5377, hobbyclub@earthlink.net, <http://www.hobbyclub.com>. ■



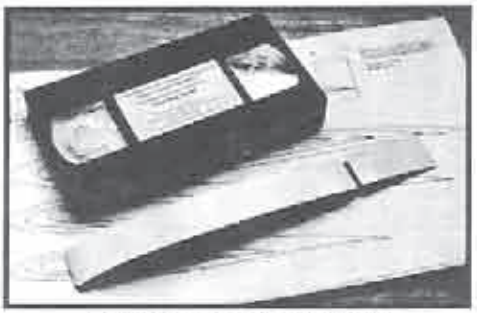
Maria

...from Buzz Waltz R/C Designs

The Maria multi-task sailplane is a "V" tail, sport hand launch kit, and can be flown on the slope, hand launched, fitted with a speed 400 electric motor, or flown in AMA provisional event 702 R/C Duration by using a 1/2A motor.

Wing span is 58" with an overall wing area of 466 sq. in. Kit features include precision cut (no die cutting) balsa & plywood parts, spruce wing spars, easy to follow instructions, and full size plan sheet.

Kit price is $37.00 + $5.00 shipping. Available direct from Buzz Waltz R/C Designs, 68-320 Concepcion, Cathedral City, CA 92234; (760) 327-1775. ■



"Everything You Always Wanted to Know About Airfoils"

...from Soaring Stuff

"Everything You Always Wanted to Know About Airfoils" is a new computer generated animation video, with live video footage, produced in cooperation with Dr. Michael Selig and the University of Illinois Low Speed Airfoil Testing Program. Video explains in non-engineering terms all the aspects of airfoils: how they work and how to choose the proper airfoil for a project, or how to evaluate airfoils on existing designs. Video shows wind tunnel testing, and how to use the wind tunnel test graphs (polars) to select a specific airfoil for a certain task. Portion of proceeds donated to UIUC Airfoil Testing Program.

NTSC (American) format is $29.95 + $3.00 S&H. Pal (European) format is $34.95 + $3.00 S&H. Soaring Stuff, 9140 Guadalupe Trail NW, Albuquerque, NM 87114; (505) 898-8281 (voice/fax), <http://www.soaringstuff.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 per month and are limited to a maximum of 40 words. The deadline for receiving advertising material is the 15th day of the month. (Example: If you wish to place an ad in the March issue, it must be received by February 15.) *RCSD* has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs. Market Place Listings are $5 a month. Personal ads are run for one month and are then deleted automatically. However, if you have items that might be hard to sell, you may run the ad for two months consecutively.

For Sale - Business

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

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

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

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

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

For Sale - Personal

1/3 scale ASW 20/20L short kit, fuse, canopy, gray foam cores, some instructions. Yields 184" or 224" span (you choose). 2 to sell. $200.00 each + shipping. Paul Wright, (402) 796-2175, <PaulW@isco.com>.

Original Hobbie Hawk in styrofoam case, no radio... $200.00 obo. Paul Wright, (402) 796-2175, <PaulW@isco.com>.

5 meter (1/3 scale) Ka6C, beautiful German workmanship, completely finished... $1595.00; 1/4 scale Grunau 4, very clean, nicely detailed, a great floater... $750.00. Both planes include all servos and are real eye candy! Dan Troxell, (949) 831-8013, California.

1/3 scale Bruckmann Fox, partially damaged, 4.66m (183"), E374-SD6060-SD6062 wing profile, ~24 lb... $795 + shipping (was $1485 new). Fuselage is white gelcoat. Wing joiner, rod & alignment pins are installed in fuselage; rudder post installed & hinged, front & rear wheels installed, elevator hold down mechanism glued in place, "monoblock" wing joiner locking system installed. Obechi covered wings are carbon fiber reinforced. Servo wire, aileron & spoiler cutouts are in place. Finished, hinged, gapless ailerons are rounded into trailing edge of wing, spoilers installed, wires for aileron servos in wing. Rudder & stab/elevator are styro/balsa, hinged, completely finished. Canopy glued to canopy frame and fitted to fuselage. Minor damage to one wing at root; more substantial damage to other wing at root. Wing rod in place; integrity of wing not in doubt. Contact Robin Lehman, 63 E. 82nd St., New York, NY 10028; (212) 879-1634, <www.sailplanes.com>.

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

Wanted

Looking for 1/5th scale Twin Astir/Twin Grob glass fuselage complete with canopy to match a pair of wings that are lonely. The original was one of the original Wik composite ARF of 15 year vintage that has given good service until the wing joiner decided to separate. Call (905) 468-3923 or e-mail Phil at <linden@niagara.com>, Niagara Peninsula, Canada.

MARKET PLACE LISTINGS

OBECHI & WHITE FOAM WINGS
BULLET CATAPULT LAUNCH SLOPE GLIDER
Finney's Hobbies
3455 Peachtree Industrial Blvd. Suite 980
Duluth, GA 30096
(770) 495-8512 • fax (770) 495-8513
finneys@mindspring.com
http://www.mindspring/~finneys

VACUUM FORMED PRODUCTS, CANOPIES
Viking Models, U.S.A.
2 Broadmoor Way
Wylie, TX 75098
(972) 442-3910 • fax (972) 442-5258
RCSDigest@aol.com

Closet Scale Stuff
At Sailplanes Unlimited. Ltd.

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

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

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

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

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

Roedelmodell Ka6E, NIB, slight imperfection, $495.

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

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

BOOKS FOR SALE

All of the books listed are duplicates from our private library. All prices include packaging and postage. Checks or cash only, please. Your money will be returned if the book is already sold.

* The Pocket Encyclopedia of World Aircraft in Color - Fighters Between the Wars, 1929-39; Kenneth Munson, Macmillan, 1970. 164 pp. $8.00

* Fighters and Bombers of World War II; Kenneth Munson, Peerage Books, 1969. 323 pp., with dust cover. $15.00

* Radio Control Slope Soaring; Dave Hughes, RM Books, 1983. 324 pp. $15.00

* Old Buzzard's Soaring Book, Dave Thornburg, Pony X Press, 1990. Square corners, damaged exterior back cover. $8.00

* Old Buzzard's Soaring Book; Dave Thornburg, Pony X Press, 1993. Rounded corners. $15.00

* Aerodynamics of the Helicopter; Gessow & Myers, Macmillan, 1952. Ex-library, has "unique" bookplate. 343 pp. $15.00

* Model Airplane Design and Theory of Flight; Charles Hampson Grant, Jay, 1941. 512 pp. $30.00

* Jane's World Sailplanes and Motor Gliders; Andrew Coates, Ziff-Davis, 1978. 192 pp., with dust cover. $25.00

* Aircraft Archive - Famous Racing and Aerobatic Planes; Argus, 1989. 95 pp. $10.00

* B-1 Lancer, in detail and scale; Wayne Wachsmuth, TAB, 1990. 72 pp. $10.00

* Radio Control Miniature Aircraft; Robert Lopshire, Macmillan, 1974. 180 pp. $10.00

* Technical Aerodynamics; Karl D. Wood, McGraw-Hill, 1935. 330 pp. $15.00

* Aerodynamics of the Airplane; Clark B. Millikan, John Wiley & Sons, 1946. 181 pp. $20.00

* America's Soaring Book; Editors of Flying Magazine, Charles Scribner's Sons, 2nd printing, 1975. 272 pp. $20.00

B^2Streamlines, P.O. Box 976, Olalla, WA 98359-0976. E-mail: bsquared@halcyon.com, <http://www.halcyon.com/bsquared/>.

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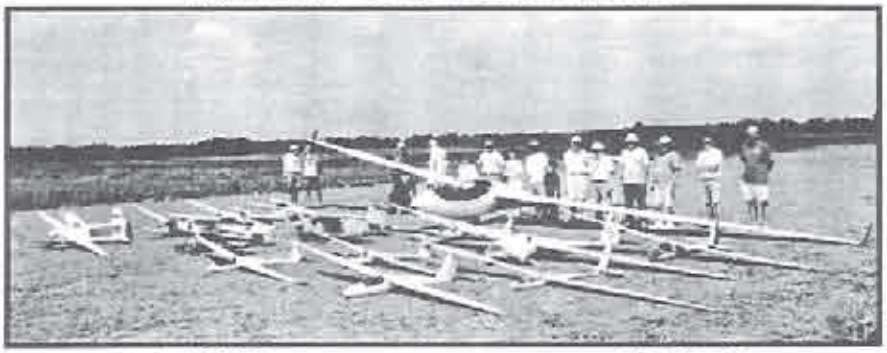
SCHEDULE OF SPECIAL EVENTS



Fayetteville '96, Lehman photo.

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

August 22-23
Mid America Soaring Championship Lexington, KY
Thermal Duration & HL Golf
Frank Foster, (606) 273-1817
102246.1017@compuserve.com

August 29
AMA HLG Redmond, WA
Joseph Conrad, conrad@namezone.com

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

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

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

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

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

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

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

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

October 17
LSF South East Regional Contest Huntsville, AL
Ron Swinehart, (205) 722-4311
ron.swinehart@lmco.com

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

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

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

Outside U.S.A.

Aug.1-2
24th Annual Soaring Contest
Coteau Station, Quebec, Canada
Alan Gregory, (514) 684-1795

Aug. 1998
F3J World Championships, organized by BARCS

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

Los Banos, Lehman photo.

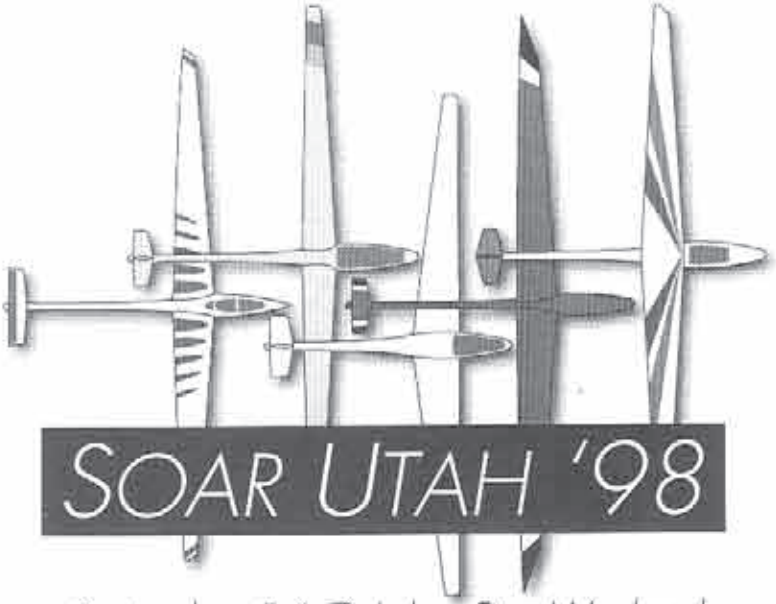
Elmira '96, Lehman photo.

THE GREATER NIAGARA AREA THERMAL SOARERS (GNATS)
Will Host their
THIRD ANNUAL
SCALE FUN FLY for SAILPLANES & MOTORGLIDERS
August 14 - 16, 1998
Approx. 30 Miles West of Buffalo/Ft. Erie
Niagara Peninsula, Canada

Emphasis will be on Aerotowing. Bring your Three Meter and larger sailplanes, fitted w/ ailerons and tow release. Enjoy the thrill of being towed by experienced tug pilots. Scale Motorgliders will be welcome at this event as will non-scale large sailplanes fitted with tow releases. This is an international event. Proof of MAAC or AMA membership is required, along with gold sticker radios for 1998. Warm-up day is Friday, August 14. Meals and accommodation are available nearby.

For additional information contact:
Gerry Knight, (905) 934-7451
Don Smith, (905) 934-3815
E-mail: Mistral@niagara.com
Linden@niagara.com

Pensacola, Lehman photo.



September 5·6·7, Labor Day Weekend
Salt Lake City, Utah

Vintage Scale · Modern Scale · Power Slope Scale · Open Fun Flying
Primary slope -Point of the Mountain
Alpine soaring - Francis Peak, more than a mile above the valley

To register or for more info visit http://www.soarwest.com, call Scott at 801.965.6055 or email smarsha@medicode.com

R/C Soaring Resources

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

Contacts & Soaring Groups - U.S.A.

Alabama - North Alabama Silent Flyers (NASF), Ron Swinehart, (205) 722-4311, <ron.swinehart@svl.lmco.com>, or Rob Clover at AMA3655@aol.com, http://sh1.ro.com/~samfara/

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

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

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

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

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

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

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

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

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

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

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

California - South Bay Soaring Society, Mike Gervais, P.O. Box 2012, Sunnyvale, CA 94087; (408) 683-4140 (H), (650) 354-5469 (W).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Reference Material

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

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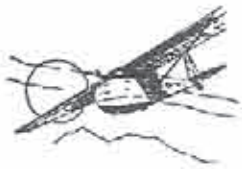

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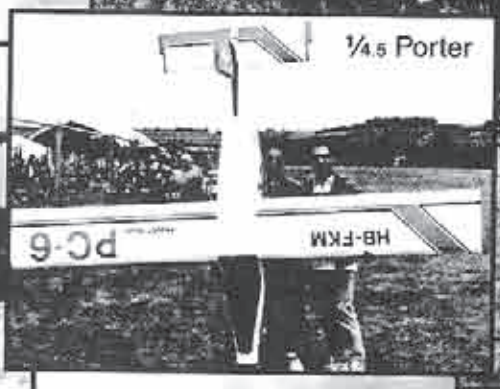

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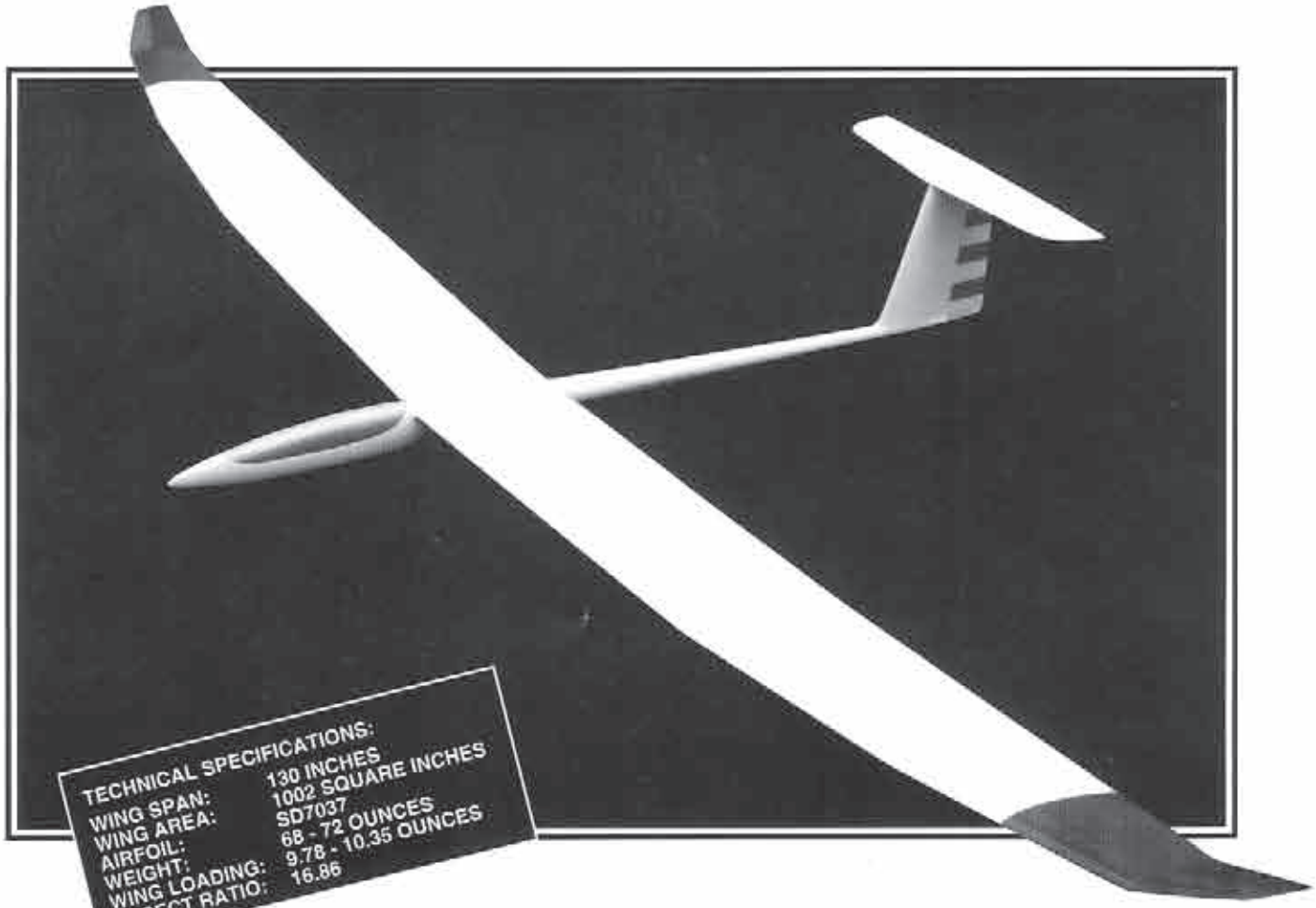

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