R/C Soaring DIGEST

April, 1995
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SOUTHWEST WINTER SOARING CONTEST
GILBERT, ARIZONA
JOE WURTS & BLACKHAWK
Photo courtesy of Tom Gressman.
Photography by Wendell E. Wilson.

R/C SOARING DIGEST

A Publication
for the R/C Sailplane Enthusiast!

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The Soaring Site

A Coming Event

We received the following note from New York.

"My name is Taylor Fiederlein and this year I am responsible for public relations for the Long Island Silent Flyers Empire State Soaring Classic open sailplane thermal duration contest to be held at Stillwell field in Syosset L.I., New York on June 17th and June 18th. This contest is the first of the Eastern Soaring League's season and as such we usually have a very good turnout. We expect at least 75 flyers this year! In addition, this is one of the oldest continuously running contests on the east coast. This is our 18th year! Our launch equipment is first class with four available launch and retrieve systems. The field is 25 acres and is adjacent to a 275 acre nature preserve which our members help maintain as part of an adopt-a-park program.

"Although this is one of the larger regional contests held around the country, not much is known about it, despite the fact that top east coast flyers such as Mike Lachowski, Josh Glabb, Tom Kiesling and John Hauff attend. This year however, we will be getting the word out and hopefully we will generate some real excitement."

Taylor can be reached at (212) 907-8380, or at (516) 922-1336 after 6:30 P.M. EST.

A New Electric Club

We received a note from Mark Nankivil about a new club in Missouri. He says, "There is a new electric club in St. Louis called the St. Louis Chargers and the president and instigator of this new addition is Peter George. We are presently going through the process of being a recognized club by the AMA and look forward to the coming flying season. Anyone interested in membership and a

Photo courtesy of Morten Munkeso, Sealand Model Soaring Club

copy of our newsletter can contact either:

Peter George
2127 Arsenal
St. Louis, MO 63118
(314) 664-6613

Mark Nankivil
7411 Canterbury Ave.
St. Louis, MO 63143
(314) 781-9175

"Membership for the year will be $15.00 and anyone wanting to subscribe to the newsletter can do so for $10.00.

"Future topics we'll cover in the newsletter are multi-engine scale, Speed 400 pylon racing, ElectroSlot 400 powered glider event, Speed 400 gearboxes, kit reviews, and many other electric and model related subjects."

The 2M Postal

Morten Munkeso of the Sealand Model Soaring Club (SMSK) in Denmark has written to say that the 2M Postal event will be held once again this year. The primary flying date is May 14, and the secondary flying date is May 21; the deadline for results will be June 26th.

Morten also says, "...Robert Anderson from California has done very well indeed in our 2m contest. I had his photo published in the February issue of *ModelflyvNyt*. He is now the experienced, and most feared 2m pilot from abroad. I believe that Robert is the best overall pilot during the past three events.

"In Denmark, some people are working with an open class, also dedicated for postal competitions. It is called F3J, which is an entirely open class where you mainly will be credited for your thermal skills, and minor for the landings. Is could be fun to try this class, as well, but it is so new that we don't really know the rules. We will return when news becomes available.

"Despite the fairly late season, we were lucky to get brilliant weather on September 25, 1994. Unfortunately, we had some problems staying up in the air, and most of the flights were approximately 5 minutes. On the other hand, we could do fair landings, as there was only a light breeze without turbulence.

"There will be a change in 1995 in comparison to 1994, as the flying dates are defined to be in May. This means that I am in a bit of a hurry to communicate this message to everyone...

"The favorite 2m model is apparently still the Spirit due to its good, overall performance. More pilots do bring two models (a fast & a slow) when they compete in a 2m event. If you get a light breeze on the day of flying, you will surely have a landing advantage with a slow model.

"I have discussed with Robert his scratch-built V-tail, and we have agreed that I will build a V-tail next time. (After all, the SMSK logo contains a V-tail, although nobody in SMSK flies one.)

"Participants can choose both days if they want, and the best day counts. Remember to fly at least two rounds to be a winner. The contact person is Steen Hoj Rasmussen, Tjornehusene 20, DK-2600 Glostrup, Denmark."

Thanks, Morten. Readers, if any of you need a copy of the 2m rules, or the score sheet, please let us know. There does not appear to be any change from the last event, except for the date. For those of you new to SMSK and the 2m event, it can be held anywhere. Just let us know if you need a copy of the rules, or more information.

Happy Flying!
Jerry & Judy Slates

The Ultimate Field Box

...by Byron Blakeslee
Sedalia, Colorado

I've been building and/or buying R/C field boxes for 35 years. Haven't kept count, but I must have had at least a dozen of them. The common denominator: each new box was smaller than the previous one. Why haul around a bunch of stuff you don't use?

The latest (And hopefully, last!) field box is a double size transmitter case from Tower Hobbies. It's sturdy, fully padded, and about as small as you can get while still containing everything you need to go flying. It costs $55 and measures 16.5 inches long by 11.75 inches wide by 6 inches high. After I bought this box, I saw a very similar one in Sam's Club auto department for $30. The Sam's box is fitted out as a tool case, is just a little larger, and a better buy.

As you can see in the photo, my transmitter, flying glasses, stopwatch, and neck strap go in the right side of the case. In the other side are loose tools, a 8" x 4.5" x 1.5" plastic fishing box for small items and Kleenex. What makes the case really effective is a plastic storage box that fits perfectly in the left side of the lid (after removing the foam padding). This box is a Plano "StowAway 3600" that I got at Walmart for $3. Dimensions are: 11" x 7.25" x 1.75". Some dividers needed to be removed using my handy Dremel tool.

The box is held in the lid by cotton belting with Velcro on the loose ends. The fixed ends of the belting are bolted to the top and side of the lid.

In the Plano box I have my expanded scale voltmeter, epoxy and CA glue, fingernail clippers and first aid stuff: sunscreen, small towel, band-aids, aspirin, insect repellent, lip sunscreen, and small packets of lens cleaner and moist towelettes.

To save weight, I carry a minimum of tools: 6.5" hemostats, long nose pliers (with side cutters), nurse's scissors, 4" adjustable wrench, exacto knife, screwdriver, jeweler's screwdriver set (also includes small hex wrenches), 6" spatula and 4.5" tweezers. Also included is a roll of Manco "Clear Poly-Tape", which is excellent for holding wings on fuselages. Special items like lead ballast and tape recorder go in as required. Hope this helps you put together your own "ultimate" field box! ■

1st overall - Mark Levoe with Super-V100

1995 7th Annual Southwest Winter Soaring Contest Gilbert, Arizona

...by Tom Gressman
Littleton, Colorado

Photos by Wendell E. Wilson

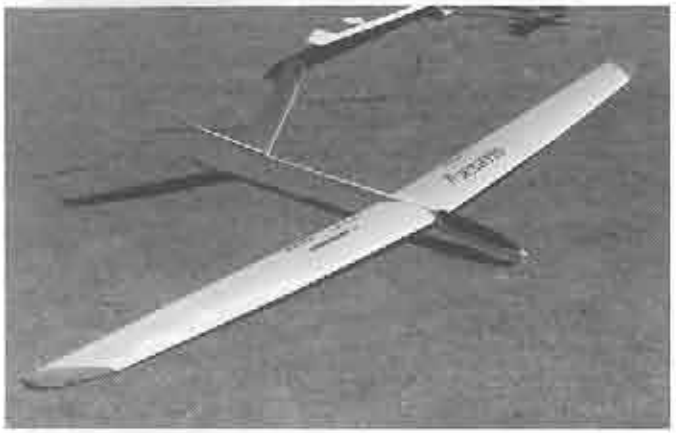
On February 4th and 5th, the Central Arizona Soaring League (CASL), held the 7th Annual Southwest Winter Soaring contest. The contest was held at the CASL field in Gilbert, Arizona, south of Phoenix, and is the first event of the Western Triad. Conceived by CVRC, the Western Triad consists of three contests: the Southwest Winter Soaring Contest, the Rosebowl Soaring Festival which will be held on May 5 - 6 (Pasadena, California), and the Fall Soaring Festival which will be held on October 7 - 8 (Visalia, California). The Western Triad trophy goes to the overall winner of these three events. One hundred and fifty-one soaring enthusiasts signed up for this winter event, with one hundred and thirty-six posting scores. Weather conditions were typical of Arizona; it was beautiful with winds less than 10 mph, blue skies, and temperatures in the mid-eighties. Light, diffuse lift prevailed both days. Many pilots stated that an early morning draw made it difficult to achieve a max.

Saturday started off with 3 minute duration, followed by 3 rounds of 10 minute triathlon and a final round of 5 minute precision duration. Sunday's events were all precision duration: 3 minutes, 5 minutes, and 7 minutes. Trophies were awarded to the top 5 in triathlon, precision duration, and the overall winners. The landing task was an L6 modified landing zone, and only unlimited class [444(D)] was flown.

It was a real learning experience observing a large contingency of very competitive flyers from around the country. I was unable to compete due to the fact that I didn't register soon enough. There was even a waiting list for positions that may open due to cancellations. Since I couldn't compete, part of the enjoyment was having an opportunity to speak with manufacturers and seeing the latest products in the manufacturer's row of tents, tables, and pick-up trucks. I didn't have the time to visit them all, but I do have a number of interesting developments to report. NSP showed off their latest kit, the Dr. Michael Selig designed Opus 750. This 100" design has a proprietary S9037 airfoil and a remarkable 42 - 45 oz. flying weight. Cody Robertson was flying one, and had positive comments regarding its capabilities.

Ray Olsen & David Diesen with molded Blackhawk.

Fredo. F3B design, RG 15, 114" span, 85 oz., 12.2 oz/sq. ft., 1000 sq. in. area. There were three at the Southwest Winter Contest. Molded ship by Fred McClung of Albuquerque, New Mexico.



Fred Rettig's Super-V110. 70 oz., Vision radio, 15th overall, 3rd in precision duration.

Opus 750, 100", S9037, 42 - 45 oz. range, flown by Cody Robertson.

Ben Clerx with 122" Maka, 5th overall.

Merrill Farmer, MM Glider Tech, with new Illusion HLG.

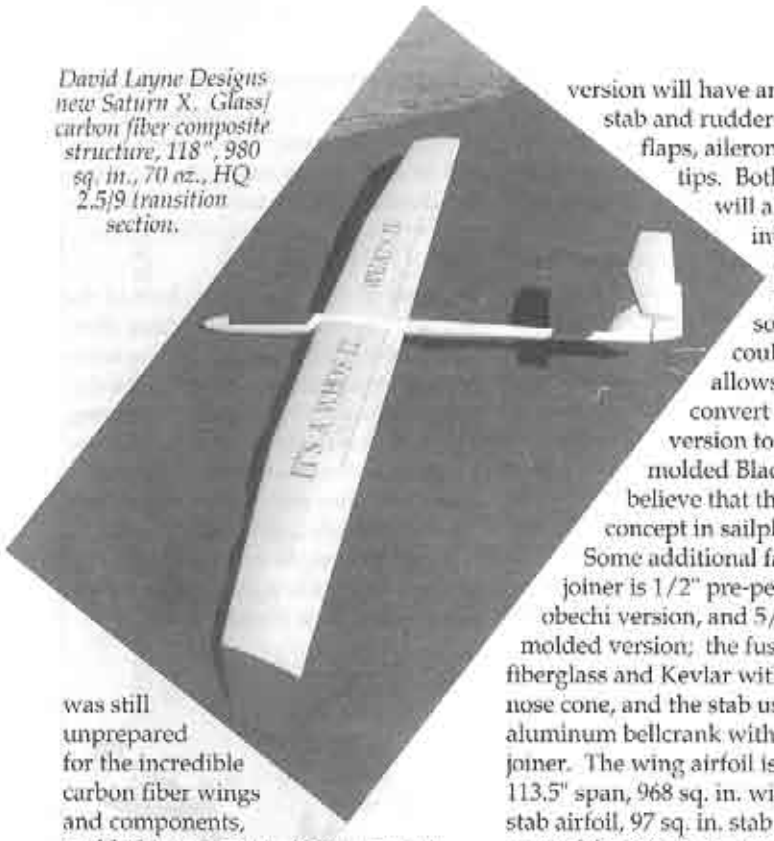
Clarence Ashcroft with his line of glider stands, (801) 467-0952.

Merrill Farmer of MM Glider Tech. displayed his new HLG called the Illusion. This machine, balsa built-up kit has a polyhedral triple taper wing, 55.25" span, 8 in. chord, 37 in. length, SD7080, and 418 sq. in. of wing area.

Mark Levoe (overall winner) was available at his booth to answer questions concerning his very competitive line of Super-V's. An examination of his winning Super-V100 with spyder foam, cf/glass wings, showed excellent craftsmanship, with a 50 oz. flying weight. This design is capable of rocket-like launches, excellent L/D, low sink rate, and bullseye landings.

Close to the Levoe Designs booth were very reasonably priced PVC stands sold by Clarence Ashcroft of Salt Lake City. Clarence also sold chutes, winch foot pedals, snap swivels, and plans for a foam cuter.

Of particular interest was the booth of Competitions Composites. This enterprise is the creator of the Blackhowk project. In the last year, numerous articles have been written about this state of the art concept in structures and design. I was very interested in a close-up inspection of this remarkable design. Even though I had read the reports, I



David Layne Designs new Saturn X. Glass/carbon fiber composite structure, 118", 980 sq. in., 70 oz., HQ 2.5/9 transition section.

was still unprepared for the incredible carbon fiber wings and components, molded in one piece, from a remarkable process. Quoting from the Competition Composites brochure, "The Blackhawk is an integrated design by Michael Selig for thermal duration flying. (Prototypes have been flying for over three years and the basic concept of this project, namely to produce a superior competition duration design, goes back to 1986.) By integrating the design, the sailplane is designed as a complete system. The airfoils, tips, fuselage, etc., are designed to work together. This results in great improvements in overall performance. Carbon fiber pieces are all molded from pre-peg uni-directional carbon, using a unique process developed by David Diesen and Ray Olsen of Competition Composites."

The kit will be offered in two versions. One will have molded wings, ailerons, flaps, stab, and rudder. The second version will have an obechi wing, stab and rudder with molded flaps, ailerons and wing tips. Both versions will allow for interchange of obechi and molded parts, so that one could, as money allows, to gradually convert the obechi version to the all molded Blackhawk. I believe that this is a unique concept in sailplane kits.

Some additional facts: the wing joiner is 1/2" pre-peg on the obechi version, and 5/8" on the molded version; the fuselage is fiberglass and Kevlar with a slip-on nose cone, and the stab uses an aluminum bellcrank with 7/32 carbon joiner. The wing airfoil is a S9000, 113.5" span, 968 sq. in. wing area, S9032 stab airfoil, 97 sq. in. stab area, S9033 vertical fin airfoil, 66 - 68 oz. weight with obechi, or 72 - 74 oz. weight molded.

Following the conclusion of the contest, I was very fortunate to receive from Joe Wurts, a most generous offer to fly his Blackhawk. After 1.7 nano seconds, I accepted. Following an impressive launch, Joe demonstrated the Blackhawk capabilities with a high speed dive and rapid pullout showing almost zero wing flex. At that point, Joe handed me his Infinity 1000 and, being the thermal guru that he is, pointed to the nearest area of lift. The next thing I knew, Joe had walked to the other side of the field and I was alone to have some real fun with this bird. I had about a 10 minute ride in what I would describe as light, diffuse lift. Taking mental notes as the flight progressed, I will make the following observations. The S9000 has a very wide envelope, which is wider than anything I

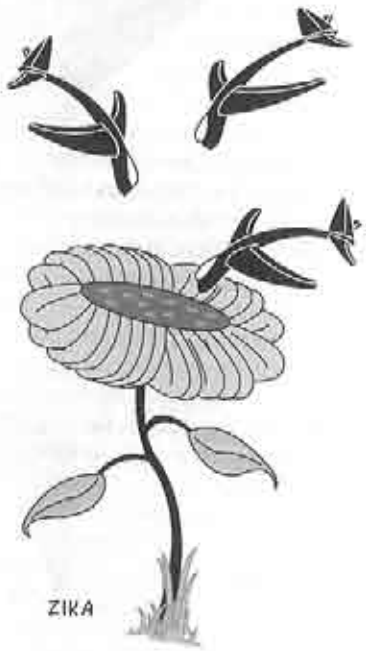
have flown up to this point. At 80 oz. (Joe's Blackhawk has 8 oz. of paint), this ship could pull high C_L's in a thermal turn without bleeding off energy or degrading efficiency. Bank angles held nicely without having to apply opposite aileron to maintain the desired bank angle. Even though I was riding very light lift, I had the feeling of being able to get a max at will. Pushing the nose down put me up on step very quickly, and I was able to cover considerable distance with minimum loss of altitude (good L/D). The stall is very gentle, almost a kind of a mush rather than a sharp break. The planform gives a stable planform that enables one to go to the limits of visibility with confidence. My landing was with a 5 mph down wind, and I was going to be very careful. My concern was unfounded; the blackhawk was a pussycat on approach and can be landing at low speeds, relative to its wing loading. Joe had some additional observations, some of which were quite interesting. In tests on Saturday, the Blackhawk consistently out launched a F3B Eagle. Joe was also getting 8 minute and 40 second dead air times in the evening. Following my flight, Joe demonstrated how competitive the Blackhawk can be in F3J with a downwind hand tow.

As is evident in my report, I was very impressed with this new design. I believe that Blackhawks will be very competitive in duration competition and F3J.

Following the awards was a Visalia-type raffle and lots of HLG fun flying. Fred Rettig presented a ready-to-fly Thermal Eagle to Tim Renaud of Airtronics. Fred said, "The Thermal Eagle is presented on behalf of all the soaring contests of America. As Tim has given to the sailplane community, we wanted to give something in return."

I would highly recommend attending this well organized event in 1996. The 8th Annual Southwest Winter Soaring Contest will definitely be on my top priority list for 1996. Iain Glithero, the C.D., indicated that next year's entry forms will be available in September, and that the closing date for entries will be November 30th 1995. There will be an entry limit of 160 in 1996.

Included in this report is a chart of the top ten overall finishers. Many fliers have told me that they would like to see what the top guns are flying. I hope that you find the data in the chart interesting. Some of the statistics that caught my attention in the chart: 90% of the radios were Airtronics, 60% of the designs used the SD7037 airfoil, 30% used the RG-15, 50% of the designs are Airtronics kits, 40% are Mark Allen designs, and there were no T-tails in the top 10. ■



OVERALL PLACE/SCORE	NAME	SAILPLANE	WT (OZ)	SPAN (IN)	WL (OZ/FT^2)	AIRFOIL	RADIO
1/1967.99	MARK LEVOE	SUPER V 100	50	100	9.375	SD7037	VISION
2/1943.60	MIKE AGUIRRE	MAKO/STD TAIL	68	119	10.0	SD7037	VISION
3/1936.96 *	J. MCCARTHY	THERMAL EAGLE	75	118	11.9	RG-15	INFINITY 1000
4/1922.52	SCOTT CONDON	SUPER V 100	51.2	100	9.6	SD7037	VISION
5/1911.63	BEN CLERX	MAKO /STD. TAIL	74	122	11.04	SD7037	FUT. 9ZAP
6/1909.18 **	KEITH KINDRICK	FALCON 880	70	112	11.45	S3021/3014	VISION
7/1906.48	STEVE GEORGE	THERMAL EAGLE	68	118	10.0	RG-15	VISION
8/1900.58	JOE WURTS	PEREGRINE	80	117	11.9	SD7037	INFINITY 1000
9/1858.35	TIM RENAUD	PEREGRINE	72	117	10.7	SD7037	INFINITY 1000
10/1857.62	T. KALLENVANG	THERMAL EAGLE	70	118	11.1	RG-15	INFINITY 1000

* 1ST PLACE IN TRIATHALON
**1ST PLACE IN PRECISION DURATION
Chart by Tom Gressman 2-12-95

Rain Marches On or Hand-Launch Topics

...by Scott Smith
2 Sugarpine, Irvine, CA 92714
(714) 651-8488
evenings after 7:00 PST

Rainy Season

The rainy season continues. "When it rains, it pours..."

E-mail

I am on Compuserve at 73541,3654. Drop me a line!

Annual Riverside Contest Classic

The date for the Twelfth Annual Inland Soaring Society Hand Launch Contest in Riverside, California is June 4, the first Sunday in June. It is always a great contest. Be there.

Dr. Paul P. Clark, Sky Pilot

Paul wrote a great letter about his project to chronicle the history of hand-launch; some of my comments in this column are from my response to him. I saw his material and he's off to a great start! I beseech all of you to swamp him with your anecdotes, observations, and history at:

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Tel: 011-81-720-41-2934
Fax: 011-81-6-954-4144
E-mail: CompuServe 76055,3546

Hand Launch Technology Status

Winning airfoils range from the 7037 to the RG15. Hence, people are experimenting with 'foils "in between": 7084, 7012, etc. They all win.

Empennages are in all combinations: conventional rudder, flying rudder, flying stab, V-tail, inverted V-tail on twin booms. They all work, and work well. There are lifting stabs as well as conventional stabs. I haven't seen any canard configurations, but figure it's just a matter of time.

Ailerons are now on equal footing with rudder/elevator.

Weight varies from 9 oz to 14 oz. All weights in this range can win.

For the hand-launch designer, how can it get any better than this?

Rudder/Elevator vs. Ailerons

Loyal readers have already read this "thread" about the rudder/elevator vs. ailerons controversy. As you also know, I've registered my opinion backed by observation that the aileron configuration can (and does) win contests.

There still is prevailing opinion that only "experts" should fly aileron, the intermediate flyers should still fly rudder/elevator.

As the duly-appointed debunker, I would like to gently suggest that this is hogwash; pilots will have success with either configuration as long as they fly one and stick with it. As is with the rudder/elevator, the aileron configuration must be set up carefully. Aileron throws must be set up to minimize tip stalling when turning.

The point is, the configuration of the airplane is less important than making sure that the components selected work together for stability and performance. After that, it is pilot skill and pilot practice. Stability, performance, and pilot skill are the motherhood and apple pie of hand launch.

Kids, Training, and Hand Launch

I talked with Paul about this. Think about this: what's wrong with kids and model sailplaning? Kids today have ta lot barriers to break through. A high-start is a must, and they must find a place large enough to use it. They have to find someone to help them fly, and most trainer gliders are too fragile to learn by themselves. The trainers are large enough to worry about injury.

"Normal" thermalling is too high for most kids; they have a hard time relating to it.

I helped a group of junior-high kids build some 2-meter trainers. Everyone finished, and the planes were beautiful. To my knowledge, none of them are still doing it. Why? The flying site/training/adult supervision effort was just too big for them to get their arms around; they stopped in frustration.

How Handlaunch Fixes the Problems

Handlaunch gliders have the following advantages:

- Are much safer because of the (much) smaller weight and the very light wing loading reduces speed.
- Are more crashproof.
- Needs no launching equipment.
- Can be flown in smaller area.
- Hence, kids can practice by themselves by throwing the glider lightly and learning close to the ground where they can better see what the glider is doing.
- In the early learning stages, expert help isn't needed to provide a failsafe against "motor skills" failure; the expert simply has to confirm that the kid is launching his plane more or less horizontally to avoid a launch stall. After that, the kid can be on his own and discover the delight of learning on his own.
- Finally, handlaunch is much more of a sport than other thermal contests, and is likely to better hold the juniors' attention. Indeed, I dream of organizing inter-junior high school team competitions.

What's Wrong with Handlaunch for Kids?

Two "biggies":

- Cost of electronics, especially servos. Just a normal radio is beyond the reach of many kids.
- Careful construction required. Foam core is the easiest precision to hold, but few kids have access to a vacuum bag setup. Wing panel alignment is critical.

What I'm Doing

So, this is what I'm working on right now. I'm designing a scheme where standard servos and receiver can be used, though a small battery pack will be necessary. I'm trying to design inexpensive jigs to insure correct critical assembly that can be packed along with the kit. The instructions will be the biggest challenge; somehow a kid has to be able to assemble it.

I'm also looking at bending the rules if necessary (maybe a wingspan over 60"), but keeping the weight under 16 oz.

It is a very challenging problem, but I think a doable one. And that makes it fun to attempt; who wants to do what's already been done? And the thought that this could help the hobby catch fire with kids makes this a very satisfying endeavor indeed.

But, I'm still in the "concept" stage. Send me your ideas. ■

Jer's Workbench

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Preparation Part II

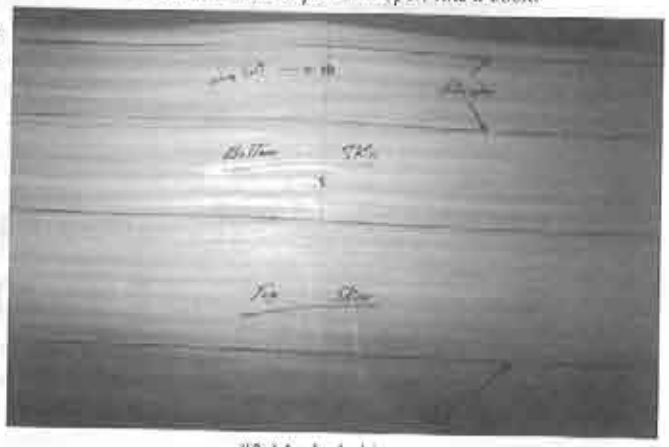
Last month, I laid out or prepared a set of foam cores to be sheeted with Obechi skins. This month, I will sheet my foam cores and complete the set of wings.

First, I begin by pre-cutting all of the Obechi sheets required. Starting at the trailing edge, the sheets are cut and marked and include the amount required for overhang. (You will need a computer printout of your airfoil to determine this amount.) Then, the other three sides are cut about 1/4 inch over size. Next, the top skin is layed up on top of the bottom skin and the skins are taped together at the trailing edge as shown in picture #1. They are shown open, like a book, in picture #2. Picture #3 shows how I marked the bottom skin, for placement of the core and fiber-glass. The core is laid onto the bottom skin and, using a pin, the pin was poked through the bolt hole and through the bottom skin. I then removed the pin and foam core, and marked the pin hole; then the skins are turned over and the pin hole is marked again on the bottom outside of the skin so that the hole can be found later on.

Now, I am actually ready to apply the Obechi skins to the foam core. A large flat spot on the work bench is required in order to lay out the skins and mix up some epoxy and cabosil. It is mixed to the concisely of creamy peanut butter, so that it won't soak through the

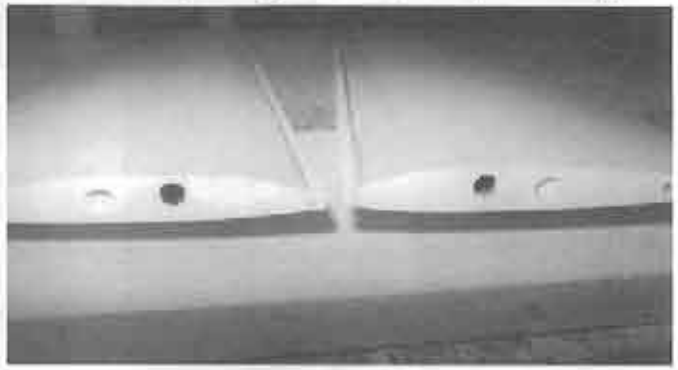
#1 Obechi skins cut to size.

#2 Obechi skins taped and open like a book.



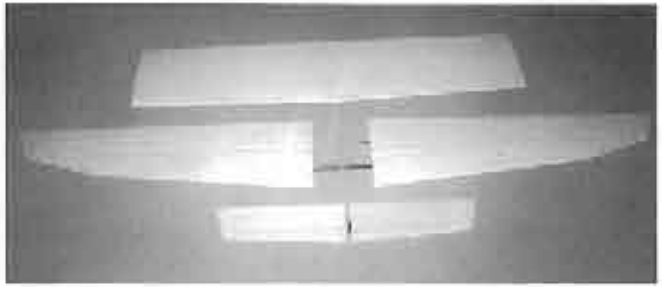
#3 Marked skins.

#4 3-piece wing and stabs after being vacuum bagged.



#5 Bass wood leading edges.

#6 Templates used to shape leading edge.

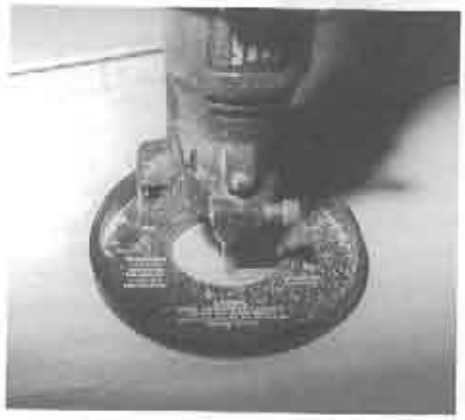


#7 Completed wing and stabilizer set.

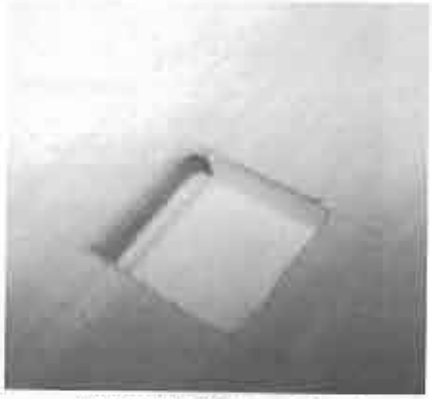
Obechi skin. Using a squeegee, a thin coat of epoxy with cabosil is applied to the inside of the top and bottom skin. I step back, looking for any spots that have been missed on the skin; then, using a squeegee, excess epoxy is scrapped off. The foam core is carefully placed onto the marked bottom skin, and the top is folded over onto the foam core. It's now ready to vacuum bag.

Picture #4 shows the 3 part wing and stabs, which have been skinned and the edges have been trimmed. Using Bass wood, 1/4 inch strips were cut for the leading edge for the wing, and 1/8 inch strips were cut for the leading edge on the stabilizer. These were applied using CA glue, the kind that won't attack the foam. See picture #5. Picture #6 shows the templates used to shape the wing leading edge. Picture #7 is the completed wing and stab set.

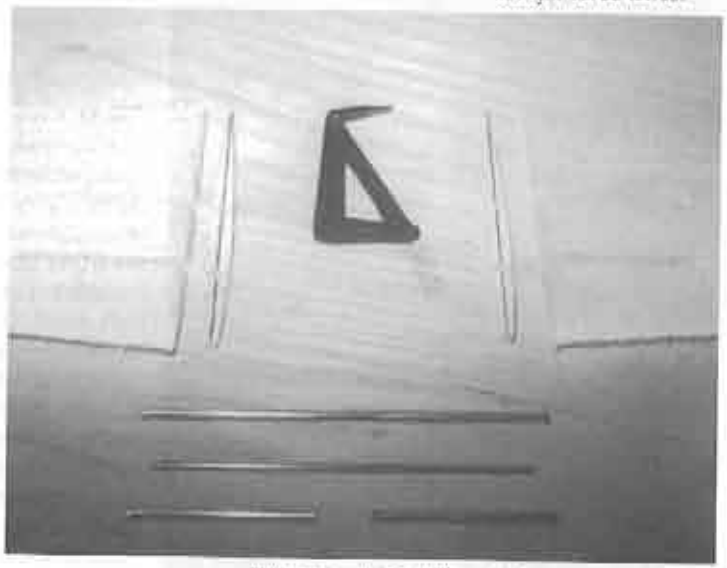
But we are not done yet, as the servo wells need to be cut, and a hole must be



#8 Dremel tool w/router attachment.



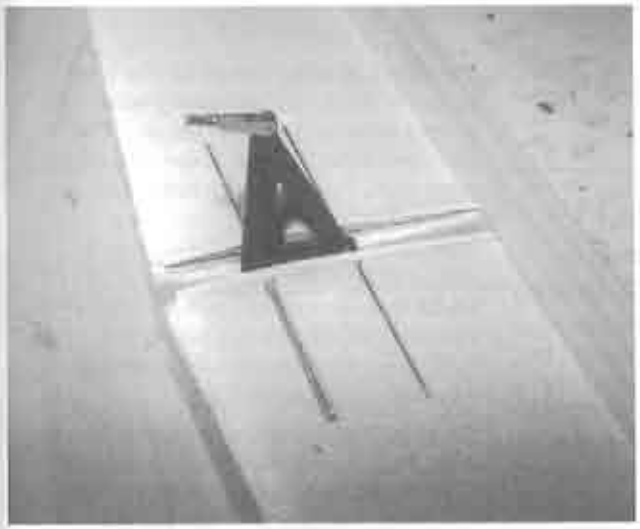
#9 Completed servo well and hole for servo wires.



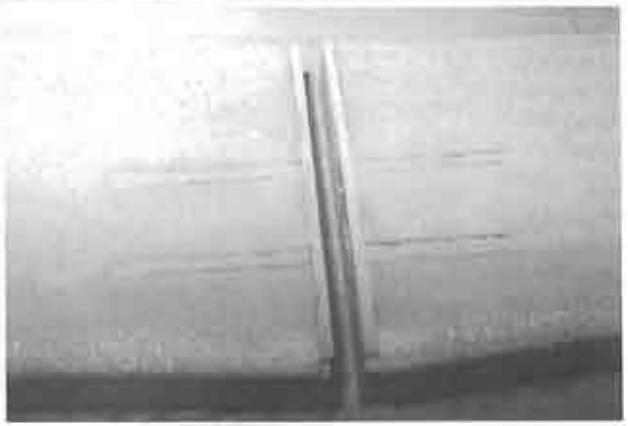
#10 Lay out of stabilizer bits.

drilled for the servo wires. This was done using a Dremel tool with a router attachment for cutting the servo wells, as seen in picture #8. If you don't have a Dremel tool, a model knife will do. Picture #9 shows the hole for the servo wires. This was done with a heated rod, using a 3/16 inch with a rounded point, ground on one end, and using a propane torch to heat the end of the rod. This is easy to do, but be careful as it's easy to slip. If you are the nervous type or have a shaky hand, ask someone else to do this for you. OK, with a steady hand, heat the end of the rod, take a deep breath, and with the aid of a guide, drive the heated rod through the foam core and very carefully remove the rod. In the last step, using a bandsaw, I made a single cut the length of each wing in order to separate the flaps and ailerons. We are done!

Once again, let us talk about preparation. Pictures 10, 11, and 12, show the lay out or preparation required for a



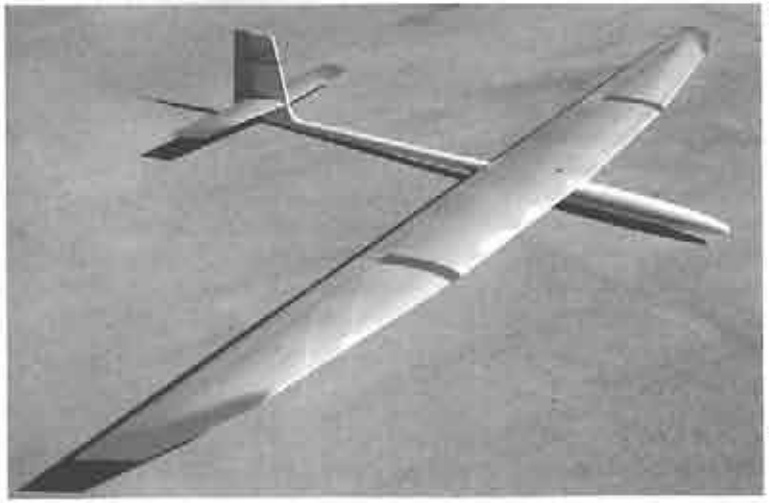
#11 Careful aliment of control horn and tubes



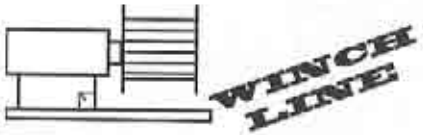
#12 Completed stabilizer cores ready to skin.

set stabilizers. Picture #10 (note all the bits) shows the foam cores, root ribs, control horn, tubes and rods. The cores can now be cut to accept the tubes; root ribs can be glued in place. The tubes are very carefully installed into the core set. Rods are installed into control horn, and control horn with rods into stabilizer tubes. Alignment is carefully checked, and once satisfied that everything is correct, they are epoxied and sanded smooth. Ready to skin, and because of all the detailed preparation, this is no longer a dreaded project.

Next month, I will talk a bit about vacuum bags and pumps. Until then, keep your wing tip up. ■



#13 Completed model, The Condor.



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Design Thoughts Part 3

The final part of sailplane design is the fuselage. The purpose of the fuselage is to hold the radio, the wings and the stab all together. While it should be aerodynamically clean and functional it would be nice to have an aesthetically pleasing shape as well.

There are basically four parts to the fuselage that we will concern ourselves with: the nose moment, the wing chord or section, the tail moment and the fin. These four pieces all need to be properly balanced in proportion to provide a well balanced sailplane.

Let's start at the front and work our way back. The nose moment should be on the order of 9 to 13 inches as measured from the leading edge of the wing to the actual nose of the fuselage. This may seem like quite a spread, but this is where individual taste comes into play the most.

I prefer a nose moment of about 12 inches or maybe a tad more. My flying buddy, Dale, likes 13 inches or even more if he can get it. This is a difference of flying style and airplane setup. Some folks prefer a shorter nose moment and will cut it down to 9 or 10 inches at most. This is also where individual preferences come into play once again.

One consideration while we are at the nose is to plan enough room for easy radio installation. The width of the fuselage at his point should be as wide as the servos you generally use for elevator and rudder with plenty of room for battery and receiver. You might as well make it easy on yourself.

The chord or wing section has been set by our wing design and pretty well pre-set as far as size is concerned. The real determination here is the type of wing mount you will use; bolt-on or plug in wing panels. In either case from an aerodynamic point of view I would suggest the fuselage not be wider than about 2 1/2 inches. If you plan on a bolt-on wing, plan for the hold down arrangement and opening for access to the servo wires.

An important consideration in the wing section is the amount of incidence to set for proper flight. A little positive incidence is required so that the airplane does not fly nose down creating additional drag during flight. If you measure some of the plans of other designs using a set of lines, one for the airfoil center line and another for fuselage center, you will note that, in most instances, the airfoil is set at a slight positive incidence. Although some designs set the wing incidence at zero and adjust incidence at the stabilizer, this is also an option.

This is also the location of a great deal of parasite drag and should be as clean as possible. For the bolt-on wing arrangement an under fairing should be built into the fuselage to assist in cleanly passing the air along the underside of the wing. If plug-in panels are used, the shoulders that protrude from the side of the fuselage should be faired into the fuselage itself with respect to smooth the air as it passes above and below the wing. The least amount of shoulder that can be designed into the fuselage cuts down the amount of drag at this point and provides a cleaner passage of air.

Tail moment is next on the agenda as we work our way to the tail. Tail moment is derived by measuring from the trailing edge of the wing to the leading edge of the stabilizer or fin if

they are the same. A longer tail moment is advantageous if our airplane is used for thermal and a nice easy flying airplane is desired. A longer tail moment will provide a softer pitch movement and easier flying.

As a rule of thumb, about 2 1/2 times the wing chord will work out to be about the right amount. In the case of a 10 inch chord this equates to 25 inches. This gives a tail moment that will provide smooth pitch control and very adequate stability in flight. If you end up in the 24 to 26 inch range for tail moment you will be in good shape. Remember going shorter on tail moment will increase pitch sensitivity.

The stabilizer is not the only device that provides the stabilizing affect on flight; there is also the fin on conventional designs. As with the stabilizer, the fin provides additional stabilizing flight characteristics. The fin includes the fin itself, and usually a functional rudder. This is generally about 12 to 15% of the wing area.

There are several thoughts on the shape of the fin; some think that a vertical rear line is the way to go while some prefer to angle the rear line of the fin. Angling the rear of the fin comes from the days of rudder flying where an angled fin made for a decrease in the amount of nose drop during a turn. The size of the base of the fin adds to the overall length of the fuselage and 4 inches seems to be about average.

The rudder and fin are generally split about 50-50 in size; although again some prefer to add more fin or rudder depending on their taste. As long as you have enough rudder to move the back end of the airplane, I don't feel that it really matters. Although some will disagree, I think that the LAR (looks about right) theory really comes into play here.

One thing to think about is the size of the stabilizer root and where you plan to mount the stabilizer. If you are thinking of a T-tail, you need to think about a platform for the stab to be mounted at the top of the fin. And if you are thinking of a V-tail all you are worried about is a platform for the stab mounts along the fuselage top. All these items must be considered while you are designing the fuse.

So we have our fuselage designed and now a complete sailplane. As I stated at the start of this series, I wanted to give some general ideas and considerations. This is not intended to be the end-all in design criteria, just some ideas to think about. If you have gotten serious about designing, go back and look at Jerry Slates' series of articles on building molds and get after the fuselage. The wing and stab are easy enough, so you are almost there.

Happy designing. ■

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Bubb's Feast

Had a real productive night last night. Billy Bob and I bagged three opossums. I figured that I best get on the outback and clean my quarry. For you city folks, quarry is game or the animals you have hunted or killed.

There I was, sitting on a wooden box, in the process of skinning and cleaning Sunday's entree. As I sat there, I remember thinking that it sure was too windy to fly; all of a sudden I caught a glimpse of a bird flying by at a high rate of speed. I turned my head to see what kind of bird it was.

It was a buzzard! He just swirled around into the wind and automatically went into a point like a quail dog pointing at a quail. Then he flew straight to the left over the remains of my cleaning process. I said, "Help yourself." He said, "I don't mind if I do," as he studied his new found dinner. As I kept on cleaning my kill, I got to thinkin' that this here master thermaller might be able to share some tips on thermals and how to find them. But, being the gentleman that I am, I didn't want to interrupt him as he ate. Aw, the heck, I thought, and started with some small talk.

"Hey, was that you out strolling and thermalling over the trailer park yesterday? You know, it was a good day for it." After a few minutes and another bite, he looked up and said, "The name is Bubb and, no, that was not me. That was my lazy brother-in-law. He is a fair weather flier. Now for myself, I like it fast and breezy, like today."

I said, "Oh. Well isn't it hard to thermal on windy days?" He replied, "Yep," and continued cleaning his beak. Smacking quite loud, he said, "You sure ask a lot of questions."

He continued with, "Listen real good boy, cause I don't like to repeat myself. Now, as for yesterday, that weren't no big deal. For you see, all that my fat, big-winged brother-in-law had to do was wait 'til the sun got a little high in the sky. Why, he just sits in the top of them pine trees and waits 'til his face is warmed by the morning sun. When that takes place, he jumps out of the tree and flaps them wings as little as possible. Yea, he'll stretch out them big lumbering wings and just float around 'til he hits the up elevator. That will take him to his next meal. Anyhow, just why would you want to know about the heavenlyward flow of air?"

I noticed that his pile of remains was gettin' low, so I tossed him some more, and answered, "Bubb, I like to play around with model gliders."

"Now wait a minute, " he said. "You wouldn't have anything to do with them wooden, faceless birds, would you?"

"Uh, yea," I replied. "We call them R/C gliders. Beings how you and I both have the same interest in that warm, invisible, upward flowing air that can carry birds as well as planes, I thought that maybe you could tell me how to find more thermals."

"Boy, you forget one thing," he replied. "I fly to survive; you do it for the sport. Now, I can't say that I don't have a good time, for I do. But I don't know if I can help someone like you. I mean, look at yourself. You look like you would get lost in the daylight. You see, I don't have to second guess myself on what I'll do next. It just comes natural. Yea, there are things to watch for, like constant flow of air moving in one direction during the day. But from time to time, the air might slow down and even change its direction for just a moment. This is a sign that the thermal has just broken away from the ground and that it will pull the air from around and into itself, the thermal, making the wind direction change as much as ninety degrees either to your left or right."

Taking a breath, he continued, "When I am flying upwind and the wind flow changes direction from straight ahead to left moving right, I automatically know that the thermal is on my right. Now, ifin I need some altitude, I will ease over to my right and sniff out the best part of that there, up going, elevator. One thing you need to know is that for every updraft, there are many more down drafts. They give you that sinking feeling. But fear not! For myself, I just put my nose over and push through it, until I find the hot spot."

"One thing, boy, I must consider for you is that you can't feel what I, or the wooden bird, feel, standin' on the ground and all. The best I can tell you is that you will have to try and feel or see what I see. You will have to try and read the wooden bird by the way it moves and what it is trying to show you. Also, you will have to use your ground and element readings and transfer them to the wooden bird. You will have to look for airborne insects, spider webs floating in the air, and tree leaves shaking on the limbs."

"Another thing I feel for is warm air moving across my body, soon followed by cooler air. This will tell me that the thermal has just moved through. Another way to detect that a thermal has just passed through is that the wind will pick up above its normal flow. Meaning, the thermal is downwind, and that the sped up air is feeding to the thermal behind you. Now, you must be careful, because when you fly downwind to the lift, you will probably be flying through sink. If you don't find the thermal, you will need to come back. Be careful, for you will be coming back in down air, which might cause you to have to take a perch in one of them tall pines. For myself, I don't mind the rest."

He suddenly yelled, "Hey, Boy! What are ya'll goin' to do with the neck bone?"

I replied, "Bubb, the name is Cornfed."

"Oh," he said. "But what about the neck bone?"

"You can have it, Bubb. You know, there have been times when my plane just seemed to come down, no matter where I traveled above the field. What was the deal there?"

Bubb said, "Uh," as he swallowed some neck bone. "Well, the air probably got real still. Right?"

"Yeah," I answered.

"What happened, boy, was that the air out in front was feeding a thermal way out in front. It feels kinda like if you move with the wind. It doesn't feel like the wind is blowing much at all until you stop. So, what I am saying is that wind is moving upwind, and you will need to fly the wooden bird as far out in front as possible, until you reach the lift."

"One thing for sure, boy," he continued, "I did not become a master thermaller over night. It took much trial and error and a lot of hungry nights. With much practice, it has paid off. Today, I eat. Cornfed, you sure throw down a mighty good meal," I heard him say as the screen door slammed. You know, I didn't have the heart to tell him that all he got was leftovers. But, what the heck. What he didn't know wouldn't hurt him.

For us thermal searching glider flyers, what we don't know does hurt us, because all we can do is go up and come

down, if we don't plan and try to have a good idea of where the thermal might be, before we fly. Our flights will each be a flight of "take what you get by chance" when we come off tow, if we don't have a plan.

By the way, Bubb did tell me, before we parted company, that he would be back to tell me why he liked windy weather flying.

Signing Off,
Cornfed.

P.S. Say your prayers and get the lawn mower ready for spring.

ATTENTION: Dave Thornburg of Albuquerque, New Mexico. I'll have to agree with you. I had no idea that them buzzards were so ugly up close. ■

Aerobatic Slope Planes The Bob Series (B1 to B9)

...by Bob Dunsire
Pleasanton, California

As each of us with an interest in precision aerobatics on the slope soon discovers, a glider kit offered for true aerobatics is very difficult to find. (I can hear the screams.) If you want a glider with which to perform precision aerobatics, it is best (in my opinion) to think that you are on your own and that you must design and built it yourself.

I'm not trying to start an argument; I am well aware of many kits stating they are fully aerobatic. (In fact, I have purchased many of them, so I have a 'hands on' frame of reference.) I'm not trying to present myself as an aerobatic snob; I have found very few gliders that are not fun to fly in their own way. (I currently have more than 20 gliders, which include F3B, Thermal, Slope Racers, Electric, Slope play things, Hand launch, slope combat, strange stuff, fun experiments, and the Bob series - my attempts to find precision aerobatics for the slope.) I simply feel that there are no kits available designed to allow precision slope aerobatics.

Precision aerobatics?

I was a pattern flyer in my first R/C life (during the 1970's). After a 12 year hiatus, I returned to R/C in 1991 and decided to start on the slope because it was the one thing R/C I had not done. (I had flown power; I had flown helicopters; I had raced R/C cars; I had tried boats.) Today, I am still dedicated to gliders; every one of my planes is a glider of some form.

After about 6 months on the slope, my skills had reached the point where I wanted to combine pattern type flying with slope flying. This was quite simply what I was looking for: a pattern plane for the slope. As my B series has evolved (along with my slope aerobatic skills), I have learned we can (on the slope) perform some very unique aerobatic moves, and slope pattern can consist of not only most existing pattern maneuvers, but it can also involve many unique (and impressive) slope only moves. (I'll describe some of these in a later article - if there is interest.)

Aerobatic slope planes?

In my view there are a few obvious tests to meet this standard:

Does is have three axis control?

You can't do advanced spins without a rudder; you can't do advanced tumbling moves without a rudder; rolls and/or point turns don't look quite the same without a rudder; and stall turns? (There is more but this illustrates my point.)

Yes indeed, my first complaint with many 'so called' aerobatic gliders, is that many of them do not even have a rudder.

My second complaint centers on the size of the rudder when one is present. Many unpowered aerobatic moves involving a rudder require massive control authority to make up for the lack of prop wash. I have yet to see a slope aerobatic plane with what I consider to be an adequate rudder.

Does is have a symmetrical (or nearly symmetrical) airfoil?

Inverted moves should be identical to 'normal'. If your airfoil is not symmetrical you are probably forced to compromise many inverted moves.

Of my 9, B series planes, 3 use fully symmetrical airfoils, 6 do not. I mention that to point out that I do understand why one may not want symmetrical, but it does present a compromise. B9 is the best of the series, and B9 has a fully symmetrical airfoil.

In my later B series planes, I've taken advantage of computer mixing to get camber changing through mixing of aileron (flap) to elevator. There is a fun mixing thing I've done on B9:

> My inverted camber changing (It looks like reflex if right side up.), is set up so that my most efficient light air attitude is inverted; if the lift backs off and I need to 'milk it', I roll inverted to wait for greater lift - a 'show off' but low risk move.

Does it have control surface proportions that are larger than you have seen before?

Too many glider kits are simply designed based upon power kits. Power planes have the advantage of a prop to push air over the tail at low flight speed, and the motor also can compensate for the drag caused by little ailerons sticking up into the airstream. Our slope planes do not have these advantages. If your control surfaces are the 'standard size', you compromise much; small ailerons mean slower rolls rates and/or a loss of flying efficiency during some moves; small elevators and rudders means limited efficiency at low rates of speed; many near stall type maneuvers are limited, like 'stall' turns, and low entry speed snap rolls (like my favorite slope only snap - the landing flair snap roll), are not clean, or pretty, or even possible in many cases.

Does it have an absolutely neutral stability?

To me, precise means you have complete control over everything the plane does; the plane can't have good, or bad habits; it must be absolutely neutral. Most aspects of design, combined with proper set up, will determine this. If you can take your hands off the controls for more than a very brief moment, you don't have the type of response and control I think you need. If your plane recovers (without your input) from air turbulence, then you have some stability, which makes for friendly, easy to fly planes, but takes away from aerobatics.

Does it have spectacular control response?

In a vertical dive, can you count the rate of roll? If you have large control surfaces, an absolutely neutral stability, and large control authority (all required for the aerobatic maneuvers I love), then you get a vertical dive roll rate that is truly impressive - 3 or more a second. We can't count them, and we have tried. (This is not a fun maneuver for me to do, because I completely lose orientation to the plane, and for me this is very uncomfortable).

I realize, with some of the new kits trying to capture the aerobatic nuts like me, there may be gliders now available that may meet my standards for aerobatics - I'm just not familiar with them, and I've had a lot of fun over the past 3 years with my Bob series. (When you show up at the slope with a new plane, they ask, '"What is it?" And then, "What is it called?" I didn't consider this question in advance, so I said, "B1, B2, etc. Now, I'm at B9...)

Design your own plane?

An intimidating thought? It was to me at

first. However, with the right attitude (don't be afraid), a little experience, and a little confidence, it is not impossible. You will learn a great deal, and you will have a new type of 'fun'. Trust me - this will be good for you..

I have averaged completing a plane a month for the past 3 years, and very few kit planes stay unmodified. I'm always trying to improve flight characteristics, and to learn the impact of changes. I have experimented with everything:

- Alternate wings - to try different airfoils, different control proportions.
- Alternate tail feathers - changing from full flying stabs to conventional, trying proportions changes.
- Alternate fuselage - to understand the impact of longer/short tail moments, trying for weight reductions.
- Experiments with CG location. Have you ever flown with the balance point at more than 50% of MAC? I have. It is very interesting!

My experiments continue to this day, and a new slope plane (although I seldom buy slope kits anymore) undergoes changes before I put them in the air. I leave my thermal planes alone; I feel I understand the slope and flight needs there, but thermal is a different world, and it seems to me the kit thermal planes are usually very good for thermal flying.

One result of my experiments has been a series of planes of my own design. I have done research (read A LOT), and experimented with many kit planes, and used that knowledge as a starting point to then design and build my own planes.

The Bob Series
A steep learning curve

B1

Designed around an airfoil, I didn't worry about the other 'little details'. I learned:

The other little details are very important.

I could design and scratch build a wing, and it would fly.

B2

I spent three months doing research and designing B2, before I started construction. It was truly intended to be a pattern plane for the slope, and except for control surfaces (which were quite large), it looked just like a modern day, large pattern plane (without an engine). It took me nearly two months to construct, and five months of effort, before the initial flight. Whew, this was a lot of work. This pattern plane flew quite well, but it never did the acrobatic moves in the way I wanted. I learned:

A long tail moment resulted in slow, looping type moves.

With large fuselage sides, it acted much more like a weathervane than I wanted. (I wanted long duration point rolls, and knife edge flight.)

With the overall large size, every maneuver appeared to be an effort, and all moves were slower than I wanted.

About conventional vs. flying horizontal stabilizers, and the impact of various tail proportions.

This plane design task was not going be easy.

B2 flew for about 3 months, during which time I learned a lot, and then I retired the fuselage.

B3

My first attempt at pod and boom construction, I learned:

One way to not do pod and boom construction.

B4

B4 was my 'proof of concept' plane. One day, in really high winds, I had an Anabat fold up and die. (In 40+ mph winds you have to really hold tightly onto your plane as you prepare to launch it. Yep, it died while I was holding onto it.) There were some things that I liked about the Anabat, so on the drive home I designed B4 in my head. Arriving home, I did some sketches, and started cutting and gluing. Eight hours later, B4 was ready for flight. This was similar to an Anabat in proportions, with a symmetrical airfoil, but low wing, all built from balsa, and with a rudder (actually I put rudders on my Anabats). I learned:

About strength requirements for fuselages, stress points and the like.

Really large control surfaces were a lot of fun.

Really large proportioned tail surfaces were fun, too.

There is such a thing as too light on the slope.

B5

B5 was based on B4, with a 36" wingspan. It was much cleaner in design, and much stronger. It had the same low wing, and the same symmetrical airfoil [That Looks About Right (TLAR)], with slightly changed control throw proportions. This plane flew for more than a year before I retired it. This was my first really good plane; it was the first time I had people asking me what kit it was, and then asking if I was going to kit it. (Never my plan or intent - even today. There is a thrill in flying something of my own design and construction, and I have no desire to turn this into something commercial.) I learned:

About the compromises in using fully symmetrical airfoils (limited in light air, interesting stalls).

Built up, low wing slope plane wings take lots of abuse on landings, and the advantages of low wing didn't compensate for the landing dings to low wing.

Dialing in control throws without using a computer radio is very time consuming.

A single servo for ailerons also complicates setup.

B6

By this time, I was confident of my control proportions, and I understood the effect of various proportional alternatives. I decided something larger and heavier was needed, and I needed an airfoil that provided some lift. (I figured I could use my computer radio mixing to help inverted flight.) Symmetrical was neat, but I wanted more. I chose a HQ1.0 7%, based on advise from another slope plane designer. I learned:

Relying on others for airfoil selection is a mistake.

A great deal about tail feather design and construction. I chose a split elevator, and the setup of this ended up being quite complicated (bad design).

My ideal mix of horizontal stabilizer to elevator proportions.

B7

I had never completely given up on the idea of large plane aerobatics. This was my first two piece wing, about 80" wing span, using my newest aerobatic control surface proportions. This is a very large aerobatic plane, with a very thick and unique airfoil, and I still fly it. Being large, it is slower to respond than the little planes, but with its massive control surfaces, it is surprisingly agile. (The ailerons of B7 are nearly the same surface area as the complete wing of an Anabat!) I learned:

Two piece wings are a lot of work, but my design and construction have survived the test.

My control proportions work, even on large planes.

Large size means higher weight, means more inertia, means additional maneuvers... (Oh, boy!)

B8

From a couple of my other slope plane, I fell in love with the RG15 airfoil. So, I decided to scale down B7 to a 48" wingspan, and use an RG15 airfoil. The first version of B8 was a pod and boom to test the wing. (From other scratch built planes, I thought I had learned how to build pod and boom.) The wing's performance was unknown, because the pod and boom were a disaster looking to happen; there was flex in the boom limited control. It was a thrill!. I used the same proportions to build a new fuselage, and B8 flew for a year. I was very pleased with this 48" plane, but I was not happy with the aerobatic performance of the RG15. I learned:

Another way to not do pod and boom construction.

Arrowshaft for pod and boom construction should be limited to light, and small planes.

Control throws for my control surface proportions.

B9

B9 is identical in proportions to B8, and the first of my B series that did not involve some major experiments in proportions. Through 3 years of evolution, I am now quite comfortable with my control surface proportions and the throws needed for my style of aerobatic flight. In addition, after many 'tests', I am now much better in designing, and in building techniques. B9 is the first of my B series to use a 'mass produced' fuse. (It is pretty.) B9 has a symmetrical airfoil, large control surfaces, and my standard 'lots' of control throw. (Since B6, all of my B series use one of my computer radios. While the only mixing I use is aileron drop/raise to elevator, I do find the travel adjustments to be really precise and easy to set with the computer radio.)

Some of B9's specifications:

Wing: 48" span, fully symmetrical, based on a Ritz top profile (384 sq. in.), white foam, glass, carbon fiber under obechi

Cord: 9" at center to 7" at tip. Double taper - even.

Ailerons: 18" by 3" - lots of throw (1.25" up and down) - 108 sq. in.

Horizontal stabilizer and elevator: 25% of wing area, 40% control surface. Balsa sheeting around carbon fiber. (This is reasonably light, and incredibly strong.)

Vertical stabilizer and rudder: 15% of wing area, 50% control surface. Again, balsa sheeting around carbon fiber.

Wing trailing edge to horizontal stabilizer leading edge: 175% of cord at root. (Just short of 16".)

Balance point: started at 33% MAC and moved back a bit. Most symmetrical foils have a gentle stall, in my experience. (And I know ugly stalls. My 7003 F3B Eagle... But that is another story.)

Weight: 32 oz., which gives a 12 oz. wing loading. A bit higher loading than I'd like, but reasonable. (This comes from the fuselage design; nose is relatively short, so I've had to add 6 oz. of lead to balance. I could lighten the tail, but my carbon fiber in balsa sandwich has proven to be very strong, and is not too heavy.)

I tend to view the proportions in this manner, relative to each other. Throughout the B Series I have been experimenting and paying attention to the results. What I report here is the results of nearly three years of effort.

If you're interested in precision aerobatic planes, and like challenges, design your own, build it, and have fun. I certainly am.

A post script:

The day after I wrote this I had a flying experience with B9 that summarizes one of the pleasures of designing and flying aerobatic planes. A good flying friend had been away from the slope for nearly 6 months, and he also designs planes. (They are limited production local kits.) He followed me out to the slope to watch my new plane fly. In winds gusting from 15 to 40 mph, he stood at my side shouting maneuvers, which I then tried to perform.

'Let's see a snap roll!'

'How about an outside snap roll?'

'OK, inverted snap roll!'

'OK, inverted, double snap!' He was then satisfied; B9 is a snap rolling fool.

'Loop!'

'Inverted loop!'

'Outside loop!'

'Outside loop turn around!' Yep, it loops, too.

'Spin!'

'Inverted spin!'

'Stall turn!'

'With inverted pull out!'

'With inverted entry!'

'Four point roll!'

At this point he said, "With a good pilot this might be a good plane." I think he liked it...

'Inverted low on the ridge, full rudder, what will it do?'

I had no idea, so I tried. With the gusty winds, and the reality of a low altitude new move, I came to my senses. I bailed on the move, and told him I'd try it when conditions were a bit more controlled.

It was a great few minutes, and I think it could be a fun aerobatic contest format; the moves are called, then executed, and no pre-plan. ■

WRAM 1995

This year, the WRAM Show was much busier than last year, and the crowd seemed to be upbeat. Certainly, the weather helped. Last year, there was a major snow storm the day the show opened. This year, the weather was very mild. There also seemed to be more people spending money with the vendors this year.

As with most shows, there are just too many displays to list and describe. But a few of the displays are shown here so as to give you an idea of who was there.

If you ever get the chance to go to a model show, DO IT! You get to meet the people involved in the sport, and get to see all the latest products.

Good Flying! ■

Aerospace Composite Products
George Sparr

SIG - LeRoy Satterlee

Hobby Lobby, Jim Martin

MODELAIR - TECH
(L) Tom Hunt, (R) Bob Aberle

Main Floor

Airtronics
(L) Larry Lloyd, (R) Tim Renaud

SR Batteries, Larry Sribnick

JR, Mike Stokes

Dyna Flite, Mark Smith

Avenger by Mark Allen

Davey Systems

Slegers International
Cheryl Slegers &
Brian Agnew

on the Wing

B²

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Olalla, Washington
98359-0975

Alfons Rieger's Nurflügelprofils

Alfons Rieger's tailless sailplanes have appeared in "Faszination Nurflügel," and *Flüg- und Modelltechnik* and *Aufwind* magazines. These models, of the numbered "Sirius" series, are all of plank planform and designed primarily for slope flying.

In an effort to achieve incremental performance improvements, Mr. Rieger has taken to designing his own reflexed airfoil sections. The AR 193-S75 is based on the Eppler 193, while the AR 2411-S77 was initially based on the Eppler 205. The AR 2610-S80 is entirely of Mr. Rieger's own design. All three sections have been used successfully. Despite their thickness, they exhibit relatively low drag at Reynolds numbers of 150,000 and above, and are capable of producing large amounts of lift with good stall characteristics.

The aft portion of each section's camber line has been reflexed to achieve a substantial positive pitching moment. The crossover point is at the percent chord denoted by the number following the "S." Zero lift angles, moment coefficients, percent camber and percent thickness for each section are noted within the included data table.

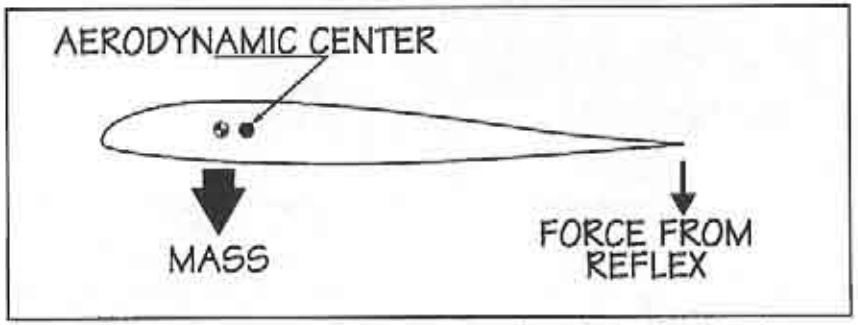
The camber line of most "self-righting" airfoils is of an "S" shape. For dynamic stability, the center of gravity must be forward of the mean aerodynamic chord (MAC), and the reflexed portion of the airfoil must provide sufficient downforce for the airfoil's pitching moment to be positive.

While the amount of reflex camber has a direct effect upon the pitching moment, the shape of the camber line ahead of the crossover point is important as well. If the goal is to modify a conventional section to achieve a specific pitching moment, a highly cambered section will require more reflex than a symmetrical section.

The usual practice when designing sections for plank planforms has been to place the crossover point at 75% chord. Fully 25% of the section's chord is then devoted to overcoming the

	AR 193-S75	AR 2411-S77	AR 2610-S80
$a_{l=0}$	1.068°	0.11°*	-0.15°
C_m	0.058	0.027*	0.026
camber	2.47%	2.33%	2.57%
thickness	10.23%	10.82%	10.0%

* = datum determined via Walt Lounsbery's computer program, SoarTech 1.



strong negative moment generated by the forward portion of the camber line.

When the crossover point is moved back to the 80% chord point, the percent camber of the reflexed portion of the section will need to be much greater if the pitching moment is to be held constant. Such sharp changes in the camber line are not usually desirable, as the surface develops sharp curvatures and the possibilities for flow separation increase dramatically. As can be imagined, flow separation over any part of the stabilizing portion of the airfoil will most likely lead to disaster.

There are instances, however, where strong positive pitching moments are not required, or where the forward camber is low enough that not much reflex is required to achieve the needed pitching moment. In these cases, the crossover point can be safely moved rearward and the camber of the reflexed portion reduced to maintain a smooth camber line. Reducing the reflex usually lowers section drag.

These three sections demonstrate how the camber line reflex point and the amount of camber in the reflexed portion of the section can be adjusted to provide a required moment coefficient without unnecessarily increasing drag.

The camber line of the AR 193-S75 (C_m = +0.058) crosses the mean chord line at 75% chord, while the camber line of the AR 2411-S77 crosses the mean chord line at 77% chord (C_m = +0.027). The camber line crossover point of the AR 2610-S80, on the other hand, is at 80% chord, and its positive pitching moment is lower still (C_m = +0.026). It should be noted that the AR 2610-S80 would not usually be considered for use on a plank planform, yet Alfons has used it as the sole section for his Sirius 90 which performs extremely well.

Reflexed sections with large amounts of camber may sometimes benefit from artificial turbulation — at about 10 to 15% chord on the upper surface, and just forward of the crossover point on the lower surface. Sections such as the three described here, designed for the relatively high Reynolds numbers of slope flying (Re_{min} = 150,000), may

AR 193-S75			
X upper	Y upper	X lower	Y lower
0.465	0.901	0.465	0.901
1.344	1.699	0.026	0.189
2.652	2.528	0.129	-0.379
4.383	3.356	0.819	-0.862
6.525	4.157	2.044	-1.312
9.061	4.910	3.791	-1.699
11.967	5.600	6.049	-2.019
15.218	6.215	8.801	-2.270
18.780	6.724	12.026	-2.453
22.620	7.131	15.697	-2.576
26.696	7.418	19.778	-2.646
30.967	7.566	24.227	-2.672
35.402	7.550	28.998	-2.665
39.979	7.363	34.035	-2.636
44.673	7.005	39.280	-2.593
49.458	6.485	44.672	-2.547
54.306	5.824	50.145	-2.504
59.186	5.052	55.630	-2.472
64.052	4.265	61.059	-2.454
68.839	3.286	66.364	-2.452
73.484	2.462	71.479	-2.468
77.923	1.675	76.339	-2.431
82.096	1.023	80.882	-2.315
85.945	0.625	85.050	-2.171
89414	0.398	88.788	-1.884
92.452	0.227	92.048	-1.553
95.023	0.113	94.794	-1.165
97.108	0.018	97.003	-0.773
98.674	0.007	98.640	-0.455
99.661	0.000	99.655	-0.277
100.000	0.000	100.000	0.000

AR 2411-S77			
X upper	Y upper	X lower	Y lower
0.000	0.000	0.000	0.000
0.5	1.042	0.5	-0.736
1.25	1.710	1.25	-1.209
1.7	2.035	1.7	-1.410
2.5	2.510	2.5	-1.676
3.5	3.020	3.5	-1.920
5.0	3.685	5.0	-2.193
6.7	4.350	6.7	-2.415
7.5	4.636	7.5	-2.500
10	5.408	10	-2.715
15	6.553	15	-2.977
20	7.280	20	-3.080
25	7.670	25	-3.100
30	7.816	30	-3.050
37.06	7.637	37.06	-2.925
40	7.430	40	-2.875
50	6.351	50	-2.737
60	4.900	60	-2.587
70	3.314	70	-2.432
75	2.534	75	-2.350
80	1.829	80	-2.208
85.3	1.180	85.3	-1.990
90	0.700	90	-1.683
93.3	0.430	93.3	-1.323
95	0.312	95	-1.073
98.3	0.126	98.3	-0.425
100	0.000	100	0.000

AR 2610-S80			
X upper	Y upper	X lower	Y lower
0.0	0.0	0.0	0.0
1.25	1.73	1.25	-1.035
2.5	2.58	2.5	-1.265
5.0	3.925	5.0	-1.535
7.5	4.955	7.5	-1.715
10	5.69	10	-1.85
15	6.76	15	-2.04
20	7.29	20	-2.235
30	7.55	30	-2.45
40	7.17	40	-2.51
50	6.15	50	-2.45
60	4.95	60	-2.40
70	3.65	70	-2.25
80	2.09	80	-2.09
90	0.815	90	-1.55
95	0.36	95	-0.94
100	0.10	100	-0.10

then be suitable for the thermal-duration environment.

In future columns we will discuss the design of reflexed airfoils in depth.

Questions, comments and suggestions are always welcome. B^{2}Kuhlman, P.O. Box 975, Olalla WA 98359-0975 USA.

AR 2411-S77, Personal communication, Alfons Reiger. October, 1994.

AR 2610-S80 — Ein Optimiertes Profil für Brettnurflügel, *Aufwind* June 1990 pp. 30-31. MIBA-Verlag, Werner Walter Weintötter GmbH u. Co., Schanzäckerstrasse 24-26, D-8500 Nürnberg 70, Germany.

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Nurflügelprofil AR 193-S75, *Flug- und Modelltechnik* October 1988 p. 25. Verlag für Technik und Handwerk GmbH, Postfach 2274, D-76492 Baden-Baden Germany.

Nurflügelprofile?, *Flug- und Modelltechnik* May 1988 p. 18. Verlag für Technik und Handwerk GmbH, Postfach 2274, D-76492 Baden-Baden Germany.

Simple Calculation of Airfoil Moment Coefficients, Walter Lounsbery. *SoarTech 1*, Herk Stokely, Editor. Herk Stokely, 1504 Horseshoe Circle, Virginia Beach VA 23451. ■

SOARING EAST TO WEST

with
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Ah...the smell of spring... the month of April. Spring has arrived in the Mid-South and thermals are really starting to pop. I hope your winter building projects are nearing completion and you're ready to go for a season of soaring. I'm ready to go for another column, so let's get started!

Henry Bostick, a member of the Soaring League of North Texas (known in some circles as the original FUN BUNCH) was gracious to send me a report for our club of the month feature. Alan Oliver from the MSVA club in St. Louis sent me a note that asks some relevant questions regarding design criteria as it relates to soaring east to west. Take a look at his comments and questions, and see what you think.

"There is quite a bit of discussion around our club (most clubs I imagine) regarding design. One observation we (the design coffee club) have made is that the majority of recent designs fall into a fairly narrow template. Designs with thin, straight wings, built for ground coverage seem to be everywhere. I don't want to imply these designs aren't worthy because they are. Among others, the Falcons, Eagles, and Super V's, are examples of the philosophy. Our feeling is that these planes have been designed for what we refer to as "California Lift". "California Lift" being defined as areas of big lift separated by long distances. The plane must be able to cover ground well in order to find lift and when it does it is almost certain to go up. Further, our observations tell us that in the mid-west areas of lift are closer together but not as strong. A conversation with Herk Stokley revealed that if anything, the east coast is the same, only more so. The point is, most of the designs coming out now seem to favor conditions in California. OK, I admit that when the west coast crowd comes east of the Rockies they don't exactly fall apart. Also, local fliers who fly these designs are often very successful.

"My question is this... Could east coast and mid-west fliers benefit from designs that are tailored to the area they fly? I believe the answer to this question is, "Yes!" Two-meter ships have limited range due to size constrictions. Why would you build a two-meter with a fast airfoil when you can easily search to visibility limits with a moderately fast airfoil? In my experience, two-meters suffer in light lift. Reynolds numbers, aspect ratio, span loading, etc., are all at a disadvantage in smaller planes. Instead of a two-meter with an RG 15, should we be building with a S7032 or a Clark Y? New radios make it easy to lower the camber of a high camber foil. Penetration is available for anybody who builds the capacity for ballast into their plane. Should fliers on the east coast be building with higher camber foils to make better use of light lift? I don't presume to have the answers for all these questions. However, I think the questions are valid. I would like to hear from anyone on this subject."

I would also like to hear your thoughts on this. Having spent most of my soaring life in the mid-west, and 4 years on the east coast, I think that Alan makes some relevant observations. I would certainly enjoy some "California" flying, but have yet to make it past Kansas, the <u>real</u> soaring MECCA!

Club of the Month
The Soaring League of North Texas

...by Henry Bostick

The Soaring League of North Texas is located in Dallas, Texas. Our name represents our membership area, as we have members in Tyler, Austin, Ft. Worth, and even Tulsa.

We are one of the oldest A.M.A. chartered R/C sailplane clubs west of the Mississippi River. Our membership over the last 4 or 5 years has stabilized at approximately 80 - 90, of which about half are very active, and the rest to a lesser degree!

Primary interest in the club is thermal flying, running the gamut from hand-launch, which one of our members has nicknamed "Horrible Little Gliders", out to unlimited. As with most soaring clubs, we also have members who enjoy electrics, slope, and multi-task. We are blessed with a long relationship with the local colleges and have 3 excellent flying sites within 15 minutes of most of our members. One of these sites is dedicated to our monthly "open" contests and the others to sport (fun) flying and our monthly hand-launch contest!

Several years ago we were able to negotiate the use of a landfill for our slope flying. "Mt. Trashmore" is several hundred feet in height and approximately 1/4 mile long. The city planners must have been thinking about us as it's laid out perfectly to take advantage of our prevailing north/south winds. The only negative is when the winds are out of the south the <u>AROMA</u> is not exactly Chanel #5!

Our regular monthly contest is on the 2nd Sunday and our hand-launch contest is on the 3rd Sunday of each month. Average turnout ranges from 20 - 40 contestants for our open contests, and 10 - 25 for hand-launch.

Years ago we decided the smoothest path for contests rested with the equipment. We have three <u>complete</u> self contained launch equipment trailers. We use Rahm winches and retrievers. Our set-up has evolved to the point now that when we have a problem, it's a real curiosity!

The last time we hosted the "Texas National Tournament" here in Dallas, we had 1,000 launches over 2 days with only one winch line break and one retriever line snag! The retriever was ready in about 15 minutes and the winch took about 3 minutes. We knew we had a good thing when other clubs called to inquire about our set-up.

One of the great things about this sport we enjoy so much is being able to share ideas and experiences. A number of us like to travel to out-of-town events. As Don Edberg said in his column, "Those Texas guys are going to have FUN where ever they go." *(ED. I*

Business end of trailer mounted Rahm winch and retriever. Editor ran this system at '93 TNT contest. It is a reliable, consistent, work house.

David Layne getting set to launch his Saturn at '93 TNT contest, hosted by the Soaring League of North Texas - Dallas. Gordon Jones pictured in background behind frequency clips.

David Layne sends his Saturn on its way. Gordon Jones runs trailer mounted Rahm retriever.

can sure vouch for that!) But that's what it's all about: having fun. It's a great feeling to get on the road to an out-of-town event, pull onto the local flying site and be welcomed by the host clubs' members.

So guys, if you're going to be in the Dallas area, give us a call. We would welcome the opportunity to have you come fly with us. You can reach us at the Hobby Counter, owned by club member and avid sailplane pilot, Pancho Morris. The telephone number is (214) 823-0208.

If you're looking for a great 2 day contest, give our T.N.T a shot; you won't be disappointed. This year's event will be in San Antonio and 1996 will be in Dallas.

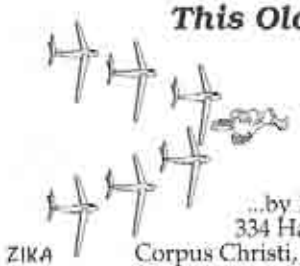
P.S. Cornfed, don't forget to bring the trophy back!

I have met many of the guys from the Dallas club and they do have fun. If you ever have the occasion to visit the area, give them a call. ED.

P.P.S You'll want to wear your boots, for more reasons than one... Right, Henry?

Thermals! ■

This Old Plane



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(512) 991-3044 (Week Days)

ZIKA

Saddle 'er up.

This column will be about a single building technique, rather than any particular plane. Many of you are already familiar with this technique, but as I travel around, someone always seems to ask how to get a nice fit of the wing to the fuselage. This tells me it is worth documenting. (Again, as I am sure it has been in print many times before.) The truth about the nice wing saddle fit, is that with my building skill, I never get a nice fit. Besides that, I always seem to build wings with a different airfoil than what a fuselage calls for. The trick is to fill the gap between the wing and the fuselage saddle when they are together, thus using the wing to shape the saddle. The technique listed here can be used for bolt-on or rubber band held wings. With a little adaptation, I use the same technique for plug-in wings, but that is another article. (Any writers to take this one up??)

The reason you want to use this technique (or some technique) to get a good fit between the wing and saddle, is that it eliminates wing wiggle. It also allows you to use a lesser amount of wing bolt, or rubber band to hold the wing securely. This allows for a better chance of a plane surviving a crash (something I need often). It also reduces drag I suppose, but the way I fly it doesn't matter.

Give credit when due, I seldom say. But this time, credit goes to Bobbie Dumas and Ray Milburn of Corpus Christi, who showed me this technique a few years ago. In fact, they are the ones who took me from built-up balsa/mono-cote gliders to carbon/kevlar/foam composite structures. My thanks.

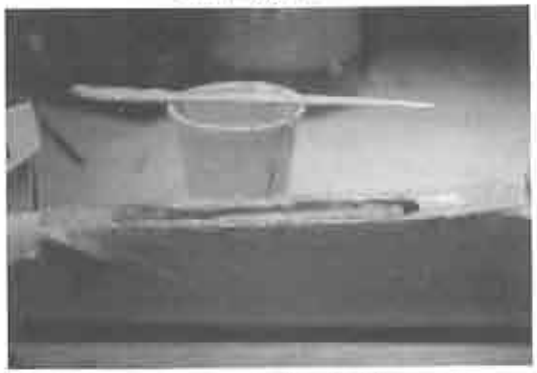
To get ready, the wing should be complete (covered/painted/whatever); the fuselage complete, but unpainted/uncovered. (I know! The pictures show the fuselage painted - I forgot! OK??)

The first step is to prepare the fuselage. If it is fiberglass, rough it up with 80 grit around the area where the wing will touch the saddle. If wood, just be sure it is clean. I like to put some masking tape around the area to mask off where I don't want the epoxy to mess things up. On some fuselages, this is the entire side of the fuse; on some I like to build a little bit of a fairing with the epoxy, so the tape is 1/4" down the sides.

Next, prepare the wing. There are quite a few techniques here. Some people use shipping tape to keep the epoxy from sticking to the wing. I find the tape sometimes peels up my paint. (I could do it before painting, but that would be smart.) I also find it hard to pull the epoxy from the tape. (Read - get the darn thing apart again.) What others prefer to use, since it is real easy, cheap, and comes apart well, is regular old kitchen cling wrap (i.e., Saran wrap). The drawback is that it always seems to wrinkle a bit, so there will be small creases in the otherwise perfect fit. But then, I have never built a plane and flown it without dinging it in some way before flight. (The perfect plane eludes me.) I now prefer to use the shipping tape method, and put a coat of wax on the tape for easier release. The pictures show using the cling wrap as it shows up better in pictures due to using masking tape to hold it out flat and snug. For monocoat covered wings, the cling wrap is a good idea, as it releases so easy. In this case, the servos are already in the wing, so extra care must be taken not to epoxy the wires in the fuselage. (Trust

After the wing was removed and before sanding the flash off. Note the wrinkles from the cling wrap!

The wing prepared.



Wet epoxy in place. Colloidal silica used in this example.

me, you don't want to do this!) The steps for this procedure are as follows:

1) Prepare the saddle area by sanding rough for good adhesion.

2) Cover the wing with a protective surface, either waxed tape or the cling wrap, as shown.

3) Protect the fuselage with masking tape to prevent a mess (especially if already painted/covered).

4) Be sure the wing fits as desired; the screws/dowels/bands are handy for attaching the wing; a trial fit would be a good idea.

5) Using a slow set epoxy, mix up a batch, and add fairing compound, or if none available, micro balloons. You want a mixture a little wetter than peanut butter; it should blob (become smooth surfaced when a chunk is cut in half), but not run. I use my laminating epoxy, but I suppose hobby store 2 hour would work. You can't add enough fairing compound to 30 minute epoxy to lighten it up, or get a real smooth sandable mixture.

6) Slobber it on extremely carefully; try to build up the correct amount for the gap you have already closely observed in the trial fit. Keep it away from trouble areas like the wing dowels, or screw holddowns. Would have been a good idea to put some wax on these components, but it is too late now. Use a gloved finger, either wet, or better still, dipped in alcohol to smooth the joint, and wipe off the extra. Don't get too much alcohol on there, but a little on the glove finger tip will give a perfectly smooth surface. You can also work the epoxy into the gap some. Often, I have no sanding to do at all after the wing sets. Just don't work the epoxy too much.

7) Bolt/screw/hold the wing in place for X hours until the epoxy sets, pull the wing off and sand till you smile.

Good luck!! ■

Kit Review

Slegers International Vulcan 2M

...by Jim Thomas
Woodinville, Washington

Mark Allen is one of today's most prolific designers. Among his more successful designs are the Falcon series and Thermal Eagle for thermal fliers, the Swifts and Nighthawk for slope racing, and the very successful F3B Eagle. Mark is arguably responsible for the current state of the art in US soaring, having pioneered the use of the Selig-designed airfoils in commercially viable soaring machines. Mark has done it again with his newest ship, the Vulcan 2M. This super little bird is available exclusively through Slegers International, Kennedy Composites and California Soaring Products.

The Vulcan 2M utilizes Michael Selig's new airfoil, the S7012, designed to combine the best of both the RG-15 and S-7003 airfoils. The ship has a one-piece wing consisting of a flat, constant chord center section with dihedral tips that are swept approximately two inches at the leading edge and one inch at the trailing edge. The center section carries a full span solid balsa spar capped with carbon fiber top and bottom. The tail is a V configuration of solid balsa surfaces. The kit consists of obechi sheeted white foam wings, a very nice epoxy glass fuselage and canopy, and all of the wood and hardware necessary to complete the kit. There were no plans, but none proved to be necessary. The instructions were detailed enough that the experienced builder will have no problems with the Vulcan. (Ed Slegers noted that updated instructions and CAD drawn plans are being prepared for the Vulcan, and will be included with the kit as soon as they are available.)

Construction of the Vulcan is very straightforward. The pre-sheeted wing only requires that the leading edges and tips be attached and shaped, the flaps and ailerons cut away and faced with basswood, and the tip sections glued to the center section and reinforced with glass cloth. Cutouts for the servos and servo wires are already in place. The wing was finished by filling the grain with thickened epoxy, then painting with Krylon brand paint after sanding smooth. The color scheme is clear on the center section, with red on the top of the tips and black on the bottom of the tips. This proved to be very visible at altitude.

The fuselage requires only five pieces of wood be epoxied in place: servo tray, tow-hook block, front and rear wing attachment plates, and the V-tail attachment plate. Installation of the two small diameter Nyrod housings completes the fuselage construction. (The tail surfaces are actuated by 1/32" music wire, not braided cable.) The fuselage was primed and painted with Krylon gloss white.

The V-tail consists of two pre-shaped balsa surfaces that are attached to a plywood plate, which has the proper angle already cut into it. The tail is reinforced with fiberglass top and bottom. The finished unit is sanded to shape and covered with any of the iron on coverings.

Set-up of the Vulcan was very easy. The wing bolts on with two 6-32 screws. After locating the wing, the holes were drilled through the wing, fuselage and attachment plates. The blind nuts sup-

plied were installed and retained with a little bit of 5 minute epoxy. The tail mounts in the same way. It is located, drilled and blind nuts installed inside the fuselage to the V-tail attachment plate. The finished airframe weighed a bit over 23 oz!

There is ample room for radio gear, though mini or micro servos are required in the wing because of its thinness. Airtronics 94141 servos were used for all six surfaces. An Airtronics 8 channel PCM receiver and 700 mah battery completed the radio installation. With everything in place, the Vulcan balanced about 1/8" aft of the recommended location. About 1/2 oz. of nose weight was required to get the CG to the desired point. The towhook was installed about 3/16" ahead of the CG; the radio was programmed to the recommendations of the manual, and it was time to fly. The Vulcan weighed in at 36.5 oz. ready to fly.

Two hard throws indicated that the Vulcan was very close to trim and ready to launch for real. Being the middle of January, it was easiest to use a heavy-duty high start for the first flights. This didn't seem to bother the Vulcan at all. With the 8-10 mph wind, this little ship got an honest 600' launch, with enough tension to zoom off to boot. After a minor amount of trim adjustment for straight and level, it was time to test the ship out.

The recommended elevator throw was a bit sensitive and was backed off. Rudder mix to aileron was increased to nearly 80% (Vision programming). Turns with coupled rudder were smooth and predictable. When the Vulcan hit lift, it reacted very well, and was quite easy to circle slowly in either tight or large circles. The stall was very gentle and straight ahead. Is this really an F3B inspired airfoil?

The next day was lovely warm (60° F) January day. There were lots of people out at the local flying field, and winches were set up. Now it was time to see how the S-7012 would launch. With lots of tension and a sharp zoom, this little rocket ship went up like it didn't believe in gravity. It topped higher than most other 2M ships have attained on their best days.

In summary, the Vulcan 2M is another success for Mark Allen and Ed Slegers. I can't wait to see what they come up with next. ■

Understanding Sailplanes

...by Martin Simons

13 Loch Street, Stepney,
South Australia 5069

Flight Without Figuring 2

Stalling

A wing generates lifting force by moving through the air at some speed. For efficient flight, lift must be generated without causing flow separation. When the flow over a wing separates, the wing is said to be **stalled**. The lifting power of a stalled wing is very poor, while its drag is very great. Flight with a fully stalled wing is practically impossible. The critical factor is the angle of attack. If the chord line of the wing is set at too great an angle to the flow, stalling results. This can be convincingly demonstrated with a very simple experiment (Figure 1).

If a piece of card, representing a wing-like surface, is held in a horizontal airstream, such as the breeze from a powerful fan, by changing its angle this way and that it will be possible to feel the various forces that arise. If the surface is held in a vertical or nearly vertical plane, the only force arising will be drag, pushing the wing in the direction of the flow. At this angle of attack, about 90 degrees,

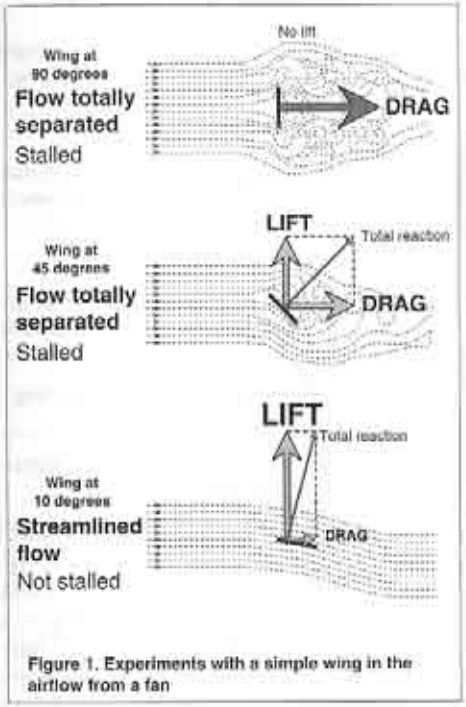


Figure 1. Experiments with a simple wing in the airflow from a fan

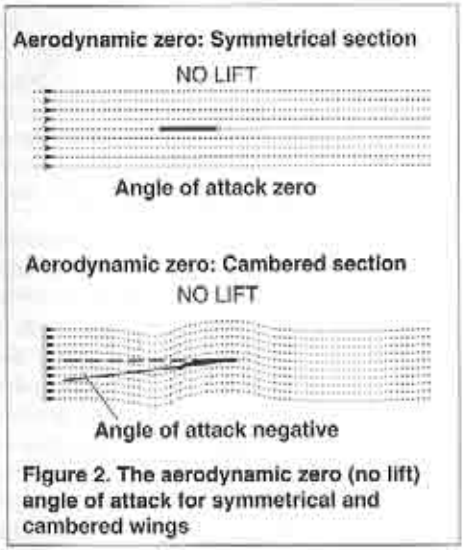


Figure 2. The aerodynamic zero (no lift) angle of attack for symmetrical and cambered wings

the flow behind the card is totally separated.

If the angle of attack is reduced to about 45 degrees, massive flow separation still occurs. The drag force will still be very large. Some upward lift will be felt but the wing is stalled.

If the angle of attack is reduced in gradual stages from this, a point will be reached where the flow becomes streamlined. The lift force will increase and the drag will become much less. The wing is unstalled. Changing the angle this way and that slightly, establishes that the wing has a definite stalling angle, which represents the upper limit of usefulness in flight.

The wing will stall at its stalling angle whatever the airspeed may be. A stall in flight can happen at any time, fast or slow, if the elevator is used too coarsely, forcing the wing to a high angle of attack. For instance, in a steep racing turn with the wings banked near the vertical, the lift force required from the wing is multiplied several times. The wing lift has to support not only the weight, but the inertia or centrifugal force generated in the turn. A turn with a bank angle of 80 degrees increases the load by nearly 6 times. (It is possible to break a wing under the strain of a steep turn, even at low airspeeds.) It is very easy to stall the wing in such a situation. Another example is when a glider is being launched by towline. The wing lift has to support not only the weight but the pull on the line, which may be several times greater than the weight of the model. If the pilot uses too much up elevator, even if the airspeed is high, a stall may result.

In aerobatics the wing may be deliberately stalled, to perform stalled turns, spins or flick rolls. In a vertical climb or dive, and in some other

manoeuvres, the wing may be held at its aerodynamic zero or pass through it for a brief moment. In normal flight, the extremes are avoided.

Aerodynamic zero

A little more experimentation with card and fan will bring the wing to a very small angle at which it produces no lift at all. There will be some slight drag. If the card is perfectly flat, this zero lift angle will be when it is perfectly in line with the airflow. If, however, the card in the experiment is given a slight camber or gentle curvature, to reach aerodynamic zero it must be held at a slight negative or leading edge down angle (Figure 2).

The angle at which no lift appears, is the **aerodynamic zero** for the wing. The aerodynamic zero angle of attack varies according to the details of the camber. If the section is a flat plate or a perfectly symmetrical form that might be used for an aeroplane fin, the aerodynamic zero will be found when the wing is geometrically at zero angle of attack. For almost all other types of section, aerodynamic zero is found when the wing is at a negative angle. For lift to be generated, the angle of attack must be more than the aerodynamic zero.

The normal limits

Two important angles have now been mentioned. At some small angle of attack, usually negative geometrically, a wing will generate no lift. This is the aerodynamic zero. At the stalling angle, the flow separates, drag increases greatly and lift is reduced, often quite suddenly. Between these two angles, the wing is capable of operating effectively, giving lift without excessive drag. These angles represent the upper and lower limits for normal flying and aircraft are designed, as a rule, to stay within these or to exceed them only occasionally. The pilot controls the angle of attack to prevent the wing reaching either its aerodynamic zero or its stalling angle, except perhaps momentarily in aerobatics.

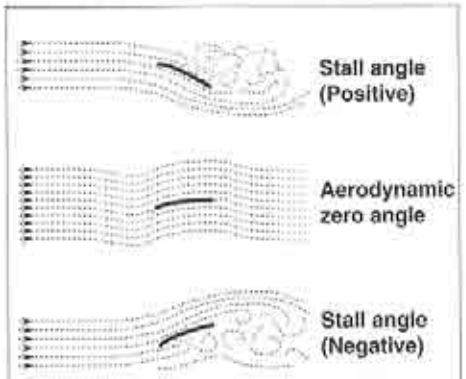


Figure 3. Positive and negative stalling angles

It is worth mentioning that if the angle of attack is reduced beyond the aerodynamic zero, the wing will produce lift in the opposite sense. This enables flight to continue upside down. The aircraft may be turned onto its back, and the elevators used to bring the wing to a sufficient (negative) angle of attack to support the weight. Again, if this angle of attack is too great, a stall will result. The wing therefore has one aerodynamic zero but two stalling angles, positive and negative (Figure 3).

How lift is generated

Air cannot pile up in one place like blown sand or snow. As the wing moves forwards it cannot push up a heap of air in front like a bulldozer. The air is fluid, it flows around, over and under, and beyond the wing. As much air must pass the trailing edge in each moment of time, as passes the leading edge. At angles of attack above aerodynamic zero, the flow above the wing has somewhat longer distance to travel before it can rejoin the general stream. In order to keep its place without lagging behind and so causing the impossible heaping up, the streamlined flow above the wing must move faster than that underneath (Figure 4).

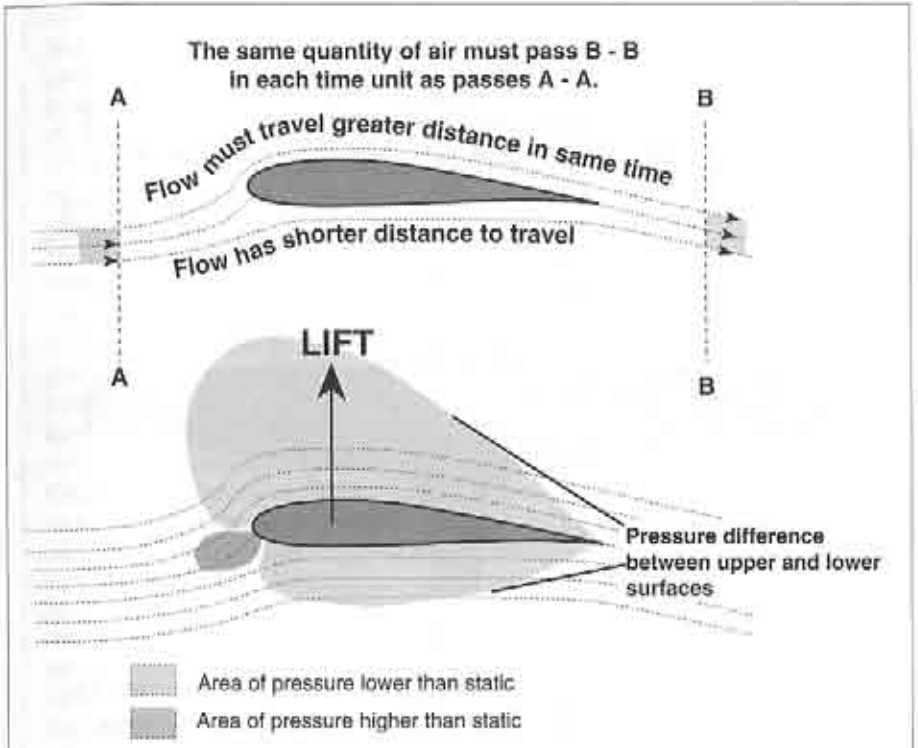


Figure 4. How lift is generated. The speed of the airflow over the upper surface of the wing is faster than that below. This creates a difference in pressure between the two sides, which creates lift.
Note. The flow under the wing usually increases in speed as well as that above so the pressure on both sides is less than the static pressure. The lift is created by the difference between the surfaces. The high pressure area at the extreme leading edge is associated with the stagnation point where the air meets the wing and divides to pass above and below.

The difference in flow speed creates a difference in air pressure between the two surfaces, low pressure above and higher pressure below the wing. This pressure difference, normally spread over the entire wing area, is the source of the lifting force.

It may seem puzzling that an increase of flow speed above the wing creates a reduction of pressure. If we stand in a strong wind, the force on our bodies is larger than in a slower airflow. But the pressure on a wing is felt, or measured, on the surface at right angles to the air motion at each place. In strong winds, when roofs are blown off buildings, it is usually the reduced pressure over them that lifts them off the walls. The roof behaves like a crude wing.

The energy in the flow has two components, one due to its speed, often called kinetic energy, and the other the pressure it exerts at each point on the surface of the wing. This is an aspect of potential energy. The flow must accelerate over the longer route above the wing, so energy has to be found to speed it up. This can only come by exchanging some of the potential, or pressure energy, for kinetic or speed energy. The power to accelerate the flow is subtracted from the pressure, which therefore is reduced. The faster the flow passing over the skin of the wing, the smaller the pressure. This

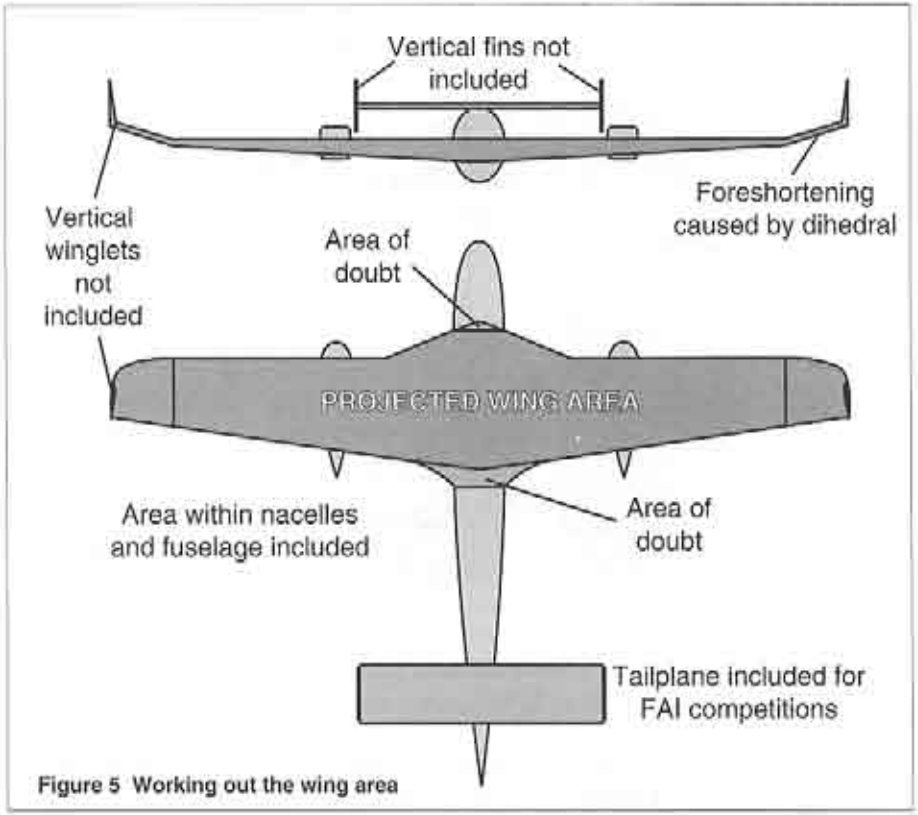


Figure 5 Working out the wing area

principle was originally discovered by Daniel Bernoulli, who worked on water flows and published his results in 1738. Bernoulli's theorem can be applied to air flow providing the speed of sound is not approached.

As the flow slows down again after the wing has gone through, its speed and hence pressure, returns to the normal or static value.

The underside of a wing is referred to as the high pressure side, but this is only relative to the upper surface. Often, the flow speed under a wing accelerates to some extent. This causes a reduction of pressure, compared with the static pressure. Useful aerodynamic lift will be produced by the wing as a whole so long as there is the required **pressure difference** between upper and lower sides.

Wing area and loading

An important relationship between wing area and mass to be lifted, is expressed as wing loading. A wing loading of 5 kg/sq m, for instance, means that each square metre of wing area is expected to carry 5 kg. of mass. A source of misunderstanding is to forget that, in modern aerodynamics, mass is measured in kilogrammes and forces such as weight, lift and drag, in Newtons. To find the lift force in Newtons required to support a model, the mass in kg must be multiplied by the gravitational factor 'g', which is 9.81. (Common domestic scales do not show Newtons weight, they read kilogrammes mass, though no-one worries about this much.)

To find the wing loading of a model aeroplane, the total mass, including any fuel or ballast, must be divided by the wing area, to give the average mass supported by each square metre of wing. A jet airliner might fly with a wing loading of 700 kg/sq m, a modern (full size) contest sailplane full of water ballast might exceed 50 kg/sq m. Model aeroplanes and gliders rarely reach 10 kg/sq m and are excluded from most competitions, and insurance policies, if this figure is exceeded.

In the FAI rule book for model aircraft, grammes and square decimetres are the units employed. A wing loading of 10 kg/sq m is 10000 grammes per 100 sq dm, which cancels down to 100 g/sq dm. Only the addition of a zero is required, or moving a decimal point one place, to convert. In the old British Imperial measures, model wing loadings are expressed in ounces per square foot. 5 Kg/sq m then becomes 16.4 oz/sq ft. Conversions are less easy with this system but a rough approximation can be made if the loading in ounces/sq ft is divided by 3.3 to give, nearly, kg/sq m.

The area of a wing is determined by viewing it in plan projection (Figure 5). If there is some dihedral or polyhedral, the projected view is slightly foreshortened. Normally this makes very little difference, but if, for instance, there are vertical winglets at the tips, they are not counted. This can lead to anomalies since winglets behave to some extent as if they were extensions of the wing in span and area.

It is not always realised by model builders that the total area of a wing includes any portions of the fuselage, or engine nacelles, that lie within the general outline. For the sake of consistency (and, often, to comply with competition rules), adherence to this convention is essential. Some small difficulties arise. An arbitrary decision may have to be made about how the lines of the wing should be carried through a wide fuselage. In special cases, long strakes at leading and trailing edges, or very large fairings, may have to be included as part of the wing.

When a professional designer refers to the wing area, it is only the area of the mainplanes that is intended. It is assumed that the tailplane, for instance, contributes negligible lift. This is nearly always good enough for practical purposes. In nearly all cases the tailplane produces a down load which adds slightly to the total lift the wing has to provide. If the layout is unorthodox, as with a tandem wing aeroplane, this does not apply and the total area is counted as part of the wing.

In this particular respect, the FAI does not follow the usual aerodynamic conventions. In model flying contests, the total area checked for compliance with the rules invariably includes all surfaces such as tailplanes, forewings and anything else that can be considered to produce useful lift. The FAI rule was introduced many decades ago when some modellers thought of using enormous tailplanes to add to the total lifting area, without counting as part of the wing. This did not really yield much, if any, advantage but it was thought to do so at the time. The rule was made to prevent such apparent cheating.

Since the FAI area includes the tail or foreplanes, the wing loading proper is always somewhat more than the FAI loading. ■

Programming The Futaba Super 7 For The RnR Genesis

A program with unique benefits for some four servo wing gliders

...by Don Whiteside
Lafayette, California

I use a Futaba 7UAFS "**Super 7**" radio (the 7UA aircraft version, NOT the 7UG glider). I bought it for the advantages of a programmable radio and to match my entry level Futaba Conquest for "buddy cord" training. It met all of my needs until I bought a RnR Genesis and wanted to program the four servo wing.

ADVANTAGES

The **Super 7** is an excellent radio. It offers great flexibility. It can be programmed to control sophisticated powered model planes, helicopters, and gliders. It's ACRO programming is terrific for slope fliers (love that SNAPROLL switch!!!). The Super 7 offers the advantages of a computer system with a variety of mixes and a four model memory, all at a fairly reasonable price.

DISADVANTAGES

The aircraft version Super 7 is NOT reputed to be a very good radio for "high performance" or "serious" Thermal Duration (TD) gliders. Futaba does sell a Glider version of the Super 7 but for a lot more money. In Northern California (and, I suspect, the rest of the country), Airtronics' Vision radios dominate the TD competition scene. The Vision is used for full trailing edge (TE) control, and with certain presets for launch, speed, etc. Rumor had it that this was impossible with a Super 7. Other Genesis owners told me that the Genesis would not perform adequately unless I could: 1) Use the flaps in conjunction with the ailerons to increase turning authority; 2) independently control the flaps to slow the plane down for landing; and, 3) camber (lower) and reflex (raise) the entire trailing edge.

CREDIT

I did not develop this program. Harry Edwards (whose writing has previously appeared in *RCSD*) deserves all the credit. I bought Harry's Genesis and he had already created this program. THANK YOU, HARRY!!! Now if I can just learn to fly the darn plane!

LIMITATIONS

I DID NOT want to buy another expensive radio. The following explanation and chart will show how to program the Super 7UAFS to perform nearly all of the necessary functions.

You won't be able to camber or reflex the entire trailing edge. I can camber the flap portion of the TE, about 50% of the span. When slightly lowering the flaps to cause this camber, I must also adjust (with the trim slider) the elevator. Why? Well, because the flaps are always mixed with the elevator to eliminate ballooning when flaps are applied for landing.

You can also use this adjustment as a "Launch" mode. To return to normal flight configuration, push the flaps up and re-center the elevator trim slider. Optionally, I've described a STAT setting for launch.

PRIORITIES

The program described addresses the highest priority for successfully flying the Genesis - the need to couple flaps with ailerons AND still use them independently for landing. It may be useful for other gliders (such as slope planes) that benefit from full span ailerons but still need separate flaps for landing. You can also program aileron differential.

If your glider turns fine using only ailerons, you can use a different setup to achieve "camber and crow". This involves a "Y" connector for the two flap servos and mixing for flaperons. With the flaperon mix, you will have to adjust differential mechanically.

HELP ON THE HORIZON

No one I know has said anything nice about Futaba's instruction manual for the Super 7. However, with time and study, it seems everyone can figure it out.

Don Edberg, columnist for *Radio Control Modeler*, and RC sailplane legend, is currently writing a book on programming the Super 7. He will include both the airplane and glider version. There will be programming examples for basic setups, programmable mixers, the fun-fly models, and sailplanes (both for the 7UA and 7UG). He hopes it will be available by April 1995, and to sell for around $10 by mail order. If the book is as well written as Don's column, Futaba would be smart to include a copy of the book with every radio they sell.

PROGRAMMING INSTRUCTIONS

I will primarily discuss the unique programming for this four servo wing setup and assume the reader understands the basics of using the Super 7. You should have the Futaba manual open when you do this! If you're brave and experienced with the Super 7, skip these instructions and go right to the table.

Plug the servo leads into the receiver as follows:

CHN 1- Left aileron
CHN 2- Elevator
CHN 3- Left flap
CHN 4- Rudder
CHN 5- Empty
CHN 6- Right flap
CHN 7-Right aileron

All of these instruction presume you are flying Mode II.

1) Go to the SEL display and choose the number to store this setup.
2) GO to the PARA display, key over to "5" and choose GLID. THIS WILL COMPLETELY RESET AND CLEAR ALL STORED PARAMETERS FOR THIS MODEL MEMORY. Don't do this later or you will wipe out any programming you have done.
3) Now, still in PARA, key over to "2" and set ATL to OFF. I'm not sure why, but this will allow you to use the trim slider over the entire stick range for your flaps.
4) Continuing in PARA, I recommend you now go to "3" and set the dual rate (D/R) COMB to "3" which will allow you to control all dual rates from the AIL D/R switch. This is optional.
5) Lastly in the PARA section, go to "4" and set the MXSW to "12". This will cause your **P. MIX** switch to control both mixes at once. Okay! Most of the scary stuff is over !

You should adjust ATV, D/R, and EXP as you prefer. Set the REV functions as necessary for correct direction of surface travel. This will depend on the brand and mounting positions of your servos. On my Genesis, using Airtronics 94141 servos, only rudder needed to be reversed. A NOTE OF CAUTION!!! In a minute I will describe the mixes and their respective percentages. If you have reversed some servos, your percentages may be PLUS "+" where mine were MINUS "-". If things are going the wrong way, try reversing servos and/or changing the "+" or "-" for the mixing "%".

6) Activate PMX 1. The MASTER is 1 and the SLAVE IS 6. (This slaves the right flap to the ailerons.) I used "-35%" up and down to have the flap move about half the aileron travel. You must adjust the "%" for both directions of travel by moving the right control stick UP, adjusting the percentage and then moving the stick DOWN and adjusting

the percentage!

7) Activate PMX 2. The MASTER IS 1 and the SLAVE is 3. (This slaves the left flap to the ailerons.) Set mix as in Step 6.

8) I've experimented with a STAT (launch) setting but it's a bit tricky. To slightly camber the trailing edge and add a bit of "back stick" elevator, you have to activate the "2>6" MIX, AND, you must also slightly lower the flap lever. (With the MIX switch in this position, the left stick will only control one flap). BE CAREFUL! If you don't return the MIX "2>6 | 6>2" switch back toward you, only one flap will lower when you pull the left (Flap) stick. BIG TROUBLE!!! Also, if you use this as your "Launch" mode, you must remember to push the flap stick full forward when you leave "Launch". See the table for the settings.

9) Activate ABRK. This is controlled by moving the MIX "6>2" switch toward you. This will allow you to use the left stick to control the flaps. I mixed "+15" on CHN 2 so that the elevator would move and compensate for ballooning when flaps are applied. This will depend on your model. CHN 6 is set to "+100%" to control the right flap. The left flap is directly controlled by the stick. Move the cursor to "3" and set to "ABRK On" to activate Linear mixing. Set the "Cut off point" at 100% (full forward stick).

10) I set the "1-4" rudder mixing to the desirable percentage and "Always on". This will vary by model.

11) Activate DIFF and set the proper up and down percentages for the ailerons. The Flaps will now follow the ailerons but you may need to go back and change the mixing percentages to get the desired travel for all surfaces.

12) Leave the FLPR inhibited. If you activate this you will erase your DIFF percentages and have to reset them.

13) The rest of the adjustments depend on your model.

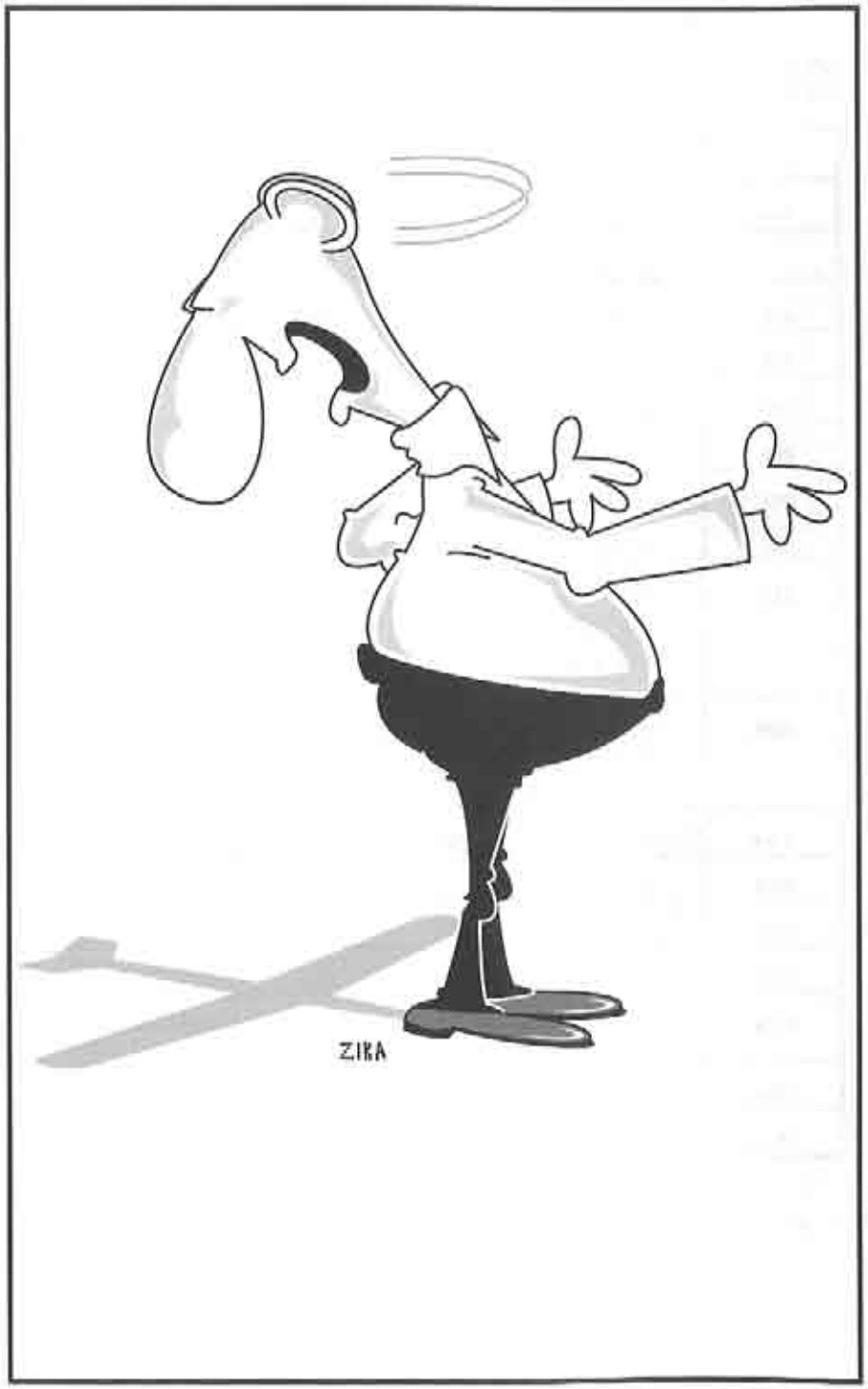
As mentioned above, this programming setup solved some specific problems for my Genesis. The Super 7 is very versatile and this program, or some variation of it, may help you with your models. Please, please, please - double check and become comfortable with the proper switch settings for this program before flying your model.

If you have questions or comments, I'd enjoy hearing from you. E-mail me at dwhiteside@aol.com. Good luck and have fun out there! ■

PROGRAMMING THE FUTABA SUPER 7 FOR A FOUR SERVO WING

CHN 1- Left aileron| CHN 2- Elevator| CHN 3- Left Flap| CHN 4- Rudder|
CHN 5- Empty| CHN 6- Right Flap| CHN 7-Right aileron

SEL	Choose the number where you will store the setup
PARA	5. GLID: 2. ATL. off; 3. COMB. 3; 4. MXSW. 12
	DO THE ABOVE BEFORE ANY OTHER SELECTIONS!!!
ATV	Adjust as necessary for your model
D/R	Use your own judgment!
EXP	Again, use your own preferences
REV	As needed, but remember this may affect slaving
PMX-1	ON, MAS=1 SLV=6, -35%, L/D and R/U
PMX-2	ON, MAS=1 SLV=3, -35%, L/D and R/U
STAT	INH, or adjust TE camber and elevator for "launch" configuration. CHN 1= "-15%" CHN 2="-12%" CHN 6= "+20%" NOTE: This will only adjust 3 of the 4 TE surfaces. You will also need to adjust the FLAP lever for launch setting.
ABRK	ON, 1=0% (You can get "Crow" ailerons here if you add mixing percentages to CHN 1. I did not do this); 2=+15% (as needed for elevator compensation when flaps are deployed); 3=On; 6=100%
1->4	Set rudder to aileron mixing for your model
DIFF	Set aileron differential for your model
FLPR	INH
VTAL	INH, or as necessary for your model
FLTR	INH, or set to ON for decreased travel control with the CHN 6 FLAP TRIM knob.
STRM	As necessary for your model
TRIM	Invoke after test flight of model if necessary



NASSA
NORTH AMERICAN SCALE SOARING ASSOCIATION

The North American Scale Soaring Association is an organization of scale soaring enthusiasts dedicated to the furtherance and enjoyment of scale soaring in North America. Membership dues are $10.00 a year or $5.00 after August 1st, and provide for sponsorship of NASSA Scale Fun Flys & Rallies, and for the implementation of a National Scale Building and Soaring Achievement Program. Join NASSA and join a network of scale soaring enthusiasts that influence the direction of scale sailplanes in North America. Please provide your address, phone #, and AMA #, and we will send you a membership card and membership roster. A bi-monthly column keeping NASSA members up to date is included in *RCSD*, with additional information available periodically direct from NASSA. Help promote and support the continuation of scale soaring by sending $10.00 (or $5.00 after Aug. 1st) to: NASSA, P.O. Box 4267, W. Richland, WA 99352.

The Vintage Sailplane Association

Soaring from the past and into the future! The **VSA** is dedicated to the preservation and flying of vintage and classic sailplanes. Members include modelers, historians, collectors, soaring veterans, and enthusiasts from around the world. Vintage sailplane meets are held each year. VSA publishes the quarterly **BUNGEE CORD** newsletter. Sample issue: $1.00. Membership is $15.00 per year. For more information, write to the:

Vintage Sailplane Association
Route 1, Box 239
Lovettsville, VA 22080

LSF

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

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

League of Silent Flight
10173 St. Joe Rd.
Ft. Wayne, IN 46835

T.W.I.T.T.

(The Wing Is The Thing)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines. Full information package including one back issue of newsletter is $2.50 US ($3.00 foreign). Subscription rates are $18.00 (US) or $22.00 (Foreign) per year for twelve issues.

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

Reference Material

Still a few copies available of some issues of the printed transcripts of talks given on RC Soaring at the Previous Annual National Sailplane Symposium. Prices reduced to clear out stock. Talks were on thermal meteorology, flying techniques, hand launch, cross country, plane design, airfoil selection, vacuum bagging, plastic coverings, flying wings, etc., etc. Send SASE or call for flyer giving details. Many copies of most recent (1992) transcript left. Clubs have found them good for raffle prizes, gifts, etc. Al Scidmore, 5013 Dorsett Drive, Madison, WI 53711; (608) 271-5500.

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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.

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!

California - California Slope Racers, John Dvorak, 1063 Glen Echo Ave., San Jose, CA 95125; (408) 259-4205.

California - Desert Union of Sailplane Thermalists, Buzz Waltz, 3390 Pasco Barbara RD, Palm Springs, CA 92262; (619) 327-1775.

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

California - South Bay Soaring Society, Mike Gervais, P.O. Box 2012, Sunnyvale, CA 94087; (408) 683-4140 after 5:00 pm.

California - Southern Calif. Soaring Action, Pete Young, 6592 Belgrave Ave., Garden Grove, CA 92645-1802; (714) 892-3473.

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

Florida - Florida Soaring Society, Ray Alonzo (President), 3903 Blue Maidencane Pl., Valrico, FL 33594; (813) 654-3075 H, (813) 681-1122 W.

Georgia - North Atlanta Soaring Association, Tim Foster, (404) 978-9498 or Tom Long, (404) 449-1968 (anytime).

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.

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.

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

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@acornbbs.com>.

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

Maryland and Northern Virginia - Capital Area Soaring Association (MD, DC, and Northern VA), Steven Lorentz (Coordinator), 12504 Circle Drive, Rockville, MD 20850; (301) 845-4386.

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.

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.

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

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

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

Northwest Soaring Society (Oregon, Washington, Idaho, Montana, Alaska, British Columbia, Alberta), Roger Breedlove (Editor), 6680 S.W. Wisteria Pl, Beaverton, OR 97005; (503) 646-1695 (H) (503) 297-7691 (O).

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

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

Tennessee - Memphis Area Soaring Society, Bob Sowder (contact), 1489 Wood Trail Circle, Cordova, TN 38018, (901) 757-3536, FAX (901) 758-1842.

Texas - Texas Soaring Conference (Texas, Oklahoma, New Mexico, Louisiana, Arkansas), Gordon Jones, 214 Sunflower Drive, Garland, Tx 75041; (214) 271-5334.

Utah - Intermountain Silent Flyers, Bob Harman, (801) 571-6406.. "Come Fly With Us!"

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

Seminars & Workshops

Free instruction for beginners on construction & flight techniques, Friday & week-ends (Excl. contest days). Bob Pairman, 3274 Kathleen St., San Jose, CA 95124; (408) 377-2115.

BBS

BBS: SLOPETECH, Southern California; (714) 525-7932, 14.4 baud - 8-N-1

BBS: South Bay Soaring Society, Northern California; (408) 281-4895, 8-N-1

Torrey Pines Gulls

Radio Control Soaring Society, Inc.

INTERNATIONAL HAND LAUNCH GLIDER FESTIVAL

Date: May 20 & 21, 1995

PRE-REGISTRATION CUT OFF: MAY 15, 1995

Place: Torrey Pines Gulls Thermal Field
West Garden Road
Poway, CA (San Diego, CA)

Times: Pilot check in - Saturday 8:00 AM
Pilot's meeting - Saturday & Sunday 8:45 AM
First Flight - Saturday & Sunday 9:00 AM

Tasks:

Saturday

Round	*Window*	*Throws*	*Objective*
1	10	unlimited	greatest number of flights with increasing times, first flight must be at least 15 sec., to receive credit for a flight it must be longer than the previously credited flight
2	10	unlimited	the most number of flights in the following sequence: :10, :20, :30, :40, :50, 1:00, 1:10, 1:20, 1:30, 1:40
3	10	unlimited	longest three flights
4	10	6	longest five flights, none over two minutes
5	7	6	one five minute
6	10	unlimited	a two minute flight, a three minute flight, a four minute flight

Sunday

Round	*Window*	*Throws*	*Objective*
7	10	unlimited	the most number of flights in the following sequence: :10, :20, :30, :40, :50, 1:00, 1:10, 1:20, 1:30, 1:40
8	10	unlimited	most flight time from increasing flights, must have at least 3 flights, first flight must be at least 15 sec., to receive credit for a flight it must be longer than the previously credited flight
9	10	unlimited	longest three flights
10	7	4	three longest flights, none over two minutes

Head to Head Round - for top ten competitors

Round	*Window*	*Throws*	*Objective*
11	6	unlimited	most number of increasing flights, first flight at least 5 sec
12	4	4	three one minute flights
13	10	4	four two minute flights

Awards: 1st - 10th, top team (3 from AMA club)

Tee Shirts: $12.00

Entry Fee: $20 Pre-Registration, $30 at Contest
non refundable

BBQ: Sat. night, $9.00, catered by Tony Roma's

Lodging: -Camping at field, no hook ups
-La Quinta Inn, $43/night, two queen beds
619 - 484 - 8800, mention contest
-Poway Country Inn, 619 - 748-6320

CD: Steven Stricklett
2376 Viewridge Place
Escondido, CA 92026
619 - 741-1037

Name _____ Phone (___) ___ - _____ AMA # _____

Address _____ Frequency 1st ____ 2nd ____ 3rd ____

City _____ State ____ Zip _____ AMA club _____

Tee Shirts: @ 12.00 each Small ___ Med ___ Lg ___ Xlg ___ XXlg ___

Dinners: @ $9.00 _____

Entry Fee	$20.00
Tee Shirts	_____
Dinners	_____
Late Fee	_____

PRE-REGISTRATION CUT OFF: MAY 15, 1995 (Make checks payable to TPG) Total Enclosed _____

Los Banos Slope Scale Soar-In

SPONSORED BY

South Bay Soaring Society in cooperation with NASSA

MODERN ▪ VINTAGE ▪ POWER SLOPE SCALE

FUN-FLY

May 5, 6 & 7, 1995

- ✈ No Scale Documentation Required
- ✈ Winches will be Provided
- ✈ Aero Towing Available
- ✈ Awards for Best Sailplane and Best P.S.S.
- ✈ Nearby Hotels and Motels
- ✈ AMA Sanctioned

At Los Banos Reservoir, Los Banos, California

Event Director: Lynsel Miller (408) 275-6403
Assistant Director: Sean Sharif (408) 258-5074

$15 Advance Registration Fee - $25 on Site Registration

Outside U.S.A.

Australia - Southern Soaring League, Inc. (SSL), 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 - Manitoba, Winnipeg MAAC Men Gliding Club, Bob Clare, 177 Tait Ave., Winnipeg, MB, R2V 0K4, Canada, (204) 334-0248.

Canada - Southern Ontario Glider Group, "Wings" Program, dedicated instructors, Fred Freeman, (416) 627-9090, or David Woodhouse (519) 821-4346.

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

Hong Kong - Robert Yan, 90 Robinson Road, 4th Floor, Hong Kong: (852) 5228083, FAX (852) 8450497.

SLOPE RACE

SIG/LASS

MIDWEST SLOPE CHALLENGE

MAY 19-21

3 Classes:
SIG Ninja
SIG Samurai
Run What You Brung

Where? Lucas, Kansas
Who? Contact Paul Wright at (402) 795-2012 or Stephen Rohman at slr@cdmasters.com

☆

HUNTSVILLE, ALABAMA June 15 - 18 1995

The MID-SOUTH SOARING CHAMPIONSHIPS

The largest four day sailplane contest in the South!

June 15 - 16
CROSS COUNTRY
Cost: $15.00 per team

June 16
HAND-LAUNCH GLIDER
Cost: $10.00 per person

June 17 - 18
THERMAL DURATION
Awards:
Expert: 1st - 5th place both days
Sportsman: 1st - 4th place both days
Novice: 1st - 3rd place both days & HIGH OVERALL
Junior: 1st - 3rd place both days
Cost: $15.00 (1 day), $25.00 (2 days)
JRS: $6.00 (1 day), $10.00 (2 days)

Due to the anticipated attendance to this event, pre-registration and payment is requested. For complete information, write or call Ron Swinehart, (205) 722-4311 (day), (205) 883-7831 (eve), Huntsville; Rob Glover, (205) 883-2988, Huntsville; Bob Sowder, (901) 757-5536, Memphis.

Show & Modeller's Mall space available on request for hobby related businesses!

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MEMPHIS AREA SOARING SOCIETY
R/C SOARING DIGEST
AMA Sanctioned

TNT COMBINE A GREAT SOARING CONTEST & A FAMILY VACATION!

2 days of Open Class, Thermal Duration
Expert & Novice

You can have TWO DAYS of Open Class competition while your family visits the sights and delights of the River Walk, and see where Travis, Bowie and Crocket stood their ground at the Alamo. Tour buses will pick up your family at the field and return them at the end of the day!

Discount Airline Tickets

Special Hotel Rates

Awards, Raffle, On Site Food & Drink

Ship us your airplane and radio! We'll have it ready at the field, and then ship it back to you.

"Out of Towners" Early Registration Raffle
Register before 15 May, and be eligible to win a double room for one night **OR** a rental car for the TNT weekend.

For a Registration Form & Vacation Planner call:
TNT Registration
(210) 658-8842
FAX (210) 554-7161

Texas National Tournament Pre-Registration
5465 Prancing Deer Dr., Bulverde, TX 78163

Schedule of Special Events

Date	Event	Location	Contact
Apr. 15	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
Apr. 23	Handlaunch	San Antonio, TX	Tom Meeks, (210) 590-3139
Apr. 23	SOAR Thermal Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
Apr. 29-30	SOAR F3B Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
Apr. 29-30	XC SOAR-IN Race	Muncie, IN	Arthur Slagle, (810) 477-2228
May 5-6*	Rosebowl Soaring Festival	Pasadena, CA	
May 5-7	Slope Scale Soar-In	Los Banos, CA	Lynsel Miller, (408) 275-6403
May 13	TPG 60" Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
May 13	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
May 14	2m Postal	Everywhere	Steen Hoej Rasmussen
May 21 (second date) - 4/95 RCSD			
May 19-21	SIG/LASS Slope Race	Lucas, KS	Paul Wright, (402) 795-2012
May 20	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
May 20	Six Rounds of Open	San Antonio, TX	Jerry Caldwell, (210) 438-4077
May 20-21	Intn'l. HLG Festival	Poway, CA	Ron Scharck, (619) 454-4900
May 20-21	Electric Fun Fly	Memphis, TN	Tom Ernst, (901) 767-9518
May 20-21	Spring Fling	Davis, CA	Joan Nolte, (916) 966-0857
May 21	SOAR Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
May 27	SASS HL 1	Redmond, WA	Jim Thomas, (206) 488-2524
May 28	TPG/SC2 Therm. Cont.	Poway, CA	George Joy, (619) 748-2167
June 3	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
June 10	TPG Unltd. Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
June 11	TPG 60" Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
June 15-18	Mid-South Champs (International Contact)	Huntsville, AL	Ron Swinehart, (205) 883-7831 Tom Ernst, (901) 767-9518
June 17	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
June 17	MAN-ON-MAN	Dayton, OH	Ken Davidson, (513) 864-1774
June 18	MAN-ON-MAN	Dayton, OH	Jerry Shape, (513) 843-5085
June 17-18	Fathers Day North/South Challenge	Visalia, CA	Ed Hipp, (209) 625-2352
June 17-18	LISF Empire State Soaring Classic	Syosset, NY Long Island	Taylor Fiederlein, (516) 922-1336
June 18	SOAR Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
June 18	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
June 23-25	SOAR Mod. F3J Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
June 24	TPG Fun-Fly & BBQ	Torrey Pines, CA	Steve Stricklett, (619) 741-1037
June 24-25	TNT Open	San Antonio, TX	Perry Van, (210) 658-8842
July 1-2	WRCC Summer Soar-In	Sedgwick County, KS	Pat McCleave, (316) 721-5647
July 1	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
July 1	TPG HLG Contest	Poway, CA	Art Markiewicz, (619) 753-3002
July 2	11th Annual HL Contest	Dayton, OH	Gale Leach, (513) 429-2543
July 8-9	Kansas Flatland Open	Kansas	Ed Kempf, (913) 780-5543
July 12-13	COGC XC Dash for Cash	Cookstown, Ontario	Jack Nunn, (707) 728-4467
July 14-16	Canadian Nationals	Barrie, Ontario	Neil Tinker, (416) 491-5823
July 15	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
July 15	Ohio Cup HL & STD	Dayton, OH	Bob Massmann, (513) 382-4612
July 16	Ohio Cup 2m & UNL	Dayton, OH	Jim Martin, (513) 376-9046
July 15	HL/Open	San Antonio, TX	Mike Howell, (210) 657-3332
July 15-16	SOAR 95 (Unl, 2M)	Redmond, WA	Jim Thomas, (206) 488-2524
July 16	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
July 21-24	Wasatch Mt. Scale/PSS Soaring Festival	Pt. of the Mt., UT	Bob Harman, (801) 571-6406
July 22-23	SWIFT/Western XC	Mead, NE	Christopher Knowles, (402) 330-5335
July 23	SOAR F3B Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
July 28-Aug. 6	NATS - Soaring	Muncie, IN	
Aug. 12-13	Thermal Grabber **	Redmond, WA	Jim Thomas, (206) 488-2524
Aug. 13	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
Aug. 19	Handlaunch	San Antonio, TX	Jerry Caldwell, (210) 438-4077
Aug. 19	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Aug. 19-20	SBSS Summer Classic	Gilroy, CA	Scott Meader, (408) 244-2368
Aug. 20	SOAR Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
Sept. 2	SASS HL 2	Redmond, WA	Joseph Conrad, (206) 630-2670
Sept. 9	TPG HLG Contest	Poway, CA	Art Markiewicz, (619) 753-3002
Sept. 9	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Sept. 9-10	13th CASA Open	Gaithersburg, MD	Steven Lorentz, (301) 845-4386
Sept. 16	2M/Open	San Antonio, TX	Gene Warner, (210) 732-3101
Sept. 16	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Sept. 17	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
Sept. 17	SOAR Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
Oct. 7	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 7-8*	Fall Soaring Festival	Visalia, CA	
Oct. 7-8	SOAR Fun Fly	Plainfield, IL	See Illinois R/C Soaring Contacts
Oct. 14	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 14	TPG Unltd. Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
Oct. 15	TPG 60" Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
Oct. 14-15	Fall Soaring Tournament	Memphis, TN	Bob Sowder, (901) 757-5536
Oct. 21-22	Canyon Lake Classic	Canyon Lake, TX	Greg Dickerson, (210) 656-1796
2M, Open, HL - Potters Creek Park			Tom Meeks, (210) 590-3139
Oct. 21	1.5m Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 22	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
Oct. 22	SOAR Contest	Plainfield, IL	See Illinois R/C Soaring Contacts
Nov. 4	TPG HLG Contest	Poway, CA	Art Markiewicz, (619) 753-3002
Nov. 5	TPG Fun-Fly & BBQ	Poway, CA	Steve Stricklett, (619) 741-1037
Nov. 5	SOAR Turkey Shoot	Plainfield, IL	See Illinois R/C Soaring Contacts
Nov. 11	TPG 60" Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
Nov. 12	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
Nov. 19	Open	San Antonio, TX	Perry Van, (210) 658-8842
Nov. 24-26	22nd Tangerine	Orlando, FL	Ed White, (407) 321-1863
Dec. 9	TPG 60" Slope Race	Torrey Pines, CA	Eric Larson, (619) 793-7640
Dec. 10	TPG Thermal Contest	Poway, CA	George Joy, (619) 748-2167
Dec. 9-10	Winter Soaring Festival	Indio, CA	Buzz Waltz, (619) 327-1775
1998	World Soaring Jamboree		

* Western States Triad
**Unlimited, 2M

18th Annual
EMPIRE STATE SOARING CLASSIC

OPEN THERMAL DURATION CONTEST

JUNE 17th and 18th

Stillwell Nature Preserve
Syosset, Long Island, N. Y.

First ESL open contest of the year.
A premier soaring site and
the top east coast flyers will attend.

For more information call:
Taylor Fiederlein
(516) 922-1336 eve. EST

A Letter of Thanks

Recently, my mother-in-law, Patricia Cox, became ill and was hospitalized. After being diagnosed with pancreatic cancer, she survived less than three weeks. Her last breaths were Tuesday, February 7th, 12:30 AM, just sixty days after she became ill.

Patricia was a better mother-in-law and friend than I could possibly describe in words.

My primary reason for writing this letter is to express my deepest appreciation for all of my friends in the soaring community. You have all been kind, caring, and thoughtful during this ordeal.

A special note of thanks to: Fred Rettig (Mobile, Alabama), Ed Slegers (Wharton, New Jersey), Tom Garing (Modesto, California), Guy Van Cleave (Modesto, California), Dave Darling (Modesto, California), Gordon Jones (Garland, Texas), Jerry & Judy Slates (Wylie, Texas), Sal Defrancisco (Williston, Vermont), Roger Hebner (Klamath Falls, Oregon), and Barry Kennedy (Flint, Texas). All of you went above and beyond, in words, if not in action.

Also, a special thanks to my customers who have waited patiently for their kits and were very sympathetic to our family.

Finally, thank you all so much for your support, and for caring.

Sincerely,

David Layne & Family

Hobby Shops that Carry *RCSD*

Action Hobbies
3723 S. Mendenhall
Memphis, TN 38115
(901) 365-2620

Air Capital Hobbies
8989 West Central
Wichita, KS 67212
(316) 721-4164

California Soaring Products
1010 North Citrus
Covina, CA 91722
(818) 966-7215

Gunnings Hobbies
550 San Anselmo Ave.
San Anselmo, CA 94960
(415) 454-3087

Gyro Hobbies
23052 Lake Forrest Dr., Unit C2
Laguna Hills, CA 92653
(714) 583-1775

HiTech Hobbys
284 - B Wellsian Way
Richland, WA 99352
(509) 943-9241

Hobbies'N Stuff
9577 I. Osuna Rd. NE
Albuquerque, NM 87111
(505) 293-1217

Hobby Counter
1909 Greenville Ave.
Dallas, TX 75206
(214) 823-0208

Hobby Town USA
8090 S. 84th St.
La Vista, NE 68128
(402) 597-1888

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

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

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Classified ads are free of charge to subscribers provided the ad is personal in nature and does not refer to a business enterprise. Classified ads that refer to a business enterprise are charged $5.00 per month and are limited to a maximum of 40 words. The deadline for receiving advertising material is the 5th day of the month. (Example: If you wish to place an ad in the March issue, it must be received by February 5th.) *RCSD* has neither the facilities or the staff to investigate advertising claims. However, please notify *RCSD* if any misrepresentation occurs.

Personal ads are run for one month and are then deleted automatically. However, if you have items that might be hard to sell, you may run the ad for two months consecutively.

For Sale - Business

GLIDER RETRACTS - high quality, 1/5, 1/4, 1/3 scale made in U.S.A. 1/4 are standard or heavy duty. Contact Bill Liscomb, 7034 Fern Place, Carlsbad, CA 92009; (619) 931-1438.

"There is always enough to do to keep me from working." One of over 670 quotes and stories by Frank Zaic in **FRANKLY SPEAKING.** $6.95 plus $1.25 postage. Model Aeronautic Publications, Box 135, Northridge, CA 91328.

PLANS - R/C Sailplans - Scale, Sport, and Electric. Old Timer, Nostalgia and FF Scale and Sport-powered, rubber and towline. All models illustrated. Formerly B⅜ Streamlines Plans Service. Catalog $2.00. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC V9B 4Z2, Canada.

FOAM CORE WINGS - high quality, 1# white bead board foam wing cores for 1/3 scale ASW 19/20. E-203 airfoil, 4 piece set. Plywood root ribs available. Contact Roy Simpson, 53260 Monterey Dr., Bristol, IN 46507; (219) 848-5973 eve.

For Sale - Business

PC-Soar Version 3.5 Sailplane Performance Evaluation Program Optional Sailplane Library now expanded to 54 models including: Alcyone, Anthem, Genesis, Mako, Probe, Thermal Eagle, and Synergy-91. Free Library Upgrades. PC-Soar Upgrade to Ver. 3.5 $10, PC-Soar New Purchase $40. New Libraries of Sailplanes and Airfoil Polars $30. Please include $3 P&H for all purchases & upgrades. Also available: *RCSD* Database and 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.

For Sale - Personal

DG-500 by Multiplex, wing servos, excellent condition... $800.00; LS-4 by Rowing, all glass, wing servos, excellent condition... $1000.00; DG-300 by Multiplex, all glass, excellent condition... $800.00; ASW -17, 3.5m, w/flaps... $275.00. Call Ray Franz @ (714) 362-5545, California.

Dodgson Designs Anthem, completely built w/servos, excellent condition... $550.00. Call Peter @ (505) 438-4847, New Mexico.

RTF Weston Magic, T-tail w/elevator, includes wing servos, rudder & elevator servos, 900 Ma battery pack & servo extension leads to receiver... $750.00; RTF Thermal Eagle, RG-15 airfoil includes wing servos and battery pack plus a set of tapered F3B-type stabs... $650.00; 1/6 scale ASW-17, fiberglass fuselage (10 oz.), light blue tint canopy... $75.00. Call or write Sal Iasilli, 75 Walnut Ave., E. Norwich, NY 11732; (516) 922-7432 (after 6:00 pm, EST).

DUCK, 2m, new, never flown, nicely built, Michigan's most successful competition sailplane... $400.00. Jim Johnston, 4300 E. Timberwood Dr., Traverse City, MI 49686; (616) 938-1272.

Banshee, pristine example, approximately 2 dozen flights logged, complete with all six servos and battery (Futaba connectors), tote (transport device)... $325.00, I'll box & pay shipping. Dave Meyers (719) 576-7379, (719) 372-6565 ext. 263.

Genesis, NIB... $289.00; Monarch '94, NIB... $99.00; WACO 7-570, incl. 4 servos... $199.00; Vertigo, mech mixer, 2-533's... $139.00; Legend fuselage, new... $39.00; Cumic fuselage & stab, excellent condition... $39.00. All items plus shipping. Jim @ (703) 356-1729 eve, VA.

Transmitter, Airtronics Vision w/ATRC upgrade by Control Systems Labs., 8 model memories, servos, 3 receivers, 2 battery packs, incl. transmitter case... $350.00 - best offer; Mariah 2m kit, NIB w/ professional construction video... $125.00. Rolf Beere, 617 Zinnia Ct., Sonoma, CA 95476; (707) 935-7705, fax (707) 939-0887.

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Gliders. All conditions considered. All gliders and parts considered, old or modern. F3B Eagle, Synergy 91 type gliders, any brand. Any 100 to 140 inch carbon fiber gliders or wings, 7037 - RG15 preferred. Scale gliders: Baby Boas, Albatross, Minimoa. ASW 20 or 25, 10 to 20 feet. Jerry Nelson KA6, 12 ft. glider or parts. Hobbie Hawk parts. Left wing, tail feathers and rudder needed. Slope gliders 60" - 130". Have 4 - 5 slope gliders for sale or trade, blue foam RG 15's, 6 panel wings, 12 or 14 feet, plywood covered or unfinished. Other misc. kits. Gene Molnar, 5362 Aurelia St., Simi Valley, CA 93063.

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Grand Espirit. Nick Demay @ (415) 728-7709.

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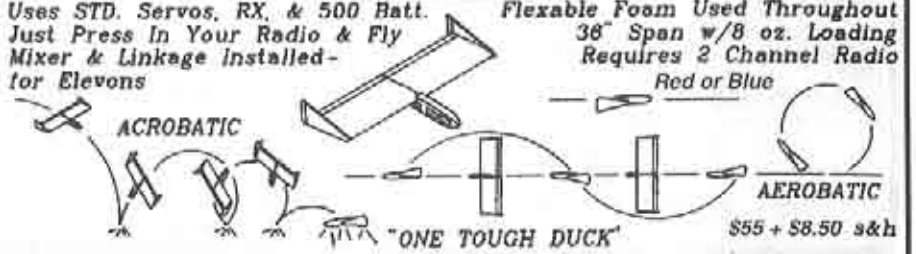

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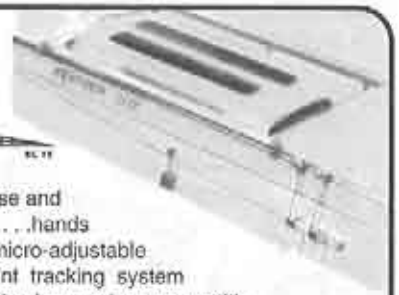

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