R/C Soaring DIGEST

August, 1997
Vol. 14, No. 8
U.S.A. $3.50

R/C SOARING DIGEST
A Publication for the R/C Sailplane Enthusiast!

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) 474-5015.

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R/C Soaring Digest is printed on recycled paper.

SIG Ninja flown by Todd Martin from Topeka, Kansas, on close pass over the Lake Wilson reservoir in Kansas. Event coverage on page 6. Photography by David D. Garwood, Scotia, New York.

SLOPE SOARING IN KANSAS

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OTHER GOOD STUFF

The Soaring Site

A Neat Web Site

One of the best web sites we have seen is that done by our own columnists, Bill and Bunny Kuhlman. If any of you haven't checked out the site because you thought it was strictly about flying wings, you're missing out on some neat stuff.

Why? Well, first, B^2 have established linkages to 15 sites that provide model aircraft information. For example, "Aircraft Design Information Sources" is the link to W. H. Mason's guide to books related to aerospace engineering, a fantastic resource. There are 8 links if one has an interest in tailless and/or unconventional aircraft; some indicate there are files that can be downloaded, if desired. And, if you're looking for an airfoil plotting program for your Macintosh, there's Foil 1.2, Foil Coordinates to MiniCAD 3, J-Foil 0.1, and Plotfoil 3.2. In addition to all this, Hobie, who was featured on the cover of the January issue of *RCSD*, continues to maintain and update his page, and B^2 have complete descriptions of the 9 specialty books that they offer through B^{2}Streamlines.

There is yet one more reason for some of you to visit the site, as it includes an *RCSD* web page, as well. The page contains general information about how to subscribe to *RCSD*, as well as highlights and status of the upcoming issue, including the cover photography shot. Late breaking news will also be posted as appropriate.

Thanks to the efforts of Bill & Bunny, we'll be able to have a presence on the web, with minimal effort on our parts. You see, they do the web stuff for us, and we provide the information, as things come up!

Yup, it's a really neat site, 'cause we're all there!

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

Happy Flying!
Judy & Jerry Slates

Jer's Workbench

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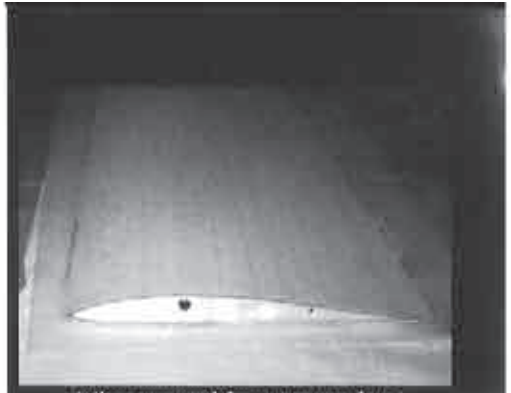
Building a 2 Channel Polyhedral Glider - Part II

Now, that the wings have cured, it's time to remove the wings from the wing bag, and trim the edges. (See photos 1 & 2.) Once trimmed, a bass wood leading edge was added to the wings, and then sanded to shape.

Last month, when the spars were constructed, a hole cut was made in the spars (1/8" wide x 4" long) at the polyhedral break. (See photo 3.) The wing was cut in half at the polyhedral break showing the hole in the spar. Filler has been applied to the top side of the wing. Why? I'm sorry to say that I didn't do a very good job of fitting the spar into the foam core, so ended up with a flat spot. So filler was applied to build up the spot; then, it was sanded to shape. The wings will be covered with iron-on film later, so the filler won't show. Now that you know about my boo-boo, let's complete the wings.

A 1/8" plywood wing joiner brace was cut and epoxied into one half of the wing. (See photo 4.) Then the other half of the wing was epoxied; the two halves were joined together. (See photo 5.) When the epoxy cures, the wing will be complete.

We'll continue this project next month.



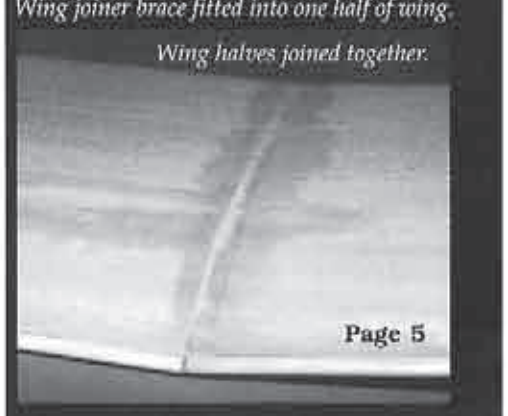
Wing removed from vacuum bag.

Edges trimmed.

Wing cut in half, showing hole in spar.

Wing joiner brace fitted into one half of wing.

Wing halves joined together.



1997 Sig/LASS
Midwest Slope Challenge

...by Dave Garwood
DaveGarwood@compuserve.com
Scotia, New York

How do you tell a happy motorcyclist? (Bugs on his teeth.) A pilot prepares to launch in the Ninja Slope race. Pilot and caller behind are already on the course.

Mike Pratt's "Box Ninja" over the Lake Wilson reservoir.

Mass launch to start one heat in the Ninja slope race. Most heats ran three or four planes at a time.

Contest Director Paul Wright from Lincoln, Nebraska.

Introduction

The 1997 Sig/LASS Midwest Slope Challenge attracted slope pilots from half a dozen states together in Russell County, Kansas for a three days of slope combat and slope racing. This continuing series runs with support of Sig Manufacturing in Montezuma, Iowa and the Lincoln (Nebraska) Area Soaring Society.

Slope soarers in Kansas? Iowa? Nebraska? There are **plenty** of them.

Put aside your geographic preconceptions for the moment. On the three hour drive between the Kansas City International airport (It's in Missouri, by the way.), and the Lake Wilson race site, I saw more soarable slope sites within walking distance of the interstate

Mike Pratt, designer of the Sig Ninja, holds up the "Box Ninja" (the one built and photographed for the box art work) for identification to flagmen.

Ken Hawkins, from Wichita, Kansas, prepares to launch at the start of a Ninja slope race heat.

highway than I've found in six years of **searching** for them in New York and New England.

The difference is fewer trees. I saw no forests in Kansas. The occasional trees that dot the landscape were planted by recent settlers. The old fence posts are made of limestone, since not enough timber grows there.

The hilly topography in eastern Kansas was previously unknown to me. Now I know there are limitations in what I learned about the 50 states in geography class.

The Events

Friday was a travel day and saw informal slope combat. Twenty or so pilots flew from a west-facing hill all day until thunderstorms rolled in about 4:00 PM. After the squall line passed through, we flew until dark.

Saturday was to run the Stock Samurai class and Stock Ninja class races, but lacked the wind we needed to finish the races. The course was set up

and a pilots meeting held; we waited for wind. Twice, the Ninja race was started, but the wind died after a couple of heats. The race turned into an all-up, last-down event for racing Ninjas; the Samurais did not launch.

Some of the Ninjas I saw showed pretty hefty construction. Last year's race saw 30-40 mph winds; some Ninjas broke at the nose on landing. This year, the people brought Ninjas with tough fuselages. Note that the event rules allow non-stock fuselage construction, as long as the stock outline is maintained.

Late Saturday afternoon, another cold front rolled through, and we got in some rock and roll flying in the brief interval, before the lightning started hitting close.

The Saturday evening banquet was tons of fun. Sig Manufacturing was wonderfully generous and raffled off a dozen kits that were to be the event prizes. The list included Ninjas, Samurais, Risers, and Tri-Stars. Everyone registered won a Sig hat or a Sig can cooler.

The Sunday schedule was to include a 60-inch race and an unlimited race, but a high-pressure dome brought us light and variable winds. People flew a great variety of planes around various points of the Lake Wilson reservoir, but no racing was held. Remember to bring an HLG when you go to slope events.

The Sig Sailplanes

In my view, Mike Pratt is one of the top slope designers working, today. Not too many makers have inland slope designs that have been in production for more than five years.

The Sig Ninja is the slope plane I learned inverted flight on, and the one I got my two hour, ISF slope flight with. My son, Lou, learned rolls with it. When Lou left for college, I asked what he wanted me to do with his planes. He replied, "Keep the Warthog and the Ninja and get rid of the rest." With the exception of the selection of light ply as a fuselage material, the plane is an excellent, aerobatic slope trainer. My suggestion is build the plane with a 1/4 inch balsa fuselage, install big tri-stock, and sand it round. I reviewed the Ninja in the June 1991 issue of *Model Airplane News*.

The sleek and slippery Sig Samurai is fast and agile, and makes me look like a better pilot than I really am. One observer said of the Samurai, "It cuts like a knife." Another noted, "The Samurai doesn't care which way the wind is blowing." If you build the kit with a two-piece V-tail, the completed plane will fit back into its original shipping box for easy transportation. I currently have two Samurai with radios and servos installed. I reviewed the Samurai in the April 1993 issue of *Model Airplane News*.

The Future

The Lake Wilson site appears to me to be one of the top 20 slope sites in the country. It's at least as steep as Point of the Mountain, Utah; not quite as tall as Los Banos, California; but higher than Leclercville, Quebec. Grass-covered, nearly treeless sites surrounding the reservoir are flyable in more wind directions than Sleeping Bear Dunes, Michigan or Cape Cod, Massachusetts.

The landlord, the US Army Corps of Engineers, is receptive to soaring events. In addition to water conservation and flood control, the main use of the reservoir is recreation: fishing, boating and camping. How many other slope sites have free, hot showers at the base, so you can wash off the sun screen lotion at the end of the flying day? Hey guys, this could improve our image.

Given the quality of the site, the outstanding organizational abilities of Paul Wright and the LASS members, and magnificent support by Hazel Sig, Mike Pratt and Jim Porter at Sig Manufacturing, I'm planning on going to Kansas for next year's race. I hope I can talk my son, Lou, into coming as well.

It would be terrific if the spring 1998 slope events can be scheduled so that events at Los Banos, Leclercville, and Lake Wilson are not on the same weekend, as they were this year. I know it's not easy to coordinate such international scheduling, but I hope it can be accomplished next year.

Driving across the Great Plains,

Dale Pahl, from Colorado, holds up his "Luftwaffe Ninja" for identification to flagmen at the start of a Ninja slope race heat.

listening to "Ride My See Saw" on 100.3, the classic rock station, and to "Cherokee Nation" on 98.5 Oldies Radio, or to "Carolina on My Mind" on 99.9 Premiere Country, is a soulful experience.

Watch for announcements in *RCSD* for the 1998 Sig/LASS slope race. In the meantime, order and build your Sig Ninja and Sig Samurai kits, so you'll be ready.

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on the Wing

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Zephyrus
The Cheapest Form of Instant (well nearly instant) Self Gratification

This month's On the 'Wing... column is written by Jim Keller of Diamond Bar, California.

Here's my story on the development of the flying wing I wrote about in RCSE and received so much mail about (approximately 20 requests for more info, specs, setup, etc.), and call the Zephyrus.

I've always been an airplane nut, starting my model building career in about 1949. I have been interested more than just mildly in flying wings for years. An early recollection during my childhood right after WW II was seeing a Northrop wing flying near the Lockheed Burbank facility.

The last few years, I have taken to designing and scratch building planes. Last year I got hooked on slope soaring, and I find every excuse in the book to leave work on time to get in some evening soaring. This is in addition to my daily jaunt to a local park near work to fly a HLG or 2m ship during lunch time. I also leave early for work sometimes and fly a small electric planes from a park near home. Did someone say I was obsessed?

Enough digression. Recently, a regular flier at the slope showed up with a Zagi LE. I was astonished at two aspects of the plane: it handled light lift with ease, and when the rest of us were sitting, waiting for the wind to pick up, he was flying. It also was very agile, regardless of the wind speed. That did it. All of the studying, reading and calculations for my own design had to be accelerated.

About this time, I was also doing a lot of business travel. I would sketch a wing and then make a card stock model, and fly around the hotel room in the evenings I was away from home. This prepared me for the practical side of things and taught me what worked, and what didn't. I experimented with planforms, sweep angles, tip twist, elevon configurations, stability and control. It seemed the best flyers were the ones with a 23 degree sweep and full span elevons. I was performing these little experiments at fairly low airspeeds, where stall recovery could be evaluated.

The resulting planform that I present here is the best compromise of all:

- 48" wing, approximately 10% thick RG 15 airfoil, 4 degree washout at the tips
- 23 degree sweep, each wing half
- 12" root chord, 7" tip chord
- white foam cores, covered with 80# Kraft paper using 3M 77 spray adhesive, then covered with 2" clear plastic packing tape
- partial span top spar made from 3/16 dowel placed in slot cut on top of wing, then filled flush with fiberglass package tape. The next version will be composite or at least partially EPP foam. The paper and tape covered foam is durable, but deforms somewhat after repeated crashes, which are inevitable for slopers. My downfall is what I call blowovers, which occur when you get the plane high, right above you at the edge of the slope and you try to turn back into the wind. The plane just blows over your head and then back into the rotor. Bummer — no control!
- full length (except for about 1.25 inches each elevon root) 1 1/2" elevons made from T.E. stock, then shaved to match airfoil and hinged with packing tape
- center of gravity so far is best at 18% M.A.C., which translates to about 6 5/8" from root L.E. for this planform. Obviously, you either need a separate mixer in the plane for the elevons, or have a computer radio programmed for elevons (which I have). Each elevon is moved by a separate Hitec HS 80 servo. You can use full size

A shot of 6 of my slopers. The two in the left rear are my own design. The flying wing is in the foreground.

servos, but they won't be flush in the wing. You can move them a bit inboard, but unless the elevon balsa is real stiff, you'll have flexing at speed.

- for launching, I taped a small strake under the wing near the C.G. to hold when I toss it off the slope.
- all up weight for this configuration is 14.7 ounces
- wing area is 451.5 sq. ins.
- pockets cut into the foam for the receiver and 150 mAH battery in the center of the wing, and two pockets for the servos, each mounted about 10" from root line. Servos mounted from the top, pushrods on top to protect from landing damage. I laid the radio components on the covered wing and moved them around to try to achieve good balance without adding weight. This, as I now realize, wasn't necessary, since more weight will be better in 10 m.p.h. wind.
- tiplets made from 1/16" ply, roughly triangular with rounded corners, 7" long and 5" high. Securely tape to tips. Make sure these are parallel with the center line of the wing, else you'll have a yaw bias for sure, which you'll need elevon trim to correct, which means you've built in some needless drag — aspects I have identified so far.

I call the plane the Zephyrus, after the Greek god of the West wind; so named since the slope I fly on faces west, into the prevailing wind.

Design Objectives

The initial full size RC plane was built with four objectives, or requirements in mind:

1. It had to be cheap, constructed of readily obtained and inexpensive materials.
2. It had to be durable and/or light enough to resist damage.
3. It had to be built simple and fast — I get antsy to try out something new, plus my building time has become precious lately.
4. It had to look different from the current genre of 'wings, but have a conventional (for a 'wing) planform, so I wasn't outside of the range of current thinking.

To satisfy all of these requirements, I decided that brown paper and packing tape over expanded bead polystyrene (white) foam would be the cheapest and fastest approach. It would be light for a sloper, which meant that it would resist a nominal number of crashes before it became landfill fodder. Remember, this was to be a "proof of concept" model.

Construction

I cut the templates to an RG 15 airfoil, but thinned the leading edge back about an inch to allow for the extra tape I would put on the leading edge of the wing. This would allow extra reinforcement and minimize the amount of ballast up front. My next version will at least have a hardwood dowel at the L.E. to take more abuse, since the white foam deforms pretty easy. After cutting the cores, I prepared the blanks. It's important that the root and tip of each wing half be square with the transverse axis of the wing and parallel to each other to have the airfoil be true. I use 3M 77 adhesive spray to adhere the templates. The tip template was attached at a 4 degree washout position and the cores were hot wired.

After hot wiring the cores, they were glued together, making sure they were each flat and true with each other — no dihedral is built into the wing. At this point, I wrapped the wing top and bottom spanwise with one or two layers of 3/4" fiberglass packaging tape. After wrapping the wing halves, I sprayed 3M 77 adhesive spray on the

brown paper and the wing. I use the heavy 80# package wrapping paper you can get at most discount stationary stores like OfficeMax, OfficeDepot and Staples. After covering with the paper, I covered the paper with 2" clear plastic package tape. At this point, you're probably only 2 hours into the project, and your equivalent outlay is only about 3 - 4 bucks. At this point (actually, it should be done before covering), I sliced a 3/16" deep groove into the top of the wing and about 15" long for a top spar made from a 3/16" hardwood dowel. I covered the dowel and its slot with fiberglass package tape.

I used 1 1/2" trailing edge stock for the elevons, and took a razor plane and matched the contour of the airfoil. You can easily carve the elevons from 3/16" medium sheet balsa. Use your favorite method of tape hinging to attach the elevons, and the wing is essentially done, except for radio installation and balancing. Mount the elevon control horns on the top of the elevons at the point where the pushrods will attach.

The tip plates are made from 1/16" birch plywood, although you could use balsa, covered with packing tape. Before mounting the tiplets, make absolutely sure that the ends of the wing tips are parallel with the centerline of the root of the wing, so as not to induce a yaw component.

Radio Installation

Radio installation is simple. Cut pockets for the receiver, battery and servos by using a sharp X-Acto knife. Cut these with care so that the components fit snugly, especially the servos, to minimize slop. Cut their location as far forward as possible, but no closer than about 3/4" from the leading edge to allow for some crush space after crashes. Insert the components into the pockets and then tape over them. You can leave an inch or so of battery lead hanging out to turn off the radio, or you can use a short servo extension as an on/off switch. The pushrods for the elevons are made with Z-bends at the servo, and adjustable clevises at the elevons. If you don't have a computer radio, add a mixer and cut a pocket for it, also. When mounting the servos, angle the servo arms rearward about 30 - 40 degrees to induce differential. Tape the servo leads flat with package tape. I tape the antenna straight back and then just let the remaining 30" or so flop in the breeze.

Balancing

The balance point, if you built in strict adherence to the specs, is 6.4 - 6.6 inches back from the leading edge at the root. This corresponds to about 18% M.A.C. for those aerodynamically endowed. I had to add about 2 ounces of lead to achieve this. Correct balance, of course, can be determined by hand tossing. I found that a triangular skeg made of 1/8" balsa, taped along the underside of the center of the wing was very handy for hand tosses. The glide should be flat, as with a conventional plane.

Flying

This plane is intended to be a sloper, so the following is strictly for that mode. Toss the plane ahead, directly into the wind, just a tad of nose down attitude. I usually give it a little down elevon initially to gather some speed and get free of the ridge turbulence. After that, it will climb fast and then you're in for some fun. Please be advised that a characteristic of 'wings is that they will "kite" if you get a significant angle of attack. In strong wind, you need to be very quick to catch this and give it some down elevator to recover. Until I learned this, I had a number of "blowovers" where I turned into the wind close to the ridge and then had the plane blown over my head into the rotor. Play with the elevon movement to fly docile or to fly fanatically. I've found about 1/2" up and 3/16" down for turns and a little less for equivalent elevator control is a happy compromise, but for the first couple of flights, set these at about half that throw.

Into the Future

With enough air time now under my belt with this plane, my next version will be fiberglass covered foam with an adjustable C.G. to experiment with stability. I will increase the weight to fall into the seven, or so, ounce per sq. ft. loading category. As the summer progresses, the wind speed increases at our slope, and the additional weight will be needed. Combat is making its way onto our hill, but Zephyrus, for now, is a peaceable soul, content with a combination of lazy, relaxing flight mixed with some exuberant aerobatics. We'll leave combat for the DAWs, Foaminators, PSSs and Zagis.

Earlier, I indicated the four requirements for building this plane. If you build one too, I think you'll see that these objectives were met, and that the fun-per-dollar ratio is pretty hard to beat. Enjoy!

Mr. Keller is an Electrical Engineer, specializing in Systems Engineering for Lockheed Martin. He has been a model builder since the 1950's. He has built and flown all forms of models from indoor to control line combat to electric flight, including the infamous Galloping Ghost RC control of the late '60's and early '70's, but now concentrates on R/C sailplanes and electrics. ■

My daughter, Colleen, holding the prototype.

Taken at Caddo Mills, Texas, Martin Simons with Grob 109 Motor Glider. Jerry Slates photo.

A Group Interview with Martin Simons

Conducted by:
R/C Soaring Digest
Jerry Slates, Wylie, Texas
Steve Savoie, Gorham, Maine
Dave Garwood, Scotia, New York

Introduction

It is always a delight to have the opportunity to chat with Martin Simons. Not only do his soaring experiences span many years, and several continents, but no one dozes off when Martin has a story to tell. From 1970 'til 1980 he was the editor of the respected Australian magazine, *Australian Gliding*, and is regarded as a leading world authority on full-size vintage gliders and sailplanes. Today, one never knows where he will show up next, what projects he is currently researching, and what the subject of his next book will be. This interview, for example, is conducted via e-mail. It started in Wylie, Texas and has followed Martin to his next stop: Surrey, England, where his older daughter and two of his three grand-daughters live.

RCSD: Hello, Martin! *RCSD*, here. How's the weather in England?

M: As usual, it varies from good to lousy, but this year there has been almost a drought. Days are mostly good for soaring, with cumulus clouds and plenty of thermals.

RCSD: Are there any vintage glider rallies that you'll be attending before returning home to Australia?

M: I have been already to one, the British National Vintage Glider Club rally. Plans to go to the bigger, International Vintage Glider Meet in France in August, look like coming unstuck.

RCSD: Can you tell us a bit more?

M: The meet I went to was at Camphill in Derbyshire. There were about thirty old sailplanes there ranging in age from the Scud 3 (1934), belonging to my friend Ted Hull, to the relatively modern I. Spatz and Slingsby types like the Swallow and Skylarks 2 & 3 from the nineteen fifties and sixties. Launches were all by winch, because airplane towing is forbidden at this site, which is in the middle of a beautiful National Park, the so-called Peak District.

RCSD: Camphill? Isn't that where you began gliding in 1947?

M: Yes. I was born in a tiny village called Nether Padley six miles away from the site. Later, after a few years in the city of Sheffield, my family moved to Eyam, another village only four miles from Camphill. I was brought up there. Whenever possible, I used to walk up the hill from home to the gliding club, and often ran down again in the evening, unless someone gave me a lift, which they sometimes did. It was great to fly again over this country and spot the houses where we lived. I was able to fly six sailplane types; a check flight first in the modern glass two place Puchaz to familiarize me with the site again after some years' absence, the Junior, the ASK 18 and three older types: the Slingsby Petrel and Sky, and the tiny Hutter H - 17. I got into the H - 17 fairly easily, but my aged joints required me to have help to get out of the very cramped cockpit after flying it! The Camphill site is on a fairly uneven plateau surface at 1300 feet above sea level, and is often

covered in cloud; but this week we had clear skies and excellent soaring up to 5000 feet above take off.

RCSD: What has gone wrong with the plans for the later Rally in France?

M: It is most disappointing. We used to be able to go to France and fly sailplanes with very few formalities. A few months ago, there was a sudden tightening up, which seems to apply only to British (and perhaps Australian) pilots. We now have to produce licenses for the French authorities. Previously, it has always been enough to show a gliding certificate or badge, like a C, Silver C or Gold C, and we have never had formal licenses. Now, in France also we are expected to submit to a fairly severe medical examination, a medical as tough as that required for the pilot of a light commercial charter aircraft. Also, British gliders used to be permitted to fly in France if they had Certificates of Airworthiness issued by the British Gliding Association. This is no longer allowed. The rule in this respect must be causing trouble even for some French glider owners who have sailplanes with British Cs of A.

It really does seem that a special rule has been made to keep the British away. It may have some obscure connection with an accident earlier this year, when a French sky diver hit the wing of a British sailplane near the airfield at Gap. The skydiver was killed; the two British pilots got out by parachute, but are now charged with involuntary manslaughter. The trial is starting soon, I believe. Don't ask me how these two things connect - maybe they don't. But it has all become very nasty. The outcome is that the British contingent cannot fly at the International Rally and, since I have dual British and Australian citizenship, I probably can't either. We are hoping to go to Germany instead for a mini rally of our own. In Germany, we know we shall have a good reception - we've been many times before.

RCSD: You yourself have a Gold C badge. Could you tell us what it represents?

M: Sailplane pilots earn badges, A, B, C, Silver C, Gold Certificates, and then up to three diamonds, by performing tasks of increasing difficulty. No one bothers with the very elementary A & B nowadays. You get the C for your first real solo soaring flight. In Britain there is a 'Bronze C', with written tests and other operational safety demonstrations before the Silver. The Gold C requires a distance flight of 300 kilometres (about 186 miles) and a height gain, after release from the launch line, of 3000 meters (9843 feet). These can be done in two separate flights or both in one flight. I did my Gold Distance in England in 1967, and my height gain in Australia the following year. Since then, I have added a couple of diamonds, one for a flight of 300 km to a pre-declared goal, and the other for a 'free' distance of 500 km (311 m), both done in Australia. I have never managed the third diamond, which requires a gain of height of 5000 meters. I once got to 4876, but couldn't squeeze the last two hundred out of the cloud I was in! Oxygen breathing gear is necessary, of course, for this kind of height.

RCSD: What was your most interesting or most terrifying experience?

M: I can remember only one occasion when I was truly frightened in the air. That was in England in 1967 when, in a competition, we had to fly to a certain airfield. I was flying a Ka 6E. When I got near the goal, there was a colossal thunderstorm, with lightning everywhere and very heavy rain. The cloud was enormous beyond comprehension, awe-inspiring, a vast dark curtain from the ground up and over my head to the stratosphere, everything in shadow and gloomy. I did not dare to go into it, not having very much height and not being sure I could find the airfield if I did try to fly into dark and rain. So, I landed in a field. One other, much more experienced pilot, who was a thousand feet above me, did press on and got to the goal in very heavy rain and hail, and said afterwards I had been wise. I didn't feel wise, just chicken, at the time!

I did have an accident at Camphill soon after starting training. I crashed from 100 feet in an 'open' primary glider, and had fairly severe injuries. There wasn't time to be frightened! Oddly enough, at Camphill last month

I met the man who was my instructor on that day. Since he was on the ground when I was in the air, there was nothing he could do to stop me diving into the deck! Now very elderly, he still remembers it!

RCSD: Do you find any philosophical differences of note between flying in Australia, Great Britain, and the U.S.A.? Full size? R/C sailplanes/ gliders?

M: I'm not sure what 'philosophical' means here, but then I used to teach philosophy, which is largely a matter of asking what this, that or the other expression means! What does philosophy mean? What is the meaning of meaning? I once read a book all about that, but I didn't know what it meant.

Model flying clubs and the members are much the same everywhere. We all like the idea of flying without an engine, extracting what energy we can from the air and developing the almost intuitive feeling for detecting and using up currents. If that is philosophy, we all have the same philosophy at heart.

In full-scale soaring, in the USA there are many more privately owned wholly commercial operations than elsewhere. In other countries the normal sailplane operation is the amateur club, possibly with a small professional staff, but most of the work is done by club members. All assets including sailplanes and launching equipment, tug planes, etc., are collectively owned and are governed by the club committee. This difference is very noticeable. The cost of soaring in the USA is on the whole greater, but the convenience of having someone else doing the work is obvious! The club atmosphere is much less apparent, but the same basic good nature and enthusiasm for soaring prevails. There are commercial operations in other countries, but except in the USA, such centers are exceptional.

RCSD: Can you tell us when you first became interested in gliding?

M: Not really, because it was so long ago. But there were two events, clearly remembered, that must have been influential. I remember being on a seaside beach somewhere in England when I was very small, probably only about five or six years old. I didn't like beaches even then - grit everywhere including in the food, abrasive gusts of sand laden wind, cold water, rough waves and smelly seaweed (England, remember!). But I watched the gulls flying above the concrete sea wall and realized that many of them were gliding without flapping their wings. I started counting the seconds of a particular bird's glide and was amazed to find I couldn't count to big enough numbers! Might it be possible, I wondered, to find a dead gull, stiffen it up with sticks and fly it! My mother didn't think so!

Much later, when I was nine, I visited Camphill, when the British National Gliding Championships were on. This was in August 1939. I was totally enraptured by the beautiful sailplanes in their clear dope and gloss varnish finish, with the light shining through the wings as they flew. I went home and tried at once to make a glider out of balsa wood. I had no idea how to do it and did not understand the principles of flight. My parents weren't interested and were not of any help!

Only two weeks later, the Second World War began and all civilian aviation, including even flying powered model airplanes, was forbidden for the next six [years. But flying model gliders was permitted and that is where I began, with simple balsa free flight 'chuck' gliders, and I went on from there. I built a lot of model gliders, some of my own design, during the war and on into my teenage years. I read everything I could find about models and joined the Low Speed Aerodynamics Research Association. This enterprising society produced some very good papers and research reports but, sad to say, did not survive very long. It was founded by a group of aeronautical students at London University, but when they graduated and left (mostly to become very distinguished in the aircraft industry), the LSARA collapsed.

RCSD: What caused you to start writing books on the subject of aerodynamics?

M: For some years, I did very little flying of any kind, while recovering

Caddo Mills, Texas. Martin on tow in Schweizer I-26. Jerry Slates photo.

from my accident, then immediately drafted into the RAF in the post war period, night school, college, marrying, starting a family, etc. I did a little flying, models and full scale, but not very seriously. I built some very early radio controlled sailplanes (including building the radio gear), but I got much more into full scale soaring when I had enough time and money to spend. It was about 1970 that I became again more interested in model flying and thought there must by now be lots of serious books about the principles of model flight. I ought to catch up on new developments and do some necessary reading.

When I started looking for the new books, I found, to my astonishment, there were none! Indeed, most of the books and magazine articles that did exist at this time, were nothing but rehashes of things that had been published thirty years and more earlier. I knew they were mostly out of date and, in many, many cases, quite wrong.

Having reached this impasse, and having by now written several little books and some academic papers (on non-aeronautical subjects), I thought the only thing to do was to write a book myself. I did a lot of searching through academic journals, delved into hefty texts on full-scale aerodynamics, and set to work. When I had a draft finished, I asked a famous aerodynamicist to read it and point out any errors, which he very kindly did. I recall he pointed out one or two bad mistakes, but they were easily put right. I was very pleased when another aerodynamicist reader admitted to having learned something - about very low speed wings - from what I had written. Most professional attention was going on supersonic flight at that time. So that was how my book, "Model Aircraft Aerodynamics", began; after twenty years, and three editions, it is still selling at the rate of about 1000 copies per year.

RCSD: Have you ever considered a career teaching aerodynamics or courses associated with aviation?

M: I have never wanted to make aeronautics my career in any way. It would take away the fun. Apart from that, I enjoyed my non-aeronautical professional teaching and it absorbed all my normal working time and energy. Turning to something completely different at weekends was a relief and much needed relaxation.

RCSD: Your book, "The World's Vintage Sailplanes 1908-45", is a masterpiece, providing an excellent resource for both R/C modelers and full-size sailplane enthusiasts, alike. Can you tell us what it takes to research a book such as this?

M: I am aware that it could be improved. Having been involved, with some brief periods of enforced absence, with the soaring movement since childhood, I have always been fascinated by the aircraft, both for their beauty in flight and for the exceptionally interesting engineering which has, over the decades, gone into their design and construction. For as long as I can remember, I have collected information, magazine clippings, old

photographs, and anecdotes. When I decided at last to make a book, I read and made notes from something like a hundred older books in various languages (getting translations done where I couldn't read them myself). I made searches of about the same number of ancient periodicals, scanning all their indexes over the years for any references to the sailplanes I wanted to include. I corresponded with people all over the world, asking for their help. I usually wrote something first, did the drawing and sent copies to those I thought would be able to look at them for me. In almost every case they were delighted to correct and amplify what I had written, and generally to give me encouragement. There is a list of these very kind people in the book. Some, like Alexander Lippisch, unfortunately died before the book was published or soon after. Many others are still active. I suppose all this took about ten years, but of course I did not work on it full time. The final task of compressing the information into a limited text, and doing all the drawings (in those days, with pen and ink on large sheets of card) must have taken another couple of years. It was a labor of love.

RCSD: How many of those planes have you actually flown?

M: I have had to check my logbook. I have evidently flown seventeen of the types described in that book, that is, sailplanes of pre-1945 origin. This includes that recent flight in the H - 17, mentioned above! I have now flown 88 different sailplane types all told, including modern types.

RCSD: Just how big is your reference library?

M: I don't know, but I have one wall of my study at home full of gliding and other aviation books, and another wall full of gliding magazines, bound copies dating back to the early thirties. I suppose, purely gliding books alone, three or four hundred. All the rest, I guess several thousand items of varying size, many boxes full of photocopies and a great many photographs. I did a big sorting of my photograph collection just a few months ago. It came to several thousand, now properly stored in acid free plastic pockets and filed by sailplane type.

RCSD: Why is it that there is so little published on the golden age of soaring?

M: I'm not sure when the golden age was, but a lot has in fact been published. The difficulty is, finding them. Large public libraries have excellent collections. The Library of Congress, for instance, yielded several gliding books I had never seen before, the British Library has others, and I even got some texts copied for me by the Moscow State Library in the days of the USSR! They were very helpful and cooperative. I had to spend many hours or days searching.

Dave: Is it possible to make money writing sailplane books?

M: I have to say it is possible, since I have made some money doing it. But the financial rewards are relatively small. I would not like to rely on this as an important source of income. The amount of work required is totally out of proportion. I have been lucky to have had secure employment virtually all my life and have had enough spare time to spend on writing as a hobby. I would have done better, financially, to take some unskilled 'moonlight' job to occupy twenty or thirty hours a week outside my main work. I have never written anything just for the little money it sometimes brings in.

Dave: Any suggestions for those contemplating trying it?

M: First, make sure you know what you are writing about, and also get it checked by a truly competent authority. If there is something in your work that moderately bright people have trouble understanding, it is probably because you don't understand it yourself! Rewrite it until you are sure you understand it and then get a reader to check it. Your reader must be someone who knows the field thoroughly and is well qualified to correct your work. Such people with time and energy to spare are not easy to find and when found you may have to pay them. Then you have to be humble enough to thank them, make the corrections, and submit the script again for review, and again if necessary until it is right.

Slingsby Sky, flown by Martin Simons, May 1997, at Campbell, the hill top club, where he began gliding in 1947, and where he crashed his primary glider. Martin Simons photo.

Secondly, make sure you write well and clearly, don't try to make your work pretty or clever by including long words or elaborate sentences, and check your grammar, spelling and punctuation. No one else will do this for you. Editors sometimes interfere with what you write but they often make mistakes themselves, so get it right first time and be ready to defend your position.

Thirdly, offer whatever you have written to a publisher, either a magazine or, if it is a book, a recognized producer of books in the field where your work belongs. It is no use submitting sailplane articles to Gardening Weekly or collections of funny gliding yarns to McGraw Hill. Look for a publisher who is already known for an interest in sailplanes or at least aviation. Explain what you have produced and ask them if they are interested in your work. They will usually ask to see an article, or if it is a book, will ask for a synopsis and a sample chapter or two. If they like what they see and think there will be a market for it, they will want to publish it. More likely, not, but then you try another publisher.

It should go without saying that everything should be accurately typed or word-processed, with any drawings needed as nearly ready for the camera as you can make them. These days, most publishers prefer everything, including drawings, to be submitted on disc and, preferably, using software with which they already are equipped. (This is not essential if they otherwise like the material, but it helps.)

If the publisher agrees to publish the work, make sure you understand the terms offered and are willing to accept them before agreeing. Modeling magazines normally make payments in peanuts per page. (Ask a professional freelance journalist what he/she gets for 1000 words in *Vogue* or the *New Yorker*. Divide by at least ten. Maybe you can get some nourishment from peanuts.) With books, the publisher should pay you a royalty of at least 10% of the retail price of each book sold, and this should be clearly stated in the contract they offer you. There may be some flexibility with respect to overseas sales, discounted copies, etc., but 10% of the retail price is typical and it is not very much really. Famous authors of best selling fiction get much more.

Do not under any circumstances approach a 'vanity publisher'. Many of these people have been known to offer to publish and market your book for you, if you pay them to do it. Then, they will print a few hundred copies, for a price, send some for your own shelves and your friends, and after a short interval, pulp the rest unsold.

If you cannot find a commercially respectable publisher and yet you are really determined to see your work in print, you can publish it yourself - writing, drawing, finding photographs, writing captions. Do the processing

and layout using one of the modern software packages such as Quark Express™ or PageMaker™. Then go to a jobbing printer and bookbinder, get a quotation for however many copies you want, and pay the price. The box of books will arrive and you then have the job of selling them all.

It can be done.
It isn't easy.
Best of luck!

RCSD: Can you tell us about your next book, and when it will be published?

M: The next one is my book about ten years in the life of Peter Riedel, the famous glider pilot who became assistant to the German Military Attaché in Washington, DC, in 1938. It is called "German Air Attaché", and is to be published in September.

RCSD: Are the publishers the same ones that published "Slingsby Sailplanes"?

M: Yes, Airlife, of Shrewsbury, England.

RCSD: If it's not too early, can you give us a sneak preview?

M: "German Air Attaché" describes the extraordinary events in Peter Riedel's life from 1938 until 1948. It is a true story written with Peter's approval, based on his own narrative, tape recordings, notes he made himself at the time of the events, and a few other sources. It has moments of high drama, danger, humor and some grim overtones of espionage and treachery, even some sea voyages. There is a little soaring in the early chapters.

The other book, now on the same publishers' desk, is the one I have done with Paul Schweizer, about the Schweizer sailplanes. The title is "Sailplanes by Schweizer". Airlife will publish this next year, sometime. Paul wrote the text with some additions by me, I did the drawings, we chose the photographs together, and I am the over all editor. It is a sort of companion to the "Slingsby" book.

RCSD: Not all of your books are about full-size sailplanes. "Gliding with Radio Control" is a beginner's guide to building and flying model sailplanes. Do you prefer to write about full-size or R/C?

M: I have no very strong preferences, and make little distinction between these two areas. But in the model field, I am often driven to writing something for a magazine because of the errors I see others making. Some writers in the modeling field do more harm than good by perpetuating ancient myths and even making up new ones. That tends to turn on my word processor!

RCSD: What are some common misconceptions you read or hear about regarding R/C sailplanes, today?

M: There are several. One that constantly crops up is the myth about the downwind turn. It has been known for many decades that in conditions of steady wind, turning an aircraft of any kind, one way or another, makes no difference whatever. This can be demonstrated to anyone by taking a short flight, on a windy day, in a full-scale sailplane or airplane. But some modelers still cannot be convinced. This is because they are standing on the ground, not flying in the real air. Every now and again someone resurrects this myth! I believe they cause many beginners to crash their models.

Only a few months ago a writer in a famous English RC magazine wrote learnedly about flying in the wind gradient near the ground and how this explained the so-called downwind turn effect. The trouble is, he had the whole thing exactly the wrong way round! That magazine did not publish my own corrective article. Perhaps it was because even the editor, who truly should know better, was confused.

Another one that gives me a lot of trouble is loose talk about stability, especially neutral stability, in relation to the so-called dive test. To go into this would require a very long article. Come to think of it, I wrote that some years ago in *RCSD*!

RCSD: For anyone interested in learning how to fly R/C or full-size sailplanes today, how would you recommend they begin?

M: Learn to fly with an instructor. Join a club, or go to a reputable school like the Schweizer soaring school, where instruction is readily available, and be ready to learn. Reading an introductory book is useful, but cannot replace personal instruction.

Some aerodynamic questions

Jerry: If I have two stabilizers of equal square inches, but one has a high aspect ratio and the other has a low aspect ratio, will they work the same?

M: There will be some differences, but you may not be able to detect them in practice unless the aspect ratios of the two surfaces are very greatly different.

A high aspect ratio wing (a stabilizer is a small wing) has a steeper lift curve than a low aspect ratio wing. This means that for a given change of angle of attack, the high aspect ratio is more sensitive, giving a bigger change of lift. That is, the high 'A' surface is more powerful and effective in correcting small disturbances. Also, since more of the total area is further from the interference effects of fuselage and fin, the high aspect ratio tail will be more efficient generally.

There are some small warning sounds to be uttered. The steeper lift curve also means that high aspect ratio wing reaches the stalling angle sooner. This can sometimes cause trouble. Under extreme conditions of tail load, on a winch launch for example if the tow hook is too far forward, it is possible to stall the stabilizer and the high aspect ratio surface will get to this angle of attack sooner than the low A tail. It is not at all likely, but bear it in mind. The other point is the fairly obvious one. A high aspect ratio stabilizer will feel greater bending loads, may be more flexible and prone to flutter, and may therefore have to be made stiffer and heavier than the low A surface.

Jerry: I'm using a NACA 0009 airfoil on all of my stabilizers for thermal flying. I'm not looking to do an 18-second F3B speed run. Would I see any difference in the performance of my sailplane if I changed to a NACA 0008 or NACA 0010?

M: I doubt if you would be able to detect any difference. The slightly thicker profile ought to give a somewhat smoother control response than the thinner section, and there is slightly less chance of tailplane stall with the thick profile. But in general, no, I don't think you would be able to tell.

Remember that the stabilizer normally produces only a few percent of the total drag of the sailplane. Changing the profile is not going to reduce or increase this, already small, percentage by very much at all, so if there is any difference you won't be able to tell.

Steve: What are your thoughts about winglets? Up, down, large, small, toe in, toe out?

M: The jury is still out on winglets for full-scale sailplanes, although many of the top contest pilots do fit them these days. (Not to mention jet airliners, but they are different in this respect.) They cost thousands of dollars to fit to an existing sailplane.

Sailplane winglets are always fairly small and are turned upwards now, never down. They may be vertical or, more often, tilted or smoothly curved to a moderate angle outward. They have to be designed with considerable care in such a way that they exert an inward, sideways 'lifting' force towards the center of the aircraft. This requires them to be cambered with the camber on the inner side. This can be called 'toe in'. If no inward side force is produced, the winglets are not working correctly and merely add drag and weight. They are not just 'end plates'.

The idea is to shape the winglet to reduce the drag induced by the wing tip vortex. At low flight speeds (e.g., when flying at minimum rate of sink in a thermal or soaring above a slope), the tip vortexes are responsible for more than half the total drag of a sailplane. To reduce this even by small amounts should yield large returns in terms of soaring ability.

Since the tip vortex is a rotary flow, the winglet has to be twisted to a different angle at each point from base to top. The winglet itself also spreads and weakens the vortex, so the 'toe in' angle at each location has to be such as to operate correctly in the modified flow. Wind tunnel testing is virtually essential. Also, when a winglet has been designed for one airspeed, it will not work so well at other airspeeds because, as the wing angle of attack changes for different trims, the vortex changes in strength, too. The winglet set for one speed will be wrong for all

other speeds.

Hence, for full scale sailplanes, winglets designed for most effect at low speed, may actually increase drag at high airspeeds, such as for the high speed dash from one thermal through sinking air to the next. Vice versa, a winglet set correctly for high speed will be a handicap at low speeds. Designers compromise, but it is still not sure that there is any gain in all round performance. There is talk of fitting winglets with variable setting angles controllable, like flaps, from the cockpit.

One thing does seem to be agreed. Properly designed winglets improve the stability and handling of the sailplane. Maybe that is the only advantage.

Steve: Are there any rules of thumb about winglet size?

M: Rules of thumb in this matter will be misleading.

Steve: Do they lose their efficiency below a certain wing span, or scale?

M: As far as anyone knows, there is no special scale effect. All sailplanes, whatever their size, generate wing tip vortices and these are responsible for most of the drag at high angles of attack (i.e., when soaring). The trouble is, modelers usually do not have access to wind tunnels, so we cannot expect winglets to work at all unless we do a great deal of testing with many different designs and various winglet angles and cambers.

Steve: What is the single, cheapest, or easiest modification one can make to a model sailplane in order to improve performance?

M: The quick answer always is to increase the wing span. This brings with it an increase of aspect ratio and reduces the power of the wing tip vortex. An important point here is that increasing the span of a given wing is very much the same as fitting winglets. Winglets are hard to design; adding a little to the span is easy. Moreover, increased aspect ratio will improve the performance at all airspeeds, so there are no hesitations about drag at different trims.

Of course, high aspect ratio wings are usually somewhat more flexible, more 'twitchy' in trim (because the angle of the lift curve is steeper - see tailplanes, above), and they are somewhat less responsive to control in roll and yaw. They may need to be stiffened up and so come out heavier, and the tail unit may have to be enlarged. (The need for greater strength and stiffness applies to wings with winglets too, but that is another story.)

Steve: Full flying stabs or conventional stab with an elevator. Could you tell us the pros and cons of each?

M: There is little to choose, aerodynamically. If the model is properly designed with the center of balance in the right place (about 30% of the mean wing chord), the tailplane carries no or very little load during normal flight. The tail incidence angle needs to be correct but, providing the elevator is hinged cleanly with no gaps or sharp changes at the hinge, the drag is the same. A fixed tail plane at the wrong angle to the wing requires the elevator to be trimmed always to some inefficient angle, so this can cause some small drag increases. But a correctly set tail plane with elevator can be stiffer and stronger, less liable to flutter, and perhaps lighter. The hinged elevator is often more powerful as a control than the 'slab' tail, because it changes the camber of the tail surface rather than altering the whole angle. In principle, only small elevator motions are needed for the same control effect.

The all-moving tail is somewhat easier to build and the rigging angle, within limits, is unimportant. It can easily be altered by adjusting the push rod lengths or servo arms.

Steve: Which is your favorite vintage sailplane, and why?

M: Full-scale or model? I can't really answer. The fascination of the old time full-scale sailplanes is that every type is different with different handling, different performance and very different degrees of comfort in the cockpit. Among those I have flown, if I had to choose only one, it would be the German Weihe of 1938. It was, for its time, an excellent sailplane both for soaring in weak conditions and for cross country flying. It was stable, heavy on the ailerons, but otherwise

very comfortable and easy to fly.

Among models I don't really have any preferences. I have, for nostalgic reasons only, built one or two which I remember admiring in my youth - the Evander, the Igo, and even the very ugly Daily Express glider. They fly, they perform very poorly, but I have had some fun with them.

Steve: Which is your favorite modern full-scale sailplane, and why?

M: The Schempp Hirth Discus, without question. It has excellent performance, handles perfectly, and is stable in thermalling turns with no vices. I am told that with winglets, it handles even better, but I have not yet tried. And I have not yet had a chance to fly the latest Schleicher sailplanes, ASW 26 & 27.

Steve: What is your favorite R/C sailplane, and why?

M: The one I am going to design and build when I get home.

RCSD: When will your next, around the world flight, bring you back to the U.S.A., again?

M: A year or three, maybe? If I remain in good health.

RCSD: Great! We'll see you then!

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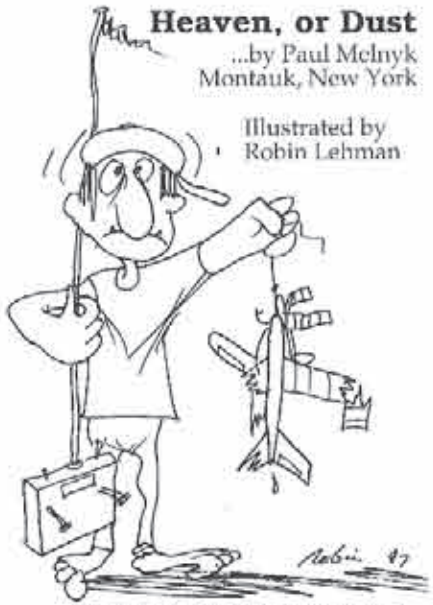
■

Heaven, or Dust

...by Paul Melnyk
Montauk, New York

Illustrated by
Robin Lehman



Not even the little ones got away! Paul is really "hooked" on gliders!

The Demolition Man...

I have been crashing my models for over twenty years now. There are some absolutes that occur within nature. Gravitation is most definitely one of them. Gravity will cause any object, which has height, to eventually fall. This holds true for a model glider, as well as that rock in the cliff-face, which tumbles blindly into the abyss. Those of us who have become skillful in the craft of modeling, and more precisely, the flight of the model glider, have come to realize this truth to painful degrees.

Yes, that's right. Crashing. Re-kitting. Hours of labor turned into scrap and dust. I have come to the realization that my ability to destroy is unsurpassed. As fact will have it, I have become quite proficient at it. This is an expertise of which I would rather do without. Only in retrospect, however, have I come to the conclusion that for all of the anguish it has caused, this skill of folly has led to the more intense memories of my modeling career.

And let me state categorically, that the destruction of these birds is a pastime that is not only a modeling certainty, but also a much anticipated result of our disease. You say you disagree? Right. What is the first thing you talk to your buddies about after an exciting day at the field? It is not Jay's exquisite demonstration of the aerobatic abilities of his new quarter-scale ASK 21 (He is a show off, anyway...); it was that high-speed inverted pass in front of the flight line, which was just a little bit too low... And, how about when Bill had the wings fold on his new Gentle Lady, five seconds into that windy winch-tow? Boy, that was... "Awful."

You believe you are a better demolition man than I? Hah! Read on poor fool, for you have a long way to go...

I believe my ability to cause classic modeling disasters began on that very first, fateful flight. You know, the one that hooks you. My twenty-second year found me with the first true chance to build a model that would fly. Not only was I stubborn and pig-headed at that point in my life (past-tense optional) but, along with the optimism of youth, came that feeling of omnipotence. I was sure I could fly that Kattie-2. Had read all the books, knew all the principles of flight, why that plane was a trainer, a box with wings... Piece-o-cake, right? With a golf course across the street, I had the perfect aerodrome. Off I go with my plane, bungee and buddies in tow. Playin' with toys, huh? I'll show them. They had to see this! When they see it fly, my craft shall be a toy no more!

And fly it would. Transmitter in hand, I had that high-start stretched out to the max. One push and she's off! God, look, it climbs! One hundred... Two hundred... Three hundred feet up into the ether it goes! But the ease of that climb-out was the lull that leads to vulnerability. As the glider broke away from the chute, I realized I had no idea as to which way it was going. There were more aerobatics performed in that first flight than should be acronautically possible. I can remember one moment where Kattie seemed to cartwheel through the air...

The next thing I knew, my tissue and twig albatross had performed a perfect aircraft-carrier landing, on the flat-top of the three story condo, two fairways away. My pals sure enjoyed that three minutes! What was I to do? I knew

my investment of cash, sweat and faith was up there. Like some neurotic bird dog, I had to retrieve it. I sallied up to the front door of those whom I supposed owned my new airstrip, and knocked. It was 1976 and, during this decade, I was not known for my conservative demeanor. This day was to be no exception. Well, if you could have seen the look on the face of the matronly lady who answered the door... I tell you, it frightened me!

"I beg your pardon, ma'am, but ah, my glider, ah... Just landed on your ah, roof," I explained, my long hair and Jesus Christ beard... a blowin' in the wind...

"John... JOHN... COME HERE, QUICK!" Mrs. Old Bitty beckons nervously to her mate.

John comes to the door, and gives me a once-over. In spite of my appearances, I find I've met a kindred spirit. You see, John is a long-time tinkerer. Up through the attic we go to find Kattie sitting there, impatiently quivering in the breeze, with a bent wing. Of course, the rescue mission deserved the obligatory coolin' down period. I was treated to "milk and cookies" and a peek at Mr. John's workbench. Yep... He's been stampin' out one model boat/car/plane for the better part of seventy years, now.

"Tried to make one that really flew, once... Didn't fly too good..."

As I thanked Mr. John for his help, he politely suggested that I receive some instruction before I attempted another solo flight. Ah, yeah John... Right.

My exploits only seemed to become more dramatic as I matured into the sport. I won't even mention slope soaring. Aw look, I already have...

Now about slope soaring...

"Hey Mom, come see my new Freedom slope soarer. You know, the plane I've been workin' on for about two weeks! You know, with the wings... It's gonna fly like the wind! You'll get a kick out of this."

"Oh, I don't think that's a good idea Paul; it's rather brisk this afternoon."

"Aw, come on, it will be fun up there on the bluff. The air is perfect, and the directions say this bird will cut through twenty knot winds!"

A short ride in my broken-down Pinto brought us down the old dirt road to the cliff and the sea.

The first clue that this should not have been a good idea was in the way the gulls zipped back and forth across the raging seascape before us. Their wings were swept-back like F-14 Tomcats in full military power... It was awesome to watch them dodging the gusts.

"Oh Paul, I don't know... It's awful fierce out here, today..."

"No sweat Mom... Get a load of this!"

It seemed as though my bird was reluctant to soar this day. The tranquil eddy at the back edge of the lift turned into a wall of vertical air as we approached the cliff. I had to push the glider away from me. She did not want to go...

I don't know what went wrong, but I found out that the plans had lied. The plane left my hands and staggered out twenty yards into the gale, then stalled... I can remember the debris flying past my head, as my bird disintegrated into the cliff wall... The maelstrom carried the splinters over our heads and into the meadow behind us.

"Oh Paul..." That was all my Mother could say...

Nothing will stop the true fanatic...

Time heals all wounds, and through a combination of good luck and zeal, I

found my way under the wing of a true modeling pioneer. Through our friendship (which lasts to this day), we discovered the joys of RC tow-plane-released flight!

Yes, I said scale glider towing. Can't tell you how exciting it gets when something goes horribly wrong and we are out of control with two planes at the same time! We learned early on to have two separate releases for the tow-line. One for the plane. One for the glider. (Duh!)

We also discovered the value of a climb indicator. This piece of telemetry is especially useful as applied to RC glider towing. Ace RC makes this nifty gizmo called a Thermic Sniffer (swear to God!) that allows the pilot to tell when the glider is climbing or falling by the pitch of a tone that it generates. This sound is delivered through one of those 98 cent earplugs that were so popular with the 60s transistor radio crowd. A high pitch means you are climbing; a low tone means falling. Simple and effective. One tip though, if you intend to give your buddy a try; be sure and wash your ears. I find Q-tips work the best...

Well, along with a thousand-foot tow comes the ability to fly 'til your batteries are drained, or to fly out of sight...

10:00 a.m., sometime in July.

Weather forecast: balmy temps. with winds light out of the south east at 7-10 mph. Mostly sunny, with scattered thunderstorms predicted for late afternoon. The phone rings. It's my pal, Robin.

"Paul, looks like a great day for thermals at the field. Let's do it."

I grab my four meter DG-400 and head out to meet up before noon. As I drive, I mentally prepare myself for a big day in the clouds.

Have I charged everything the night before?

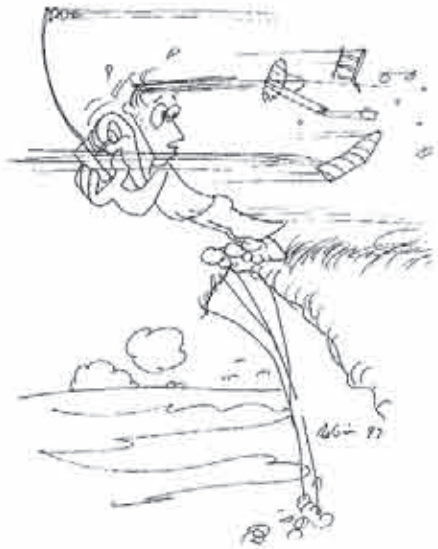
Check.

Have I brought my radio and extra batteries?

Check.

Got the wings?

Check.



As I approach our field, I start to feel those first flight jitters. I know that this is gonna be one for the record books, as I view the forming puff balls of low cumulus clouds. Those are thermals on the horizon. Maybe a day for a duration flight!

Uh-oh... Robin has brought the Extra as a tow-plane. I hate aerobatic tow-planes. Robin doesn't know this, and I am too proud (stubborn?) to tell him.

"Hey buddy, I'm all set up. Roll out the tow-line and let's get airborne!"

As I spool the tow-line, I focus on all that could go wrong. Having range checked the radio, I'm ready but nervous.

"Pull up the antenna, Stupid." (I talk to myself... Been doin' it for years...)

"OK, we're ready!" Robin shouts from the flight line.

I have taken up position behind my glider on the runway. I check to insure the release in the nose of the '400 is working properly.

It is.

The "Sniffer" is on?

It is.

Wipe my hands.

Take a deep breath.

"Go for it!" I yell. I wave my arm as a physical sign to take off.

The smoke trail from under the '400 is visible before I can hear the throttle advance. Robin accelerates down the center line as I watch the tow-line become taut. The bungee shock cord stretches...

...Oh Boy... I forgot to tell you about the shock cord! Do-not-forget to put about five feet of bungee cord about one-third of the way down the tow-line! Add another fifty feet of tow-line to this. The whole gizmo should be about seventy-five feet long. Most important: you must mount the tow line on the top of the tow-plane fuselage, near the wing. You must also mount a tow release in the nose of the glider. Don't forget! (You don't want to know what happens if you forget...)

...And the DG 400 starts to move with a jerk. (The line; not me!)

As the glider guider, you have to focus your attention between two objects: the tow plane and the glider... (Sweaty palms optional...) 'Cause if you don't, and the tow goes bad, you are @#$%^&*! Remember, the first 200 feet, PLUS THE FIRST TURN, are critical! Otherwise... No big deal...

Off we go!

The climb is tense, 'cause you know that the Extra is stally at low speed.

The '400 is climbing nicely as the Extra leaves the runway... I watch as a cross wind causes the Extra to veer... (Keep your pinkie finger on the release!) ...Robin corrects.

OK, now it's time to breathe.

The down-wind turn is complete and all that is left is to stay "outside" of all the turns, 'til release...

...What is "outside", you say? Hmm...

"Outside" refers to the path followed by the glider. This means that your moment of inertia is such that relative to the tow-plane, the two arcs circumscribed by the paths of the tow-plane and the glider are such that the glider will diverge, to follow a parallel but non-intersecting course. Get it? (You know, I should be writing text books.)

...And up we go...

"I'm gonna release," I say.

"What's the matter? We're not high enough yet!"

...Up some more...

"It's high enough for me. I'm gonna release!"

"OK. If you're happy... WAIT! Let me get you up-wind!"

...And up...

"O-KAY!"

"OK!!!..."

RELEASE! Good separation.

Phew! Glad that's over...

Oh yeah, I forgot. All of this time, that "Thermal Sniffer" has been buzzin' in my ear like some lunatic bumble bee... Don't worry though... You get used to it. (The benefits far outweigh the drawbacks?)

There she is; at 1500 feet the DG-400 has become a black dot in the afternoon sky, outlined with the background of the low cloud base. The sniffer is "saying" she is level, with just a hint of sink. Time to cloud hop. Back and forth in lazy circles, as we go looking for the "up" stairs. But each little error is magnified by the "Sniffer", as I struggle to keep my turns flat. I'm out of practice.

Robin has landed the towplane and is in the pit.

"Is that the way I taught you how to

fly? At this rate, you'll be on the ground before I get re-fueled!"

"I haven't done this in six months. Give me a break, pal." The glider slips lower with each turn. Now its tail is easily visible at a height of 500 ft.

I'm losing it... Each turn brings me closer to the field. I look around in search of the slightest clue of lift.

There it is! Just up-wind of my position. I see the silhouette of a Red-tailed hawk rising against a cloud. As I traverse the gap between us, I see the bird circle and rise. I slip the glider in below and behind my new benefactor. The sniffer begins to squeal like a happy little schoolgirl. I hear a shout. Mr. Hawk has noticed his new shadow and moves to investigate. As we climb, the hawk flinches. We become intertwined in the body of the thermal. He has had enough of his new friend and heads off.

As I rise, I think to myself, "Surely this one must be the express car to Heaven!" My DG has once again become a speck in the clouds, as the thermal drifts, downwind. I begin to fear that I will lose sight of the glider as the sniffer shrieks out her climbing song. Time to deploy the spoilers. I reach for the switch...

When things go wrong, it's usually when you least expect it. This was one of those times. As luck would have it, someone in the pits calls a warning to "look out". I don't know what the shout was for, or why it was given, and in truth it wasn't even a loud or menacing call from the group. All I know is that this call caused me to take my eye off my bird for that-split-second. That was all it took. One quick look to see if there was danger to person or property. There wasn't. But as I returned my gaze... She is gone...

The sniffer continues to scream in my ear, but for the life of me, I can't find my glider in the gray afternoon sky. I deploy the spoilers and hear the low tone of a descending plane. She is coming down, but God knows where. The frantic search is fruitless.

"I'VE LOST THE PLANE!" I scream, as I seek the assistance of my friends.

"Where is it?" was the collective cry.

"What are you talking about!" Robin shouted.

"It's gone, I tell you. I took my eye off it for only a moment and it vanished!" In my ear, I could hear the sniffer change from the trill of excitement to an agonizing moan. The pitch fell so low as to almost become inaudible...

That was it. The end.

We searched for the glider for a while, but it was not to be. Nothing was ever to be seen of the DG-400 again. Our field is remote and thank God no damage was done, as my personal "Daudelus" fell from the sky. Another death in the family. Not even any bones this time to dedicate to the shop wall. Or, maybe it hadn't fallen at all. It sure seemed to have vanished up there in that cotton ball sky... Maybe it truly found that path to glory... ■

Improved Tape Hinges

For Wood And Composite Wings Plus, Wing Skin Adhesive Weights

...by Greg Norsworthy
Los Angeles, California

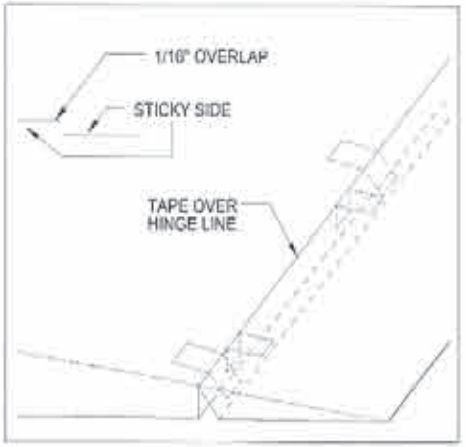
In response to the hinging scheme shown in the May 1997 issue, following is a method of hinging either wood or composite wings when it is not desirable to insert a mechanical hinge, such as a very thin wing, or one which has only the foam core exposed at the hinge line. These hinges both seal the gap between the surface and keep the alignment straight. Unfortunately, I cannot take credit for this method, as I saw it on a second-hand Banshee in Oregon.

The surface is first attached using small pieces of plain Scotch tape. Next, a set of Z type hinges is made using 3M type 850 Mylar tape. This is by far the best hinge tape I have found. The Z hinges are applied approximately 8" apart in groups of two or three, enough to keep the flying surface from bowing. Next, the Scotch tape is removed and replaced with 850 Mylar tape along the entire hinge line. This forces the Z hinges to bend only at the taped pivot point.

This hinge method takes far less time than the "laced Monokote" hinge popular in the late 1980's, and has the advantage that it does not loosen in the sun. Also, the few tape Z hinges are enough to keep the hinged surfaces from bowing or pulling away from the tape, as they often do when using tape along the hinge line only.

Going against my favorite saying, "Wood is for furniture," I recently purchased an Interceptor jet style slope soarer, which is skinned with 1/16" balsa. In order to determine the most appropriate skinning adhesive, a test was conducted using three types: double stick tape, epoxy + colloidal silica, and 3M 77. The epoxy was thickened to the consistency of peanut butter and applied using a credit card scraper, with approximately 1/64" triangular notches 1/4" apart. The spray adhesive was applied in two light passes by hand. All weights were determined using an analytical balance.

The substrates used were three pieces of 1/16" balsa cut from the same sheet, each



3.91 square inches. The dry weight of the substrates was 1.0158 grams. The weights of the substrates and the net adhesive weight per 2000 square inch wing are shown in the table below.

Adhesive	Weight (g)	Oz./2000 sq. in.
Tape	1.1941	3.22
Epoxy	1.1088	1.68
Spray	1.0265	0.19

As expected, the double stick tape is by far the heaviest method, though the fastest and least messy when weight does not matter. The low number for the spray contact adhesive is suspect and may require a heavier application to obtain good adhesion. However, my Phoenix was skinned using 3M and is the lightest one I have seen, yet it has not experienced peeling problems.

In conclusion, the Interceptor was skinned using epoxy and colloidal silica because the weight seemed reasonable and I wanted to try the method. However, after spending several nights piecing sheeting together and sanding, the next one will be bagged from glass and blue foam using pre-painted Mylar. ■

Mike Popescu with Grand Esteem, Baby Esteem, and Pelikan.

An "Esteem'd" Gentleman

Mike Popescu

Designer of the Grand Esteem

...by Gordy Stahl
GordySoar@aol.com
Louisville, Kentucky

This time my travels took me to the internet soaring site. I kept reading posts about how happy this guy, or that guy was, with his Grand Esteem, or his Pelikan sailplane. Now I knew those ships were out there, I knew they were "different", and I knew they had that "strange" *modified* 7080 airfoil. The posts talked about huge launches, "comfortable" flying characteristics and, in general, how great it was to deal with this Mike P. guy.

Sure, I had consistently seen the name Grand Esteem listed in the winners group of various contests over the past few years, but I guess I never took the Grand E's seriously as a competitive ship, but rather, more of a "one man's good intentions" design. So, what did all these guys know that I didn't?

I figured I had written about extreme sloping, reviewed a beginner's ship, caught a Cajun at home with his ships, hunted down a mysterious *RCSD* article contributor in the hills of Kentucky and, most recently, interviewed the designer of a past ship of legend, so why not some more investigative work to uncover the fact behind this man and his mystique?

This two part trip is about *the man and his machines*. I wondered what course of actions and motivations inspires a guy to end up designing and producing a composite RC sailplane.

So I asked him.

About the Man....

Mike was born in Romania and graduated from college in Bucharest. He emigrated to the USA, with little more than the clothes on his back. He became a U.S. citizen, and worked as a mechanical engineer developing the Environmental Simulation Chamber for the Viking Spacecraft Project. When that was completed, he went to work for the $18 billion Johnson and Johnson company, and retired as the Director of Sterilization, Engineering Department. He is the proud father of a daughter soon to be married, and an engineer son involved in designing Centrifuges and Flight Simulators.

Why RC Sailplanes as a hobby? Even as a child, Mike had a strong interest in model sailplanes, but circumstances, career, and family kept him away from hobbies.

His work with Johnson and Johnson kept him traveling, and he visited 54 countries. Whenever possible, he made it a personal goal, as part of his modeling education, to visit RC sailplane manufacturers in whichever country he visited. He questioned every process, and every concept of construction and design criteria the builder had in mind, so that when his own time and turn came, he wouldn't be doomed to repeat what had already been tried and built. He consumed current, as well as back issues, of all the RC sailplane publications produced in Europe and the USA, also with his own education in mind.

His modeling started like most: a Gentle Lady, a Spirit, a Chuperosa, and then his first, full boat ship, a Vortex 2 meter. From there he knew he'd only touched the surface. He made a point to buy, fly or try every ship available to further his goal of creating his own special design. His world visits had taken him to the finest composite ship manufacturers in the world, including MAP of France, whose molded electric sailplanes are as near perfection as in humanly possible.

His ship trials covered the last 7 years, and confirmed his suspicion that none of the overseas builders/designers had a clue as to what a great thermal ship was about; his trials of the hot, current ships all fell short of the performance, quality, and durability standards he wanted in his ship.

Oh, they all flew fine. One ship or another did one thing better than another, but none had the total package he was looking for, until the team of Layne/Urwyler created the composite Saturn 3.0. It was the closest thing to his dream ship that he'd seen and tried. Its composite wing was a trait necessary for a serious competition ship.

He wasn't saying that obechi skinned ships weren't great performers; it's just that if you want sharp trailing edges for true airfoil integrity, light weight strength, resistance to environmental effects, and long term durability, which his dream demanded, only composite construction would fill the bill. Another important component of Mike's thinking was to use an airfoil that could be enhanced in flight by the features available on computer radios.

That ship and its construction was the key and inspiration that coalesced Mike's dream into a clear guideline for designing the Grand Esteem.

So why that 7080 airfoil???? I mean everyone knows there is only one truly good airfoil for our TD tasks! Right??? Right??? Hmmmm.

Stay tune for 'the rest of that story', and a kit review of the Grand Esteem's new friend, the Pelikan. I'll share with you how I took it out of the car, set it on the roof, a thermal came by, and it skied out, still in the box! Sorry, not my style of story. Seriously, look for more bolts than nuts in the next segment! Many of your questions will be answered! ■

Gordy's Travels Part 1 1/2

An "Esteem'd" Young Man Chris Saunders, Age 12!

While my "territory" is the South east, I also end up on special trips to train the trainers in other states. My interview with Mike Popescu was done entirely over the internet and the phone, since the chances of my getting to the Philly area were slim to none. Then, the boss calls and says, "Get to Philly quick and your flight will keep you over the weekend!" Oh, darn.

I got to Mike P.'s, flew his planes, and we went to a contest of the Eastern Soaring League (ESL) in York, Pennsylvania.

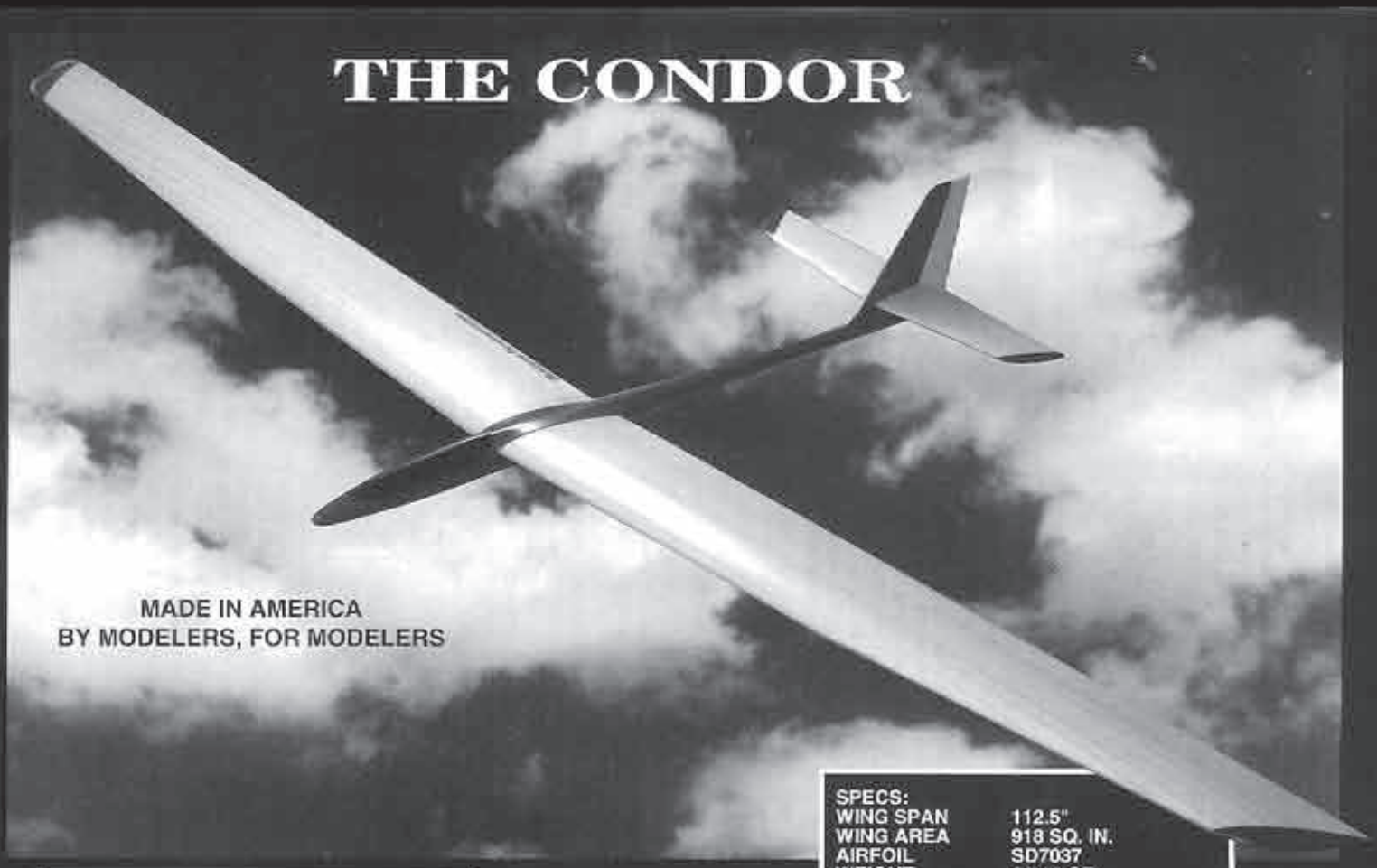
These guys are awesome; I met some of our hobby's best, but one that really stuck out was Chris Saunders.

The pilot's meeting was called to order; the mood was dead serious, because the yearly contest points are on the line. Right up in front, paying equally deadly attention, was this little blond hair'd boy! I thought, "This is some flyer's son — has to be." But I was wrong.

Chris's uncle and cousins are modelers, and his poor parents are now chauffeur and timer. His ship is the Esteem by Inventec, and he absolutely loves it. Watching him intently assembling it was almost surreal. He carefully checked each servo connection, linkage and control movement. Taping the wing, then sitting, staring at his ship to study and repeat each step, it was clear; he was there to compete. I asked him, "If you were offered your choice of all the current or past ships for free, which would you choose?" He thought for a moment, looked me right in the eye and said, "Grand Esteem," and went back to his checkout.

Chris is already an excellent competitor, hitting landings, working lift, and has taken a fourth place in competition with the boys; not bad for a seventh grader. It is not often we meet a young man with such focus and maturity... On this trip, I just lucked out. ■

THE CONDOR



MADE IN AMERICA
BY MODELERS, FOR MODELERS

SPECS:	
WING SPAN	112.5"
WING AREA	918 SQ. IN.
AIRFOIL	SD7037
WEIGHT	62-66 OZ.
WING LOADING	9.7 - 10.3 OZ./SQ. FT.

★ VISA ★ MASTERCARD ★ DISCOVER ★

CONDOR

Tomorrow's Sailplane, Technology Today

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 850 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. 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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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: (414) 731-4848 after 5:30 pm weekdays or on weekends; http://dataex.com/~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.

Digitally mastered video of the 1996 and 1997 Los Banos Scale Fun Flys. Includes a special Torrey Pines (1/3 size birds) edition. Please send $22.50 for your copy to: Mark Foster, 1738 Hanscom Dr., South Pasadena, CA 91030.

SOARING SIMULATOR - for PC's. Ka-8, LS-1f, SB-10, ASW-27. Realistic aircraft and weather model. Lift from thermals and slopes. Winch launch or aerotow. Target, target-return, and triangle courses. Dynamic scenery. MUCH MORE! Free Demo Available. geewiz@wwnet.com. (248) 932-0825.

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RAHM'S, Winches, & Line Retrievers, (310) 866-2405.

For Sale - Business

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

For Sale - Personal

Gliders Galore! Duo-Discus, NIB, 1/3 scale, 6.7m... $1750.00; ASK-13, finished, 1/3 scale, very large... $1750.00; Roke DG 202, finished, 4.83m... $1495.00; Rowing LS4, finished, 4.0m... $995.00. Finished sailplanes have metal gear, high torque servos throughout. Dan Troxell, (714) 831-8013, So. California.

DG-600, 1/4 scale, NIB, retract, 3-view dwgs... $675.00 + S&H. Curt Nehring, (626) 966-7876, eve. after 7 pm, California.

California Condor kit w/painted in mold fuse, wings & stab, ready for finish. Airtronics Peregrine built, JR 351's for flaps, JR 341's for ailerons, airplane wired for Airtronics. Phil Weigle, (303) 371-9112 (days), (303) 341-9256 (eve).

1/4 Roebers Pilatus B4, 3.75 meter span (147"), wing profile Ritz 3, NIB... $495.00; 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; 1/4 Rosenthal Ralley Morane (towplane), 2.78 meter span (109"), NIB... $495.00; 1/5 Wik Twin Astir, all glass, NIB... $595.00. Contact Robin Lehman, 63 E. 82nd St., New York, NY 10028; (212) 879-1634.

Wanted

Kit, model or parts, for Mariah 2-M glider. Don Anthony, 7562 Langmuir Ct., Dublin, CA 94568; (510) 833-0504, <dlawriter@aol.com>.

Schedule of Special Events

Date	Event	Location	Contact
Aug. 17	Open TD Contest	San Diego, CA	Patrick Dionisio, (619) 586-7997
Aug. 29-31	TNT	Dallas, TX	Henry Bostick, (972) 279-8337
Aug. 30-1st	SHA Western Div. Workshop	Tehachapi, CA	Dan Armstrong, (805) 822-8852 danarmstro@aol.com
Sept. 6	9th Annual MASS Fall Soaring	Memphis, TN	Max Hurst, (901) 989-3508
Sept. 6	HLG Contest	San Diego, CA	Tom Clarkson, (619) 486-4068
Sept. 6	Slope Combat	San Diego, CA	Arthur Markiewicz, (619) 753-3002
Sept. 7	F3J	San Diego, CA	Mike Ziaskas, (619) 484-7596
Sept. 13	60" Slope Race	San Diego, CA	Bob Matheson, (619) 754-2657
Sept. 14	Open TD Contest	San Diego, CA	Patrick Dionisio, (619) 586-7997
Sept. 13-14	Sailaire One Design Contest	Cincinnati, OH	Paul Siegel, (513) 561-6872
Sept. 19-21	Last Fling of Summer	Broken Arrow, OK	Jeff Naber, (918) 495-1028
Sept. 20	Scale Glider Festival	Costa Mesa, CA	Rick Briggs, (562) 433-6327
Oct. 4-5	CSS Pumpkin Fly	Cincinnati, OH	Ed Franz, (606) 586-0177 edkim_franz@msn.com
Oct. 4-5	24th CVRC Fall Soaring Festival	Visalia, CA	Phil Hill, (209) 686-8867
Oct. 11	60" Slope Race	San Diego, CA	Bob Matheson, (619) 754-2657
Oct. 12	Open TD Contest	San Diego, CA	Patrick Dionisio, (619) 586-7997
Oct. 11-12	Fall Intergalactic HLG	Cincinnati, OH	Paul Siegel, (513) 561-6872
Oct. 11-12	Fall Soar	Bristol, VA	Greg Finney, (540) 645-5772
Oct. 25	TPG Fun Fly	San Diego, CA	Don Richmond, (619) 587-0226
Nov. 1-2	Aerotow Fly-In	Pensacola, FL	Asher Carmichael, (334) 626-9141
Nov. 2	2 Meter TD Contest	San Diego, CA	Patrick Dionisio, (619) 586-7997
Nov. 8	CSS Turkey Fly	Cincinnati, OH	Ed Franz, (606) 586-0177 edkim_franz@msn.com
Nov. 8	60" Slope Race	San Diego, CA	Bob Matheson, (619) 754-2657
Nov. 15	New England R/C Soaring Convention	Portland, ME	Steve Savoie, (207) 929-6639 Jim.armstrong@juno.com
Nov. 16	Open TD Contest	San Diego, CA	Patrick Dionisio, (619) 586-7997
Nov. 28-30	24th Tangerine	Orlando, FL	Don Cleveland, (407) 696-7516
Dec. 6	HLG Contest	San Diego, CA	Tom Clarkson, (619) 486-4068
Dec. 6	Slope Combat	San Diego, CA	Arthur Markiewicz, (619) 753-3002
Dec. 7	Open TD Contest	San Diego, CA	Patrick Dionisio, (619) 586-7997
Dec. 13	60" Slope Race	San Diego, CA	Bob Matheson, (619) 754-2657
Dec. 14	F3J	San Diego, CA	Mike Ziaskas, (619) 484-7596

Schedule of Special Events - Outside U.S.A.

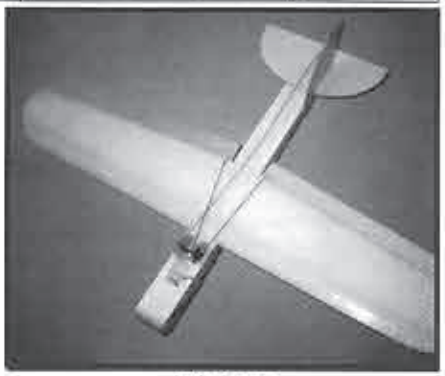
Aug. 16-17	Scale Fun Fly (GNATS) Sailplanes/Motorgliders	Nigara Peninsula, Canada	Gerry Knight, (905) 934-7451 Don Smith, (905) 934-3815 Mistral@niagara.com
Aug. 21-24	Int. DM Semi-Scale-Motormodelle, MSC Condor Göttingen, Germany, DMV*		
Aug. 23-24	IGG Slope Soaring Weekend Hahnenmoos, Switzerland (near Adelboden) http://www.interconnect.ch/customers/igg		Peter Aeberli, 011-41-1-915 37 53 Jack Kagi, 011-41-1-926 2187
Sept. 13-14	DMFV Scale Masters Motor Glider - Germany		Winfried Olgard, or Bernd Wich 011-49-2 28 97 85 011 (direct line)
Sept. 13-21	World Air Games	Turkey	Turkey Aeronautical Association**
Sept. 20	R/C Glider Euro-Cup	Uetze, Germany	Lars Biermann 011-49-5173 1377
Sept. 19-20	DMFV Scale & Semi-Scale, Germany		
	Bernd Stollenwerk Bruchstr. 16 52152 Simmerath tel/fax: 011-49-2473	Winfried Roder Schiffenborn 44 52156 Monschau tel: 011-49-2472/5148 e-mail: Winfried.Roder@t-online.de	
Aug. 1-3	1st Aerobatic Scale Glider Contest, Germany Frank Oeste, 011-49-6103/81801 Harold Seitz, 011-49-2236/67473 Jan Kurt Hoffman, 011-49-29042848		
Aug. 1998	F3J World Championships, organized by BARCS		

* Deutscher Modellflieger Verband - tele. 011-49-2 28 97 85 00, fax 011-49-2 28 9 78 50 85
**Turkey Aeronautical Association - tele. 903123104456/903123104840

New Products

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.



Ding-No
...from M M Glider Tech

The Ding-No is a quick and simple, all EPT foam, slope combat plane. Kit features an all foam fuselage and wing, with balsa ailerons and coroplast tail. Elliptical wing tip and tail surfaces have been designed for clean mid-air getaways; E374 airfoil, 483 sq. in. wing area, and 2" wide, full span ailerons. Kit includes roll of packing tape to cover all foam surfaces (strapping tape [not included] may be used for added reinforcement), EPP foam cores, wing spar, pre-cut ailerons, EPP fuselage, die cut tail surfaces, pushrods, and linkages.

Ding-No can be bungee launched by adding a tow hook. Cartwheels and inverted landings are not a problem, because of bounce ability. Requires 4 channel radio w/standard size servos.

Kit is $41.95 + $5 S&H (CA residents add 8.25% sales tax) from M M Glider Tech, P.O. Box 39098, Downey, CA 90239; phone/fax (562) 923-2414, e-mail <mmglidri@keyway.net>. Call or send SASE for more info. ■

DG 800 (3m or 3.6m)
...from *ICARE* Sailplanes

The DG 800 is one of the most popular, high performance gliders available today. The model is a 1:5 semi-scale reproduction of the full-size standard (15m) and open class (18m) gliders.

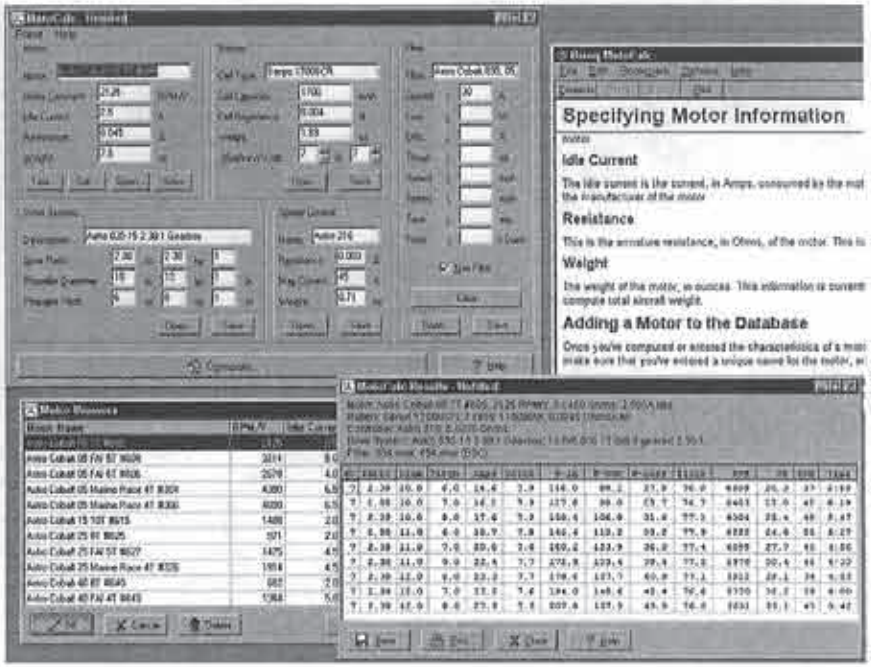
The DG 800, which comes completely built, and ready for radio installation, can be acrotowed for thermal duration flying, and will perform tight circles without tip stalling. The SD7037 provides a very wide speed range. On the slope, it has excellent energy retention, and will perform most known acrobatic maneuvers.

The wings are sheeted foam, with carbon and glass reinforcement, completely finished, covered, with leck spoilers installed. The high gloss, gelcoated, fiberglass fuselage has wing joiner carrying tubes and control linkage installed. Tail surfaces are finished and hinged; model includes package of small hardware and building instructions. This model requires two micro servos for the ailerons, and three regular servos for the elevator, rudder and airbrakes. An additional servo might be installed for the tow release and one for optional retract wheel.

Specifications:

Wingspan:	118" or 142" (3m or 3.6m)
Wing area:	723 sq. in. or 802 sq. in.
Weight:	85 oz. or 93 oz.
Wing loading:	16.5 oz./sq. ft.
Airfoil:	SD 7037
3m RTF kit:	US$389.00 + 20.00 S&H
3.6m RTF kit:	US$439.00 + 20.00 S&H

ICARE Sailplanes, 381 Joseph-Huet, Boucherville, Quebec J4B 2C4, Canada; (514) 449-9094, <ICARE@telts.com>, <http://www.jonction.net/~icare/icare.htm> ■



MotoCalc
...from Capable Computing, Inc.

MotoCalc, by Capable Computing, Inc. of Ontario Canada, is a program for predicting the performance of an electric model aircraft power system, based on the characteristics of the motor, battery, gearbox, propeller, and speed control. You can specify a range for the number of cells, gear ratio, propeller diameter, and propeller pitch; *MotoCalc* will produce a table of predictions for each combination.

MotoCalc will predict current, voltage at the motor terminals, input power, output power, power loss, motor efficiency, propeller RPM, static thrust, prop blast velocity, and run time. By producing a table of predictions (which can be sorted by any column), *MotoCalc* helps you determine the optimum propeller size and/or gear ratio for your particular application.

MotoCalc requires a 386, 486, or Pentium based computer, with 8Mb or more RAM, 10Mb of free hard disk space, and Microsoft Windows 95.

MotoCalc (and other electric R/C information) is available via Capable Computing's web page at http://www.capable.on.ca/rcstuff.htm.

MotoCalc may be used free for 30 days, and no features are missing during the evaluation period. After 30 days, you must register to continue using it. The cost to register is $40 Cdn (plus applicable taxes), or $35 US. ■

Super Skeg
...from Tim McCann

Designed for the rigors of competitive R/C soaring, the "Super Skeg" protects the flaps and flap servos, providing maximum stopping power when used with the "Hooktooth". The base of the "Super Skeg" and "Hooktooth" are curved to match the contour of the fuselage. Both have an energy absorbing boss that extends into the fuselage to provide strength and durability. Quickly and easily attached to most sailplanes with two screws, they can also be easily removed when necessary. "Super Skeg" is $4.95 ea.; "Hooktooth" is $3.95 ea. Postage paid (U.S. orders, U.S. funds.) direct from Tim McCann, P.O. Box 2091, Harrison, AR 72602; (870) 365-0023. ■

New Products
...from Unbeaten Path Imports
B25 Mitchell

The B25 Mitchell is a semi-scale model of World War II bomber for twin geared Speed 400 electric motors. Gel-coat molding encompasses the fuselage; nacelles and inboard wing section is designed to simplify the building effort, and eliminate alignment problems. Electric installation is designed for easy motor maintenance; built-up and fully sheeted outboard wing sections are completed and ready to cover. Miscellaneous plastic parts and hardware complete the kit. Model 005-00070 estimated suggested retail price is $299.00.

Pterotec Pterosaurs

Eudimorphodon 40"

For the flyer who has everything else, these kits are handmade, scale, light wind slopers, of 100% carbon fiber and Kevlar™ construction. Body and limbs are made of hand-laid carbon fiber; wings are hand-laid Kevlar™ membrane. Models are constructed according to scientific studies, and each model is a work of art.

Each model requires 3 servos for radio control. An elevon effect is obtained by bending the wingskin up and down, which is performed by a vertical actuation of the flight arm pivoted at the shoulder, using 2 servos, one in each wing. Rudder effect is obtained by tail movement left and right. Use of strong metal-geared servos is strongly recommended.

Additional short-tailed models are available on special order. These will require the installation of a gyro for safe operation. Models are ready to assemble and paint; professionally airbrushed versions are available by special order, and require only a layer of matte clearcoat to finish. Model prices vary from $349.00 - $749.00.

Dimorphodon 55"

Rhamphorhynchus 71"

For additional information or to obtain a catalog, contact Unbeaten Path Imports, P.O. Box 271, Oconomowoc, WI 53066; (414) 569-5711 (Mon. - Thurs., 7 pm - 11 pm CST); fax (414) 569-5915; <www.unbeatenpath.com>. ■

Fayetteville 97 Airtow Fly-In

Up. up and away. The Roedel Fox on tow.

Pete George with his Gnat FO-141 electric ducted fun. It flew beautifully.

Robin Lehman
63 East 82nd St.
NYC, NY 10028
(212) 879-1634

Once again, Wayne Parrish, Sam Smith and Bernie Coleman pulled off a great airtow fun fly. Hosted by the Piedmont Aeromodelers on April 25th and 26th (the 27th got rained out), modelers came from all over to participate in this friendly and most enjoyable annual event in North Carolina. Along with many locals, Tony Napoleon came from Long Island (ASK 18), Asher Carmichael and Rusty Rood drove all the way up from Alabama (ASW 27, DG 800, DG 600), Pete George came all the way from Missouri (ASK 18), and Tony Fiorentino flew up from Pensacola, Florida in his Tripacer with his Speed Astir.

Of particular note was the first ever scale airtow acrobatic contest organized by Wayne Parrish. This was a strictly low key event, and great fun was had by all concerned. Most of the pilots had not flown in a contest before and, much to their surprise, they found it both educational and exhilarating! As one said to me, "Gee, it's not so easy to do three perfect thermal turns entering and exiting in exactly the same heading!" It was a learning experience for all!

This event was held on Saturday afternoon, simultaneously with fun flying. At times, several gliders were landing while two towplanes were ready to tow gliders aloft. We found out a lot about traffic congestion, and how to deal with it. Two parallel strips are ideal - one for all glider landings and one for towplane take-offs and landings. If you have only one strip, and if it's long enough (as it was in Fayetteville), the glider line-up and take-off area can be staged halfway down the strip. Once gliders are aloft and released, the sailplane pilots then can walk *downwind* and land the gliders in all of the free space down the strip. In other words, if take-off is to the right *into the wind*, once released the glider pilots will walk left *downwind* so that they will have plenty of uncongested space to land. It's very rare that two sailplanes will be landing at exactly the same time, so this system works quite well.

Quite often there were two towplanes on the field side-by-side with sailplanes getting hooked up. In these circumstances, one or the other would take-off first.

The scale aerobatic fun fly contest was held very informally. There was no judging or points given for scale fidelity. The contestants chose any five maneuvers plus landing, which was mandatory (six maneuvers in all were scored). As it turned out, the judges called the maneuvers for the pilots and the maneuvers had to be flown in the order which the pilots listed them. Airtowing was as high as one wanted - often much too high to be able to see the maneuvers properly. Just a minute or two of airtowing was sufficient to gain enough height in order to complete the five maneuvers plus landing. Two rounds were held.

The scoring was on a basis of one to ten (ten being perfect), and then all of the flight scores for each maneuver were simply added up and multiplied by the difficulty factor, the six total maneuver scores were then added together to get the final flight score. As a result of our efforts, I revised the score sheet we used to better reflect what was required.

As you might expect, the pilots who were more used to flying their sailplanes were the ones who fared best. The lesson here is: If you plan to enter any such contest (there was no advanced warning for this one), you might practice a few maneuvers ahead of time. Those who fared least well, even if they were excellent pilots, chose maneuvers which were far too difficult for their particular sailplane. Perhaps there is a lesson here too - choose maneuvers you can easily fly and perform well.

The winning combination proved to be the largest and heaviest sailplane entered, Gunnar Stumpe's 1/3 ASW 20 with an 18 foot span and weighing in at 23 pounds. His flight routine was three thermal turns, a procedural

Pete George's ASK 18 coming in for a nice (as always!) landing, after flying this ship to second place in the aerobatic contest.

This 4.2 meter ASK 18 fits nicely inside of the box made for skis. Distributed by Mark Nankivil (314-781-9175), these boxes will fit nicely on top of your car.

Rusty Rood with his 1/3 PriBek ASW 27. He took Pilot's Choice for Best Modern. He won the beautiful desk model that Asher Carmichael built and donated as a prize.

turn, a loop, a roll, and a stall turn linked together one after the other.

Pete George took second place with his Roke ASK 18, followed by Luther Mitchell, Asher Carmichael (DG 800), Tony Fiorentino (Speed Astir), Jamie Carpenter, and Tony Napoleon (ASK 18).

Pilot's Choice for Best Modern went to Rusty Rood with his immaculate 1/3 PriBek ASW 27, and Pilot's Choice for Best Vintage went to Pete George for the second year in a row with his ASK 18.

A few new pilots were to be seen, amongst others was Landon Grindstaff who flew his G 62 powered Telemaster towplane for the first time and gave us many good tows to height. Several other pilots had their first airtows ever.

Of particular note was Wayne Parrish's 1/5 Pilatus Porter (2 meter span). This 40 pound towplane is powered by a King 95 motor with a nifty, very quiet German muffler installed in the fuselage with exhaust underneath. With such a super quiet muffler, the prop makes more noise than the motor! As far as mufflers are concerned, we are very far behind the Germans! At any rate, it was very nice to see the Porter fly and airtow. It's a most unusual looking beast!

At the end of the day, Pete George entertained us with his nifty little Robbe Poland Gnat FO 141. This is a very pretty little airplane that flies extremely well. In Pete's skilled hands, it looks like a very easy airplane to fly.

Although it would have been nice to be able to fly some more on Sunday, it was a wonderful and memorable get-together. Thanks, Wayne, for your great hospitality, and we look forward to next year's event! ■

Wayne Parrish with his 120" 1/5 Pilatus Porter. He flew its first tows on Saturday. Plenty of quiet power with its King 95 swinging a 26 x 10 prop. The slowest idle I have ever seen! It tows very nicely.

And, there was a special presentation at the event made by Wayne Parrish. Wayne says, "The bronze eagle in the photograph was presented to Robin Lehman, at the Fayetteville event, for his tremendous support of all the scale sailplane fliers in this country!" Ed.

Wind Tunnel Tests of Wing Profiles

...by Martin Simons
Stepney, South Australia

(An expanded version of a talk given at the LSF Conference held at Ferilderie, New South Wales, Australia, Easter 1996.)

Part IV

(Last month, we concluded, saying that the problem is no longer lack of information, but to make sense of the flood that almost overwhelms us. Figures 6, 7, & 8 are shown this month.)

Interpretation

A little may be said now about interpretation of the new results coming from the American wind tunnel, or rather, the tunnels. (When Professor Selig moved from Princeton to UIUC, he also moved to a different set of apparatus.) Figure 9 shows how a modern low speed wind tunnel may be laid out. Note the isolation of the motor and fan from the working section. This is to prevent vibration upsetting the airflow and the instruments. Even noise can sometimes affect the character of the airflow at the very slow velocities involved in low Re number testing. In operation, the fan draws or sucks air through the tunnel, rather than blowing it. This prevents the fan blades themselves from creating gross turbulence. The air entering the tunnel, filters relatively slowly through several finely porous anti turbulence screens; then, as the flow moves into the contraction cone, it is speeded up by the venturi effect. Any remaining lateral oscillations are smoothed out in this way, before the air enters the working section. It then departs to the fan through an expanding channel.

The most important measurements are those of drag coefficient against lift. In Figure 3 (*RCSD* June 1997, page 25), the older method of charting the

Sorted by Thickness		
Airfoil	% Thickness	% Camber
S2055	7.99	1.66
SD7003	8.51	1.46
SD2030	8.56	2.25
S2048	8.63	1.94
SD8000	8.86	1.71
RG15	8.92	1.76
SD2083	8.96	2.85
HQ2/9	8.97	1.99
NACA 0009	9.00	0.00
NACA 6409	9.00	6.00
E387	9.06	3.80
SD7043	9.13	3.51
SD7080	9.15	2.48
SD6080	9.18	3.74
SD7037	9.20	3.02
DAE51	9.37	3.98
AQUILA	9.38	4.05
SD5060	9.45	2.30
S3014	9.46	2.57
S3021	9.47	2.96
S3016	9.52	2.09
S4062	9.53	4.14
S4061	9.60	3.90
SD7084	9.63	2.31
S4180	9.77	4.36
SD7032	9.95	3.65
FX60-100	9.97	3.55
SD7090	9.99	1.87
SD8040	9.99	2.65
NACA 64A010	10.00	0.00
SD8020	10.10	0.00
S2091	10.10	3.91
E193	10.22	3.57
S3010	10.32	2.82
SD6060	10.37	1.84
E205	10.48	3.01
E374	10.91	2.24
DF103	11.00	2.30
DF102	11.00	2.30
DF101	11.00	2.30
NACA 2.5411	11.00	2.50
E214	11.10	4.03
CLARK-Y	11.72	3.55
SPICA	11.72	4.74
E193MOD	11.85	4.15
J5012	12.00	0.00
MILEY	12.81	5.16
WB135/35	13.53	3.75
FX63-137	13.59	5.94
S4233	13.64	3.26
WB140/35/FB	13.92	3.70
SD7052	13.98	3.97
MB253515	14.96	2.43

Figure 6 The airfoils tested and published in "Soartech 8, Airfoils at Low Speeds".

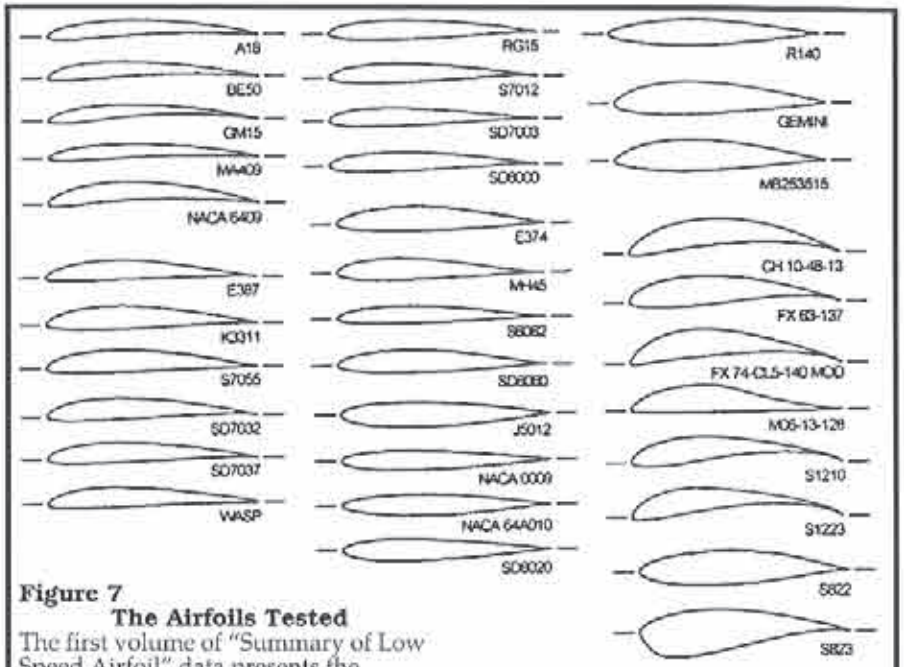


Figure 7

The Airfoils Tested

The first volume of "Summary of Low Speed Airfoil" data presents the performance characteristics of 34 airfoils (36 wind tunnel models), most of which are intended primarily for model aircraft, although the airfoils and data are expected to have wider application. Figure 1.1, in that volume, shows by category the collection of airfoils that were tested. The myriad of airfoils depicted reflects the variety of airfoil design requirements that differ widely from one application to the next. These differences are highlighted in the pages that follow. A further 30 profiles are presented in Volume 2.

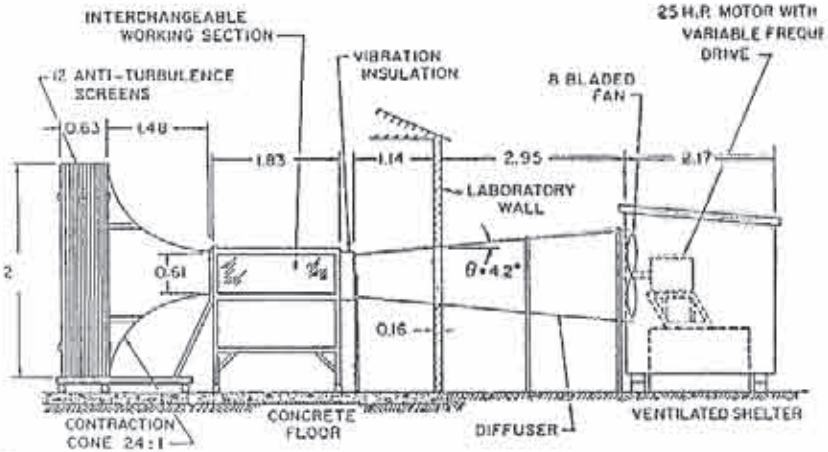


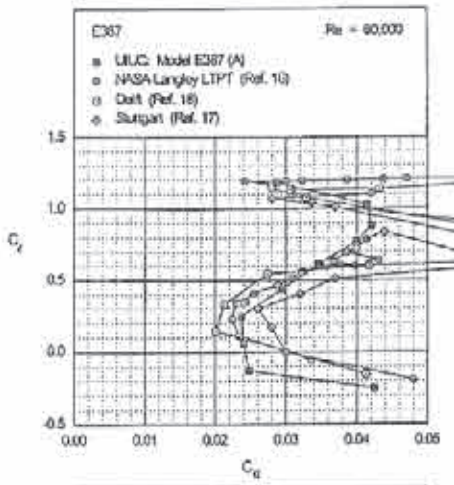
Figure 9 A modern low speed research wind tunnel of the open return or Eiffel type at Notre Dame University, Indiana, USA. Note both intake and exit are sheltered. ALL DIMENSIONS ARE IN METRES.

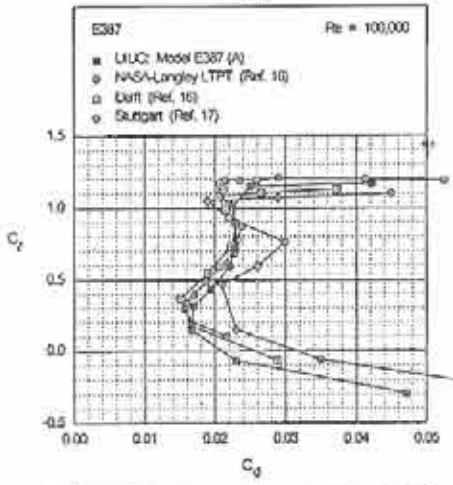
Airfoils Sorted by Category — **Figure 8**

Airfoils for:	Airfoil	% Thickness	% Camber	$C_{m,c/4}$
Free Flight Models	A18	7.26	3.84	−0.126
	BE50	7.31	3.96	−0.114
	CM15	6.70	4.76	−0.154
	MA409	6.69	3.33	−0.115
	NACA 6409†	9.00	6.00	−0.163
Thermal Duration Sailplanes	E387 (A)†	9.06	3.90	−0.082
	K3311	11.03	3.23	−0.085
	S7055‡	10.50	3.55	−0.068
	SD7032 (D)†	9.95	3.66	−0.099
	SD7032 (E)	9.95	3.66	−0.099
	SD7037 (A)†	9.20	3.02	−0.085
	SD7037 (B)	9.20	3.02	−0.085
	WASP	9.35	2.98	−0.074
F3B Sailplanes	RG15 (B)	8.92	1.76	−0.058
	S7012‡	8.75	2.02	−0.068
	SD7003†	8.51	1.46	−0.035
	SD8000†	8.86	1.71	−0.049
Slope Racers	E374 (B)†	10.91	2.24	−0.056
	MH45	9.84	1.64	−0.006
	S6062	7.95	1.59	−0.040
	SD6060†	10.37	1.84	−0.039
Tail Sections	J5012†	12.00	0.00	0.000
	NACA 0009†	9.00	0.00	0.000
	NACA 64A010†	10.00	0.00	0.000
	SD8020†	10.10	0.00	0.000
Quickie 500 Racers	R140 (A)	12.04	0.45	−0.012
Sport Planes	GEMINI	15.38	2.20	−0.048
	MB253515†	14.96	2.43	−0.050
Heavy Lift Cargo Planes	CH 10-48-13	12.75	10.20	−0.230
	FX 63-137 (B)	13.59	5.94	−0.170
	FX 74-CL5-140 MOD	13.01	9.72	−0.250
	M06-13-128 (B)	12.81	5.16	0.004
	S1210‡	11.87	7.20	−0.250
	S1223‡	11.93	8.67	−0.290
Small Wind Turbines	S822	16.00	1.89	−0.070
	S823	21.00	2.49	−0.150

† Wind-tunnel models tested previously at Princeton[1]
‡ New airfoils designed and built for the current test phase

results is shown. It is usual these days to arrange the graph differently with the lift coefficient as the vertical scale and the drag scale horizontal, with a common origin, or zero, at bottom left. This is represented in Figure 5 (*RCSD* July 1997, page 43) and in later figures below. Of course, no wing profile can yield zero drag, but at negative aerodynamic angles of attack, any profile will 'lift' downwards; hence, the lift coefficient scale extends beyond the zero to the negative side. (A model flying upside down is operating on this side of the zero lift line.) It then becomes easy to pick out critical





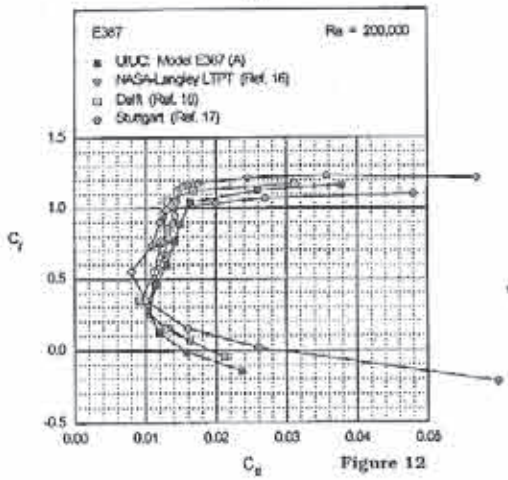


Figure 12

points, such as the minimum drag where the curve is furthest to the left, and this is associated with a certain value of the lift coefficient. A 'fast' section will have this minimum drag point at a low lift coefficient. A slow section will have the minimum drag point higher up the chart, associated with a higher lift coefficient. This arrangement of the graphs also allows identification of the approximate limits of the useful operating range, the so called low drag bucket. Above and below the drag bucket, the curves swing sharply to the right, and soon go off the chart.

It would be worrying if the new results

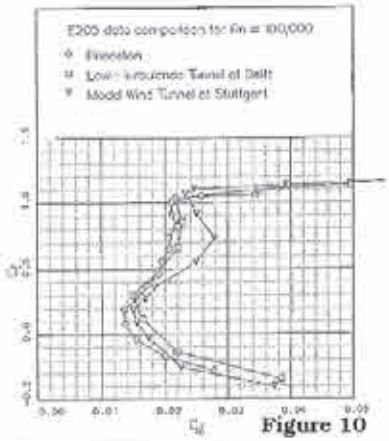


Figure 10

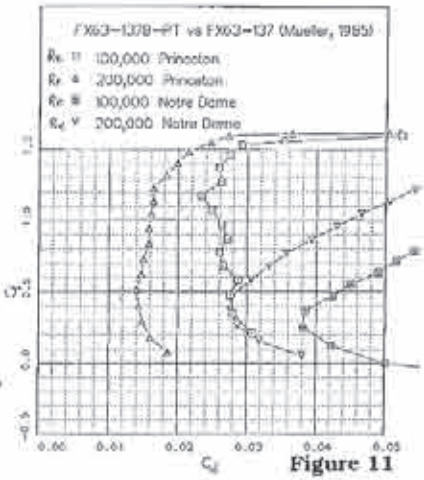


Figure 11

were seriously out of line with everything that has gone before. This is not the case, but the question does help us to understand the situation better.

The charts on pages 24 to 40 of the Soartech 8 volume show how the Princeton measurements compare with some of those from Stuttgart, NASA and Delft (Figures 10, 11 & 12 here). Some more recent tests at UIUC on the Eppler 387 section are also included in the comparison with earlier, Princeton results (Figure 11). Work is still going on and there will be more results emerging in future. These too will need to be analyzed and understood.

Agreement among the various testing laboratories is generally quite good in that the curves on the various charts do show similar features. We are not facing a revolution in aerodynamic thinking.

But in absolute terms, the profile drag measurement from the four tunnels, on what is nominally the same profile at the same trim, sometimes differ by 10 or 20%. There may be much more difference than this, especially at the lower Re numbers (i.e., for the slower phases of a flight where Schmidt's critical Re number is approached). Even when the **same test model** is used in two slightly different wind tunnels, there is some disagreement (Figure 13). The minimum drag coefficient measured for the identical test piece E 374 profile at Re 300,000 was 0.0085 at Princeton and 0.0091 at UIUC, a difference of about 7%. At lower Re numbers the agreement is less good. Any modeller who chooses a particular profile because he has seen a chart showing fractionally better drag figures, or a higher maximum lift coefficient than some other profile tested in some other laboratory, should hesitate.

Some of the reasons for the variations in results become clear when attention is given to detailed methods of measurement employed. Michael Selig points out that the Stuttgart and Delft measurements of drag on the E 387 profile were taken at only one location along the span of the model wing. As mentioned later in the present article, it was later discovered (first in Stuttgart) that several measurements across the span of the model in the tunnel are required to give more reliable results. Much of the apparent discrepancy between the Stuttgart tests and those at other laboratories is explained by this. Another source of variations is the relative accuracy of the models used and the mathematical methods employed for analysis and reduction of the data to standard conditions. When the model wings are accurate and the techniques refined, agreement between different wind tunnels improves considerably.

One point that needs to be made is that the forces involved are very small, especially the profile drag. Imagine a small wing in a wind tunnel, which at a certain angle of attack and flow speed creates a lift force of five hundred grammes or so, half a kilogramme or about 18 ounces. The drag force may be one sixtieth of this, i.e., about 8 grammes or less than a third of an ounce. An ordinary kitchen spring balance will not be capable of measuring such a small force. But more importantly, when we are comparing two profiles, one against the other, if there are any experimental errors (there always are), their effects may be enough to obscure small differences. A difference of 5% in the drag requires measuring apparatus capable of detecting variations of 0.4 of a gramme, less than two hundredths of an ounce. At Re numbers about 30,000, the flow speed in the wind tunnel is about 5 ft/sec, walking speed.

The methods and apparatus are all described and explained in the Selig volumes.

From the foregoing it emerges that in practical terms it makes little sense to compare directly the drag measurements in one tunnel with those coming from a different laboratory.

It is safer to make comparisons of different profiles when these have been tested in the same tunnel with all the same methods and correction factors by the same group of people. Even then, there will be some experimental errors but the errors might be consistent; any bias will apply equally, or nearly equally, to all the tests. Thus, the minimum drag coefficient of the RG 15B section (1.76% camber, 8.92%

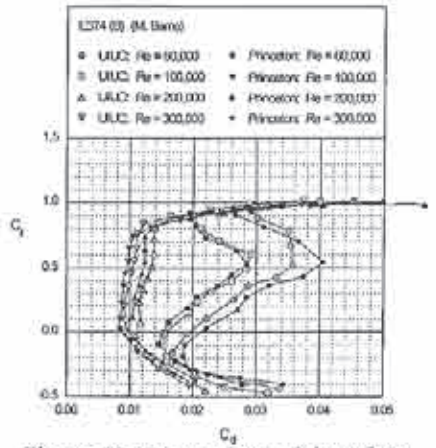


Figure 13 Comparison of drag data for the E374 airfoil from the Princeton and UIUC wind-tunnel facilities

thick) at Re 300,000 is given as 0.0077, which does perhaps represent a saving of about 7% against the E 374 (2.24% camber, 10.91% thick).

The same charts indicate that the so called drag bucket of the E 374, which is a thicker profile, is wider than the RG 15, so it ought to be more versatile, capable of good performance at low flight speeds (soaring) although slower in a speed dash. This is to be expected.

■

(Part V continues the discussion with spanwise variations. Ed.) ■

Donations may be sent to Professor Michael Selig at:
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University of Illinois at Urbana-Champaign (UIUC)
306 Talbot Laboratory
104 S. Wright St.
Urbana, IL 61801-2935 USA
e-mail: m-selig@uiuc.edu

Information on how to obtain the books referenced can be found under R/C Soaring Resources/ Reference Material toward the back of *RCSD*.

Steve Savoie is on vacation. He wanted you to know, he'll be back next month!

Video Review

"Los Banos '96 - '97"

...by Gary Fogel
Los Angeles, California

Mark Foster with his Ka 6.

Mark Foster is well known in southern California for his collection of large scale R/C sailplanes. It was with pleasure that I viewed a new video tape on scale soaring being offered by Mark, a member of the International Scale Soaring Association. "Los Banos '96 - '97" is a production of Gliders Downunder, and is the work of both Mark Foster and Trevor Broadbent, who narrates much of the footage. A native of Australia, Trevor met up with Mark for the filming of this video on a recent trip to California. As someone who attended the Los Banos scale fun fly in 1996 and, unfortunately missed the 1997 event, I felt qualified to review this video as both a personal recollection and as something brand new to me. From both perspectives, I feel that you will be pleased with the results!

We start out at the historic Torrey Pines Gliderport in San Diego, California, where a small group of scale glider enthusiasts has found their piece of glider heaven. Clearly, the video was filmed on a weekday, as the only objects in the sky are scale gliders! Dan Troxell, Gene Serrano, Dave Pray, and Mark Foster put on a good show with a host of machines from an ASW-27 to a 1/3 scale 5 meter Ka-6. One gets the idea of what a good day at Torrey is all about. Another one of Mark Foster's larger sailplanes, the Grob Twin III is used for a series of takeoffs and landings, with some aerobatics thrown in. This first bit of video (although having little to do with Los Banos!) is surely enough to convince the uninitiated to visit this world class site... at least on a weekday!

Next, we head on a soaring safari to Los Banos, about 300 miles to the north of southern California. This footage describes the events that took place at the recent 1997 scale fun fly hosted by the South Bay Soaring Society. At Los Banos, nearly everything scale ends up in the air at some point during the event. Pilots launch by winching or aerotow, and when the wind comes up, the ridge soaring is exhilarating. Close up shots of many of the scale gliders are shown, including Mike Reagan's 1/4 scale transport trailer for his 1/4 scale ASW-27, Lynsel Miller's Schweizer TG-3, and of course, Gary Brokaw's fabulously huge, 25 foot wingspan Austria Elephant. For those of you who haven't seen the Austria fly, this video is worth the price of admission. For those of you who already have seen the Austria fly, kick back in your favorite chair and watch the show! The video has footage of the Austria winching, aerotowing, and sloping, including enough wing flex to make any modeler's heart skip a beat or two. At the end of the Los Banos '97 footage, a series of still pictures in the form of a scrapbook is a nice close.

After the Los Banos '97 footage, we start again, back in Torrey Pines, with several scale ships cruising the slope. Only limited narration from Mark Foster and no background music occur from this point on. After watching this video, I was left with the question, "How did these guys find the only two days of the year at Torrey Pines when there are white caps and no air traffic congestion?" Mark obviously knows some secrets that I have yet to understand!

Again, we move back to Los Banos, but on this trip it is for the 1996 scale fun fly. Mark asks several of the pilots to describe their own sailplanes while on the ground, and I thought this was a nice addition to the soaring footage. As the waves of PSS, vintage, and modern gliders take to the skies, zip back and forth, and land again, I sat back and was content to realize that scale soaring in America is indeed alive and flourishing. The last few minutes of the tape show some soaring by Mark Foster and his friends, at a location in Laguna Hills of southern California, after we returned from Los Banos.

The first half of the video comes with nice instrumental background music and the narration of Trevor Broadbent. Sometimes, his Aussie accent can be a bit quick for the average Yank, but overall the narration is well done, introducing all aspects of scale soaring to the viewer. The latter half of the video is narrated by Mark Foster and is less of a "production video" and more of a "home movie". You might think this would detract from the quality of the video, but I found just the opposite to be true; it made me feel like I was more of a part of the group and closer to the pilots. At the Los Banos '96 event, Mark introduces the viewer to many of the pilots, especially Robin Lehman, Dennis Brandt, Gene Serrano and others. This effort allows the viewer to put a face together with the sailplane and seems to suggest that the enterprising modeler could see his own photo and scale glider in the next video!

"Los Banos '96 - '97" can be ordered directly from Mark Foster for $22.50 in the U.S.A. Checks or money orders should be made to: Mark Foster, 1738 Hanscom Drive, South Pasadena, CA 91030. The total running time is approximately 135 minutes. For those of you interested in seeing footage of scale soaring in California, or learning what all aspects of scale soaring are about, I recommend this video to you. ■

ROEDELMODELL 1/3.75 MDM FOX

...by Asher Carmichael
Spanish Fort, Alabama

The Roedelmodell Fox on final. The wings are so low to the ground, it needs no aileron control. It does hands-off take-offs! Photos courtesy of Robin Lehman.

Mandi Breeden with the Fox. It thermals, tows just fine, and is highly aerobatic. Capable of doing any stunts, it's easy to fly, and quite stable.

The two seat Fox is the latest thing in full-size aerobatic sailplanes. It is manufactured by MDM in Poland, and has taken the world sailplane aerobatic scene by storm. It's sleek jet-fighter style lines are definitely in the genre of what one would expect in a high speed flight envelope, and yet the unmistakable lines of a "glass slipper" are evident. The Swift (single seat version) and Fox designs took the top 15 places in a field of 50 plus entries at the latest world sailplane aerobatic championship. With a pedigree like this, it is no wonder that model manufacturers around the world have jumped on the bandwagon to produce kits of these outstanding newcomers to the world of full-size soaring.

One of the best offerings of the Fox comes from Roedelmodell in Germany. It is imported into the U.S.A. by Sailplanes Unlimited, Ltd. This 1:3.75 scale glass, foam and obeche kit, seems to me to be a real deal for those who are interested in aerobatic flight routines. Its 13 lb. weight, 3.75 meter span, and generous wing area, coupled with a semi-symmetrical RG 12 airfoil, make for good floatability and maneuverability. The overall quality of this kit is outstanding and, as with other Roedelmodell kits, most of the work has been done.

I was fortunate to fly the Fox in March of this year, at an event in Pensacola, Florida. It is an interesting blend of agility and stability. Although aerobatics are not my cup of tea, I found the Fox enjoyable to fly. Tracking is predictable, as one would expect; airtow is rock solid, and yet rolls require just a "flick of the stick", without the attendant "up and down" elevator compensation associated with more cambered airfoils. Note that this maneuverability comes with a price in the form of energy, which translates into speed gained at the expense of altitude, though I would say that the Fox retains its energy well, in this regard. In fact, it had the longest flight of the day: about 30 minutes from a 2000 foot tow. This bird will definitely thermal, but don't expect it to "speck out" from ground level on weak days. Airtow or slope is the best bet for putting this ship in the "chips". The L/D is remarkable, based on what I saw Rusty Rood do with it near Ground Zero.

I witnessed some pilots manipulating this plane into doing things one might expect on a west coast slope, instead of on a flat field on the coastal plains of northwest Florida. Outside loops, four-point rolls, Immelmans, Cuban-eight's, inverted Cuban-eight's, a beautiful "true" spin, stall turns, and many others are all within the purvey of this little gem. It certainly opened my eyes as to the possibilities of what might take place in scale sailplane aerobatic competition in the near future. ■

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, Ron Swinehart, 8733 Edgehill Dr. SE, Huntsville, AL 35802; (205) 883-7831.

Alabama - Central Alabama Soaring Society, Ron Richardson (Tres.), 141 Boradmoor Ln., Alabaster, AL 35007; e-mail: <richardson@wwisp.com>.

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; (602) 325-2729. 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 - 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 - South Bay Soaring Society, A.J. Angelo, P.O. Box 2012, Sunnyvale, CA 94087; (415) 321-8583, fax (415) 853-6064.

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 (President), (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.

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), Don Cleveland (Pres.), 1515 Cuthill Way, Casselberry, FL 32707, (407) 696-7516, <Dcleve130@aol.com>.

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

Hawaii - Maui Island Slope Soaring Operation, MISO, Hank Vendiola, 10-C Al St., Makawao Maui, HI 96768; (808) 572-5283.

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; (708) 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 - Wichita Area Soaring Association, 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 Jay_Burkart@hp.com.

Maine - DownEast Soaring Club (New England area), Steve Savoie (Contact), RR#3 Box 569, Gorham, ME 04038; (207) 929-6639. InterNet e-mail <Jim.Armstrong@juno.com>.

Maryland - Baltimore Area Soaring Society, Russell Bennett (President), 30 Maple Ave., Baltimore, MD 21228; (410)744-2093.

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), Ken Trudeau, 3033 Plum Creek Dr., St. Charles, MO 63303; (314) 926-3537.

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

Nebraska - S.W.I.F.T., 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) 643-2424, <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) 658-1998.

New Jersey - Vintage Sailplane R/C Association, Richard C. 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@mcimail.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, Taylor Fiederlein (President), (516) 922-1336, or Joe Coppola (VP), (516) 798-1479.

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, (206) 874-2429 (H), (206) 655-1167 (W).

Ohio - Cincinnati Soaring Society, Chuck Lohre, 3015 Beaver Ave., Cincinnati, OH 45213; (513) 731-3429, lohre@iac.net, http://www.iac.net/~lohre.

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

Oregon - Portland Area Soaring Society (PASS), Pat Chewning (Secretary), 16766 NW Yorktown Dr., Beaverton, OR 97006, (503) 645-0323, e-mail: patch@sequent.com, web page: www.europa.com/~patch/

Oregon - Salem Soaring Society, Al Szymanski, (contact), (503) 585-0461, aszy@teleport.com, www.teleport.com/~aszy/sss.html

Oregon - Southern Oregon Soaring Society, Jerry Miller, 3431 S. Pacific Hwy. TRLR 64, Medford, OR 97501, e-mail Milljer@aol.com, ph/fax (541) 535-4410.

Tennessee - Memphis Area Soaring Society, Bob Sowder, 1610 Saddle Glen Cove, Cordova, TN 38018, (901) 751-7252, FAX (901) 758-1842.

Tennessee - Tullahoma (Southern Middle Area), Coffee Airfoilers, Craig Logan, 147 Stillwood Dr., Manchester, TN 37355, (615) 728-5446, jclogan@edge.net.

Tennessee - Soaring Union of Nashville, Terry Silberman, PO Box 17946, Nashville, TN 37217-0946, (615) 399-0846.

Texas - aerotowing, Dallas area, Andrew Jamieson, 9426 Hillview, Dallas, TX 75231, (214) 349-9346, e-mail ajsleep@aol.com. Larry Sengbush, (972) 291-4840.

Utah - Intermountain Silent Flyers, Tom Hoopes, (801) 571-3702 (eve). "Come Fly With Us!"

Virginia - Tidewater Model Soaring Society, Herk Stokely, (757) 428-8064, herkstok@aol.com.

Virginia - Appalachian Soaring Association, Virginia's Southwest (Bristol area), Greg Finney, 106 Oakcrest Circle #5, Bristol, VA 24201; (540) 645-5772, e-mail <gfinney@naxs.com>.

West Virginia - Chip Vignolini, 1305 Perry Ave., Morgantown, WV 26505; (304) 598-9506, <ydne30a@prodigy.com>.

Washington - Seattle Area Soaring Society, Waid Reynolds (Editor), 12448 83rd Avenue South, Seattle, WA 98178; (206) 772-0291.

Wisconsin - Valley Aero Modelers, Lee Murray, 1300 Bay Ridge Rd., Appleton, WI 54915; (414) 731-4848, <74721.65@compuserve.com>.

Outside U.S.A.

Australia - Southern Soaring League, Inc., Mike O'Reilly, Model Flight, 42 Maple Ave., Keswick SA 5035, Australia. Phones: ISD+(08) 293-3674, ISD+(08) 297-7349, ISD+(018) 082-156 (Mobile). FAX: ISD+(08) 371-0659.

Canada - Greater Niagara Area Thermal Soarers (GNATS), Flat Field Soaring & Aerotowing, Gerry Knight, (905) 934-7451 or Don Smith, (905) 934-3815.

Canada - MAAC Men Gliding Club, Jim Holland, 168 Verona Dr., Winnipeg, Manitoba, Canada R2P 2R8; (204) 697-1297.

Canada - Southern Ontario Glider Group, "Wings" Programme, dedicated instructors, Fred Freeman, (905) 627-9090, or Bill Woodward, (516) 653-4251.

England (Thermal Talk & Europe), Jack Sile (Editor), 21 Bures Close, Stowmarket, Suffolk, IP14 2PL, England; Tele. # 0449-675190.

England (southwest) - Sean Walbank, Woolcombe Hays, Melbury Bubb, Dorchester, Dorset, DT2 0NJ, phone 01935-83316.

Hong Kong - Robert Yan, 90 Robinson Road, 4th Floor, Hong Kong; (852) 25228083, FAX (852) 28450497, yanr@asiaonline.net.

Japan - Dr. Paul "Sky Pilot" Clark, 2 - 35 Suikoen Cho, Hirakata Shi 573, Osaka Fu, Japan; IAC+(81) 720-41-2934, fax: IAC+(81) 6-954-4144, e-mail: 76055.3546@compuserve.com, http://chaos.fullerton.edu/~jclark/skypilot.

Scotland - Ron Russell, 25 Napier Place, South Parks, Glenrothes, Fife, Scotland KY6 1DX; Tele. # 01592 753689.

Seminars & Workshops

Free instruction for beginners on construction & flight techniques, week-ends (excl. contest days), "AJ" Angelo, South Bay Soaring Society (San Jose area), (415) 321-8583.

BBS/Internet

Internet - Email list/resource of RC soaring related folks, including US and international club contacts, vendors, kit manufacturers/distributors, software, equipment and supplies. Check out the web site: www.ocpapsych.com/yellow.htm, or contact Manny Tau at taucom@kaiwan.com.

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

The Frequent Flier's Info. Hot Line, San Francisco Bay Area - Box 1 (lost & found airplanes, helpful tips, upcoming events), Box 2 (questions), Larry Levstik, (415) 924-4490.

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San Anselmo, CA 94960
(415) 454-3087

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23052 Lake Forrest Dr.
Unit C2
Laguna Hills, CA
(714) 583-1775

Gyro Hobbies 2
17431 Brookhurst Unit H
Fountain Valley, CA 92708
(714) 378-8924

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9577-L Osuna Rd. NE
Albuquerque, NM 87111
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1862 Petersburg Rd.
Hebron, KY 41048
(606) 334-4331

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8060 S. 84th St.
La Vista, NE 68128
(402) 597-1888

Hobby Warehouse
4118 South St.
Lakewood, CA 90712
(310) 531-8383

Tim's Bike & Hobby
2507 Broadway
Everett, WA 98201
(206) 259-0912

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.

"Elmira Aerotow 96 Video" taken at the First Annual Northeast Aerotowing Fly-in, New York. Over 40 minutes of flying, interviews, and a special preview of the National Soaring Museum with Paul Schweizer. Check or money order, $19.95 plus $3.00 S&H (U.S.), payable to Harris Hill L/D R/C, c/o John Derstine, RD 3# Box 336, Gillett, PA 16925, (717) 596-2392. S&H foreign: $6 Canada/Mexico, $7 Europe, $8 Asia/Africa, $8.50 Pacific Rim. VHS format, NTSC standard.

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Wing Span	100 - 136"
Airfoil	RG-15
Controls	As Required

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