R/C Soaring Digest

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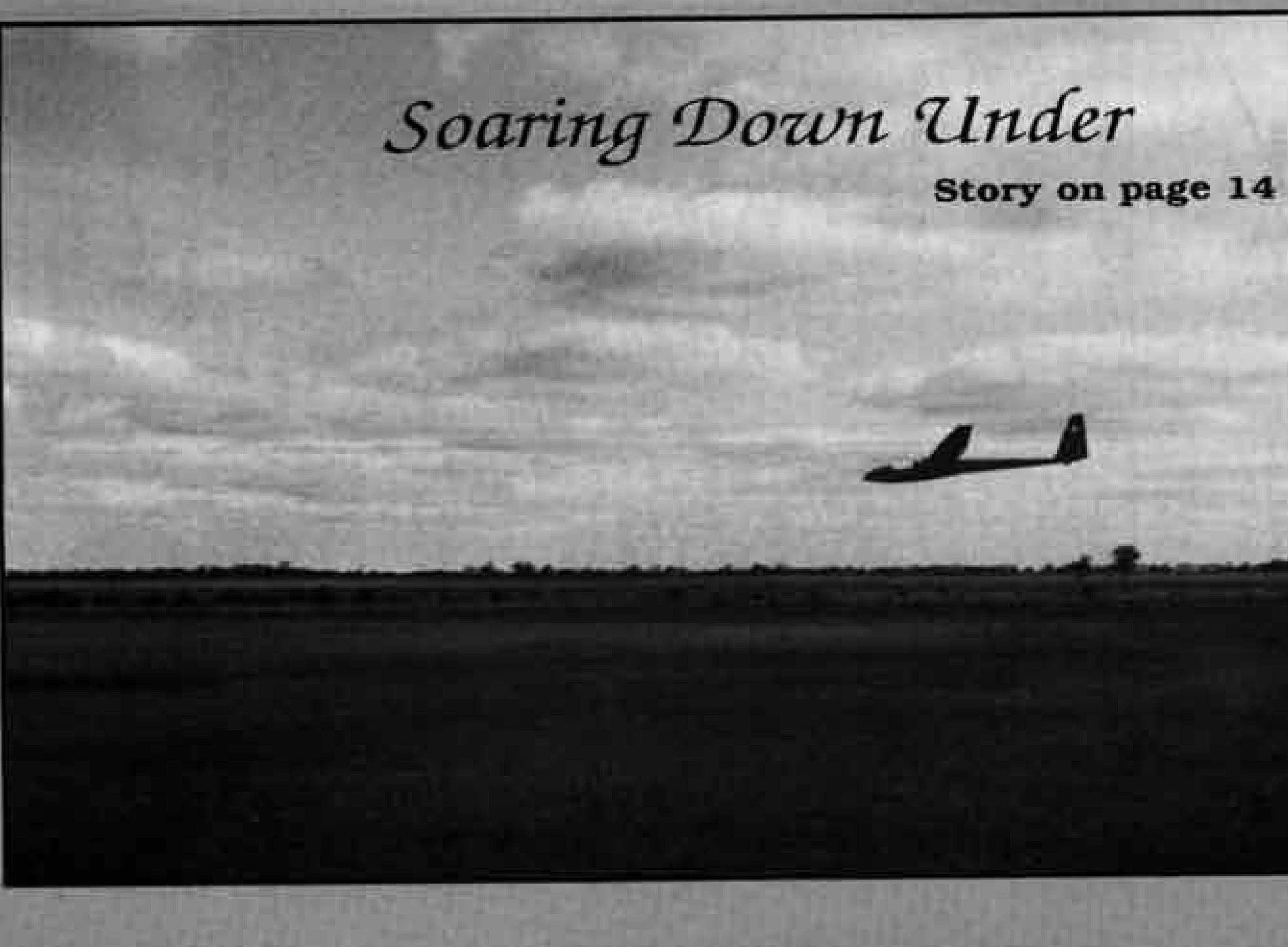
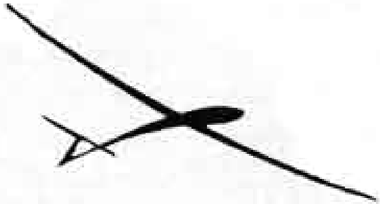


R/C Soaring Digest

A publication for the R/C sailplane enthusiast!



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R/C Soaring Digest (RCSD) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January, 1984. It is dedicated to sharing technical and educational information. All material submitted must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of all articles, model designs, press & news releases, etc. are the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author. *RCSD* was founded by Jim Gray, lecturer and technical consultant. He can be reached at: 210 East Chateau Circle, Payson, AZ 85541; (602) 474-5015.

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The Soaring Site

We recently received two beautiful European soaring publications that are full-size, color, well designed and, of course, the content is "all sailplanes and it's all neat".

Silent Flight

Silent Flight is out of England and the Editor is Dave Jones. The first issue, Autumn 1991, contains a free airfoil pull out, Power Scale Soaring (PSS), plans for the "Thermic Prowler", special interest in F3J, F3B, F3E and F3F, plus Electric Soaring, with electric motor testing and many more subjects, too many to list. Fascinating reading.

Silent Flight will be issued quarterly or 4 issues per year. The subscription agent in the U.S.A. is Wise Owl Publications, 4314 West 238th Street, Torrance, CA 90505; (310) 375-6258. The cost is $24 per year (plus tax for CA residents) and they accept Mastercard and Visa.

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Aufwind

The *Aufwind* is out of Germany and the Editor is Kai Erdmann. It comes out every other month, six issues per year, at the rate of 54 DMs in Germany and 62 DMs for Foreign.

All the text is in German, but with the aid of my Cassell's German Dictionary and a copy of "Soartech 6", I can stumble through each article and hopefully my translation comes out as the author intended. I have seen four issues, and I found each section intriguing with its expert coverage of thermal, slope, scale and international events plus the electric coverage. For more info. contact: Antwort, MIBA —Verlag, Abonnenten — Service, JakobstraBe 7, 8500 Nurnburg, Germany.

What's Jim Gray up to???

(We have received several letters asking what Jim is doing these days. So, here is what he has to say...and if you missed the address on page 1, he can be reached at 210 East Chateau Circle, Payson, AZ 85541; (602) 474-5015.)

"Since selling *RCSD* and also retiring from my former "full-time" job in magazine advertising, Peggy and I have found some time to play catch-up on some things that we just didn't have time for in the past six or seven years.

"First, we decided to do some "fun" things like taking a course in prehistoric Indian pottery of the Southwest, using the same materials, methods and techniques used by the early Americans. In fact, we dug our own clay, processed it, formed it by hand, decorated it and fired it...and along the way learned a lot about archaeology, geology and ethnology. In other words, Great Fun!

"I took several art courses and began painting in watercolor, as well as doing portraits in several different media. Almost all of the work has been taken by friends (notice I didn't say "sold") who admired them.

"We've done a slight amount of travelling, too, but not as much as we'd like because we both have taken on considerable community service work which has tied us down close to Payson. However, this is now slacking a bit, and we think maybe we can take a longer vacation this summer.

"As far as flying goes, I have built and flown a (gasp, choke) POWERED model, if you can believe that! In Payson, there are few (read NO) glider pilots per se, except for myself...but we do have a power-plane club, for which I do the newsletter. I figured that if I were to be at all knowledgeable about R/C power flying, I'd better know something about it, hence the transition. I've got a Goldberg Piper J-3 on floats to do, and a nice Playboy for electrics, plus a Goldberg Interceptor for Class "A", etc...so a whole year of work ahead, I guess.

"We're going to try to make it to Geneseo, N.Y. Flying Aces Club contest in July and will probably attend the Southwestern glider meet here in Arizona in February.

"Meanwhile, there's a couple of sailplanes I have to work on...one is about done and another is still in the box. Boy, this "retirement" means we're working harder and getting more involved than ever before...probably oughta go back to work for a rest!

"I've heard from a number of friends who used to correspond when we were still actively involved with *RCSD*, and certainly would enjoy hearing from others from time to time. The widespread on the contest circuit we had hoped to do just hasn't materialized...but there's still time! So, that's about it except to mention the archery - another hobby I've taken up. I'm shooting a recurve bow, and doing a lot of competition target shooting. Was lucky to take a gold metal in the Arizona Senior Olympics in my age group and hoping to do well again this year. Also been shooting some regional contests and doing okay there, too. Never a dull moment!

"Hope to hear from y'all soon."

Happy Soaring,
Jim Gray

Flying a Dodgson Pivot

SD7037 VS SD8000

(The following information was provided by Phil Pearson, Issaquah, Washington. ED.)

"You may be interested to know that I have been flying a Dodgson Pivot (8 oz/sq. ft.) very frequently for a year now with 72" vacuum bagged balsa wings covered with 1/2 ounce glass and three servos (standard servo for wing pivot). I have been interested in airfoils for many years and "Soartech 8" and David Fraser's performance program prompted me to construct two alternate airfoiled wings that are instantly interchangeable. In fact, I flew one flight with a SD8000 right wing and a SD7037 left wing inadvertently! David's program predicts flight characteristics that are easily observed while flying the plane, especially in the case of the SD8000.

"The laminar flow characteristics of the SD7037 and SD8000 allow a more efficient use of pivoting wings than the E387 with its inherent separation bubble. The SD7037 performance is remarkable, very smooth in pitch, no sharp stall, slows down for easy hand catches, very clean and good energy recovery, good climb, and <u>very precise roll control</u> for thermal centering and fantastic L/D for this size model. I fly light, small slopes with thermals most of the time and the SD7037 excels in this situation. It is so much an improvement over the E387 that Bob says he is changing the kit over to the SD7037. When the wind increases, I switch to a pair of SD8000 wings. This airfoil is aerobatic (outside loops as easy as inside) and is cleaner and has an even better observed L/D. The stall is more pronounced but predictable and the minimum sink is greater than the SD7037. I have found the SD8000 to be a very good airfoil for use on low sand dune (20') sloping in light shearing winds (as low as 6 MPH). The good L/D and low drag allow for flying above a hill with a very low slope angle. Of course, the maneuverability of the Pivot allows one to place the plane precisely in the narrow lift band."

On The Subject of Wings

(We received the following letter from Jason Wentworth and if anyone can help out, please contact either Jason or *RCSD*.)

"I am trying to get in touch with a few individuals who had designed sailplanes in the late 1970's, whose sailplanes had been covered in the "S.O.A.R. Subjects" feature in *Model Airplane News*, written by Jim Gray, who formerly owned *RCSD*. Since the models appeared in that feature, they almost certainly were in that same month's issue of *RCSD*.

"The first glider is a large plank-type designed by Kirk Kreigh (*M.A.N.*, November, 1977, p. 58). The next five are all German designs which flew in the Sept. 25, 1977 tailless sailplane contest on Sylt, an island in Helgoland Bay in the North Sea. The sailplanes are Claus Strange's "Blaumeise", Dietrich Alkenkirch's "O-Wing", Dieter Paff's "PN-9", Gerhard Gatke's "Dwars Loper", and an unnamed design by Bernd Wiese. The report was sent to Jim Gray by the late Dave Jones, who was sent it by Werner Thies, then president of FAG-Kaltenkirchen, the club that sponsored the Sylt meet. Thies also authored a book on designing sailplanes that devoted 35 pages to tailless craft. This report was in the March, 1978 M.A.N., starting on page 61. I was wondering if these plans and those of outstanding entries in subsequent Sylt meets, as well as an English translation of Theis' book, are available in the U.S.A. If not, I would need the current address of the FAG-Kaltenkirchen.

"For that matter, I wonder if outstanding entries in the Northrop-sponsored flying wing contest have their plans published anywhere. I will gladly pay you for the photocopying of the address list or the plans themselves, should you have them. I would be most grateful to you for your help."

Happy Holidays, (signed) Jason Wentworth, 3081 N. W. 4th Terrace, Miami, Florida 33125

Soaring is still alive and well

Gerald Knight, St. Catharines, Ontario, Canada says, "Soaring is still alive and well in the Niagara area, although there are only six or seven active participants around the St. Catharines locality. We do enjoy some excellent sod farm fields, thus we are a flat field group.

"We fly everything from 2M to Std. class and also some 1/5 and 1/4 scale, at times. We launch by either winch or Hi-Start, but I have just completed a 100" span towplane c/w Quadra 35, which should be operational for towing in 1992. It has flown several times and is a pussycat to control. The plane is a Centurion by Englishman David Boddington (1980), and modified to tow large sailplanes by myself.

"There will be 2 other towplanes ready to go in '92, one a Cub and the other a Telemaster 40.

"We are also flying electrics and see a good future for this type of plane; they're so easy to prepare for flying - no launch equipment - so they're ideal for a spot of quick and easy flying late evenings, etc.

"The photos were taken in early 1991 showing the towplane and one of 2 scale sailplanes. The white (front), unfinished one, is a Slingsby T-31, 1/5 scale and 104" span.

It flies like its full-size counterpart, and was built by Cliff Whybra of Niagara Falls, Ontario. The yellow one is a 1/4.5 scale Spalinger drawn by myself from 3-views out of Martin Simmons' "The World's Vintage Sailplanes" with other detail from the *Bungee Cord*. It flies reasonably well, but is prone to tip stalling if flown too slowly due to the very narrow and thin tips. This particular model is of an S-18 full-size, modified and flown by Willi Schwazenbach of Switzerland."

Centurion 100" Span (*R.C.M.&E.*)

Power - Quadra 35 2.1 cu. in.

The first flight was in 1991 using a Futaba 5UAF radio. Trim striping and name were added after photo was taken. Originally designed for .60 to .90 engine. Added to the original drawings: ailerons, releasable towhook, engine mount modifications on pylon. Controls (5 channels): rudder, elevator, ailerons, throttle, towhook release.

Flying in Wisconsin

Gordy Stahl, Milwaukee, Wisconsin, says, "My first swap meet got me an old but good Airtronics Square Soar which, on my third launch, lucked into one of the few great thermals encountered in Milwaukee history and gliders lodged themselves into my heart forever.

"I now own most of the Airtronics models: Bird of Time, ASW-24, Paragon, R08, Atlas, Astro Monterey, ASW-17, 2 sizes of the old wierd shaped Shuttles, Sailaire, and a Wing Freak flying wing. I'm sure there are others in the basement, but they're not accessible at this time! My slope experience is on the bluffs of Lake Michigan, but with the prevailing winds in the wrong direction, the slope is a rare treat.

Sterling Schwietzer...over 100 pieces in the canopy alone! AAgh! Flies good, though.

Gordy Stahl and ASW-24

"My fleet. Plus, four kits under construction."...Fran LeClercq, Green Bay, Wisconsin

Kaoro Kiyose, Shiobe, Kofu-shi, Japan sent in this photo.

K6, 1/5 Scale from Jim Ealy plan...from Ray Reiffer, Zeeland, Michigan

Alan Ball
Boston, Massachusetts

"I was doing fine until I realized I was flying the wrong plane."

Jer's Workbench

I'm back. Sorry for the delay on my progress reports for the Test Bed. I have not been able to do any flying these last few weeks, because of several trips that I have made to Texas and Northern California. I have made one change in the Test Bed that I wanted to share with you.

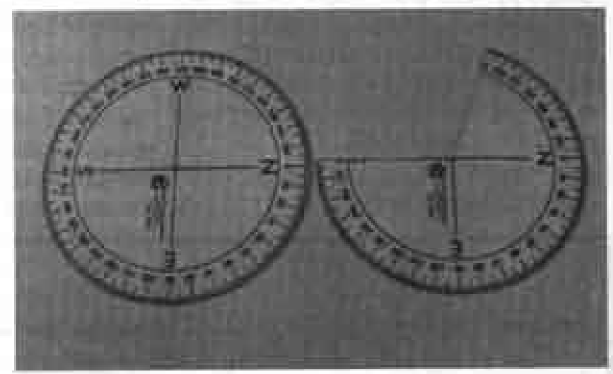
I removed 2 1/2 ozs. by hollowing out the solid nose block. It would have been much easier if I had done this in the beginning when the Test Bed was first constructed, but I was in too much of a hurry. By hollowing out the nose block, this enabled the battery pack to be moved almost 1 1/2 inches forward. By doing this, it was easy to remove the 2 1/2 ozs. of lead from the nose, thereby lowering the gross weigh.

As soon as the flying field dries out, I hope to get some flying in. I don't actually expect to see any drastic changes in the flying of the Test Bed, but do expect to see some sort of difference.

The last time that I flew the Test Bed, I said that I pulled 4 clicks of flap while I was circling in a thermal. How much flap is 4 clicks? To find that answer I used a circle protractor, and it worked out to be 5 degrees.

The photos show how part of the circle protractor was removed so that it would slide onto the wing allowing one to measure how many degrees the flaps moved. As you can see, this is a simple tool to make and use.

However, when cutting the protractor to fit onto the wing, be careful not to remove the center mark of the protractor. This center mark should be set up on the pivot point of the flap hinge and adjusted so that 0 degrees is at the center of the trailing edge. Once done, the flaps can be moved and then measured. ■



Two circle protractors before and after cutting. Note protractor center mark...Do not remove. To use after cutting, line up the protractor center mark on the flap hinge pivot point and adjust 0 degrees at the trailing edge of your wing, move the flaps, and read.

Protractor installed. Easy to use; easy to read.

on the Wing

B²

P.O. Box 975
Olalla, Washington
98359-0975

Gregory Vasgerdsian of California's Bay Area is planning to have a Storch IV ready for this year's Richland Scale Fun Fly in May. Gregory has full sized plans for his model, but some questions regarding certain aspects of the design and its construction remain. As some of his questions are relevant to other designs, scale and otherwise, we thought we'd share Gregory's questions and our responses with *RCSD* readers.

Movable Rudders?

Gregory: "The plans show the fin and rudder construction (see Figure 1), which to me looks like the rudders should move, though the plans do not show a linkage to the rudders. Are the rudders supposed to move? How?"

B²: Yes, the rudders are supposed to move. Swept flying wings with fins and rudders at the wing tips are usually set up so the rudders swing outward only, providing a method of yaw control. This should be the case with the Storch IV model, as evidenced by the fin/rudder cross-section shown on the plans. Note the flat side of the rudder is outboard. (The cross-section for the right side is opposite to what is shown here.)

A simple method of achieving outward movement only is shown in schematic form in Figure 2. The cable, consisting of light stranded wire enclosed in a small diameter plastic sheath, needs to be free to slide through the control horn when pushed. A small diameter brass tube inserted in the plywood control horn is one way of achieving this. The small stop at the end of the cable then pulls the rudder outward as tension is applied to the cable by the servo.

A second method is to use cord, as one would to operate spoilers.

In either case, the rudder should be held against a stop by a light spring or rubber band so it remains in neutral when not being deflected by the servo.

The intent of the 1/16" plywood inserts shown on the plans is to provide a firm surface through which to install "figure 8" hinges of carpet thread, as depicted in

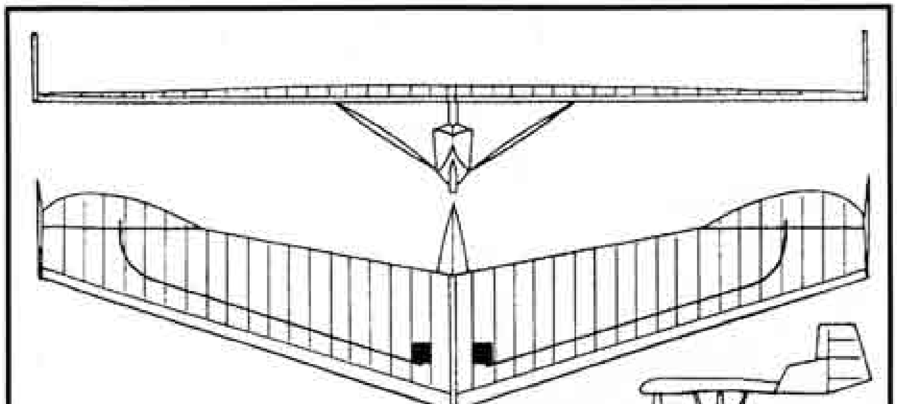


FIGURE 7
THREE VIEW SCALE DRAWING

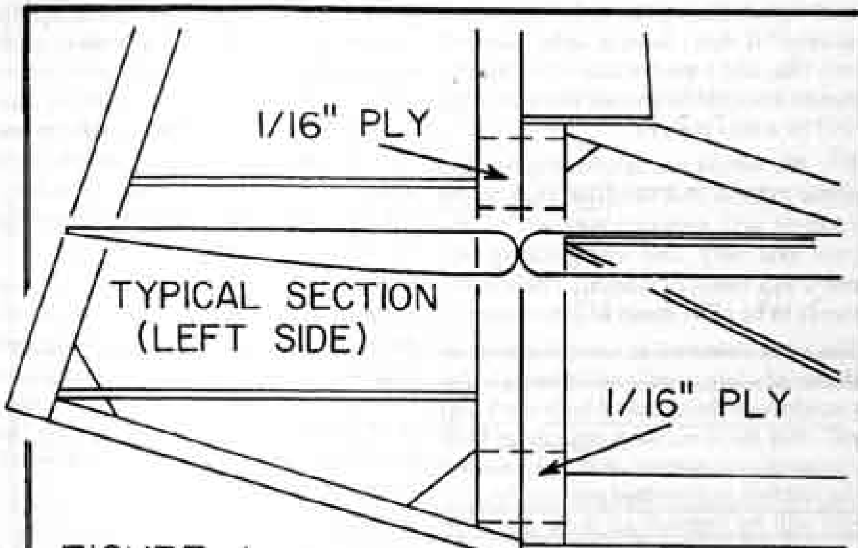


FIGURE 1

Figure 3. The idea here is to make the hinges, then insert them in the trailing edge of the fin and leading edge of the rudder. This is an older method of hinging.

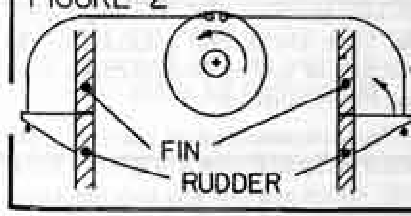
Small light conventional metal pinned nylon hinges marked for 1/2A size models can also be used, or, if using one of the heat shrink plastic films, the hinges may be made from the covering material itself. Both of these methods are far less labor intensive than the "figure 8" hinge.

The edge contours of the fin and rudder shown on the plans may make it difficult for a hinge of any type to work properly. The underlying problem is shown in Figure 4. The two edges try to rotate apart when the surface is deflected, and this puts a strain on the hinge. We recommend a change to one of the contours shown in Figure 5 and 6. The latter is easiest to build, particularly if using the covering material as a hinge, and has the best appearance; it is also the strongest.

Elevon Control System

Gregory: "The plans show one servo (located in the wing root) to operate each elevon, as I've drawn in (see Figure 7). Since I'm not too familiar with flying wings, I'm not quite sure what will give this model the best control. Use elevons for up and down and the rudders for left

FIGURE 2



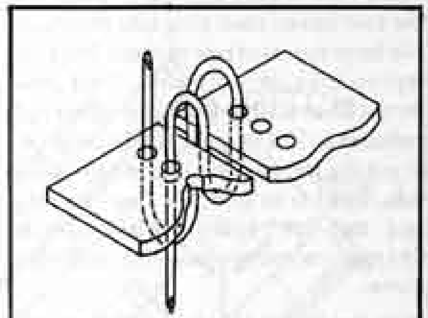


FIGURE 3

and right... Elevons mixed elevator and aileron? (I don't have a radio that will mix this, and a mechanical mixer for this function would be a hassle since the wing will be a two piecer.)"

B2: We would not rely on the rudders alone to bank and turn the 'ship, as the rudders will generate rotation on the yaw axis only, and any banking will come as a result of sideslip. There really needs to be some method of roll control.

The term "elevon" is a combination of the words "elevator" and "aileron". The two elevons thus control both pitch and roll, and these surfaces operate as both elevators and ailerons. With elevons and the rudders as described previously, control will be through all three axes. We would recommend this type control system for the Storch IV even if it were not so stated on the plans.

A mechanical linkage would be a complicated affair due to the two piece wing, but there are several solutions to the problem of getting two functions from one control surface:

(1) Use an electronic mixer, like the Christy Mixer (available from Ace R/C for about $35), which can mix any two functions. These mixers plug into the receiver, and the two servos then plug into the mixer. We have not used one of these, but from reports they do work well. Total servo throw as available from one channel is reduced to 50% of normal. The only way to get the left elevon to go to full deflection, then, is to give full "up" elevator and full "left" aileron. Make sure the linkage geometry provides sufficient throw.

With the Storch IV's large fuselage and generous wing thickness, placement of an electronic mixer within the airframe should not be a concern. Hook up the mixer to the aileron and elevator plug on the receiver, the rudder servo to rudder. This will give the controls a feel similar to that of a conventional tailed aircraft.

(2) Rather than purchasing a computer radio which can directly mix aileron and elevator functions, see if the transmitter has both V-tail and aileron/rudder mixing capability. If it does, hook up one elevon servo to the rudder socket on the receiver, the other elevon servo to elevator, then connect the rudder servo to the receiver's aileron socket.

With a Mode 2 transmitter and V-tail and aileron/rudder mix turned on, both elevator (pitch) and aileron (roll) functions will be on the right stick, and the rudders (yaw) will be coordinated with the ailerons. The left stick will control only the roll function of the elevons and there will be no rudder coordination.

If the transmitter has V-tail mixing only, control of the elevons will be through the rudder and elevator sticks, and control of the rudders will be through the aileron stick. This setup may take some getting used to, but is entirely feasible.

(3) A final option (and one which we've never tried in flight) is to use a basic transmitter operating in Mode 2, and hold it at a 45 degree angle to the body, oriented so the elevator and aileron axes are as shown in Figure 8. The elevon servos are connected to the receiver aileron and elevator outputs, the rudder servo is connected to rudder.

With this option, the elevons are controlled from the right stick with shifted axes, the rudders from the left stick with no axis shift. It may take some time to become accustomed to the offset pull of the centering springs on the two sticks, but this method should work well if practiced on the ground first.

Additional Comments

We would highly suggest mounting the elevon servos in the wings so the pushrods can connect directly to the elevon control horns. Curved cables give a lot of slop, something which is quite detrimental in a swept 'wing configuration. If there is insufficient room to mount

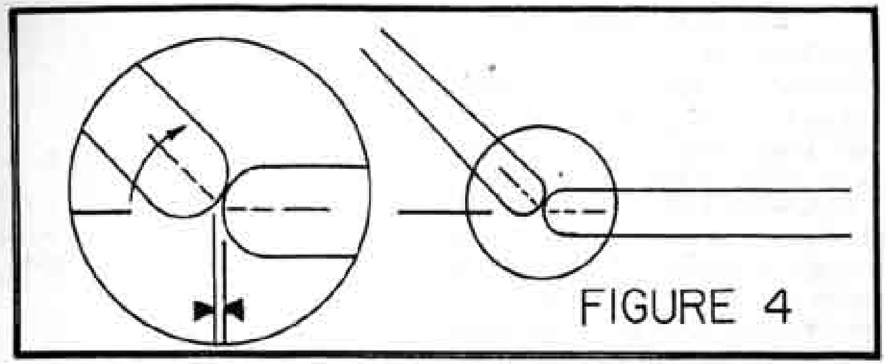


FIGURE 4

FIGURE 5

FIGURE 6

the servos at the inner edge of the elevon, go ahead and mount them as shown in Figure 7, but use a bellcrank system rather than sheathed cables.

The Storch IV should make a good slope 'ship. However, winch or hi-start launches will be impossible as the two required towhooks will need to be mounted on the lower surface of the wing rather than on the fuselage. In this location the struts will get in the way of the bridle's lines.

Gregory plans to have his Storch IV completed in March so he has some flight time on it by the time the Fun Fly comes around in May. As the Storch IV has been a favorite of ours for some time, we are quite eager to see the completed model. This is an exciting project, and we wish Gregory the best of luck in his endeavor. ■

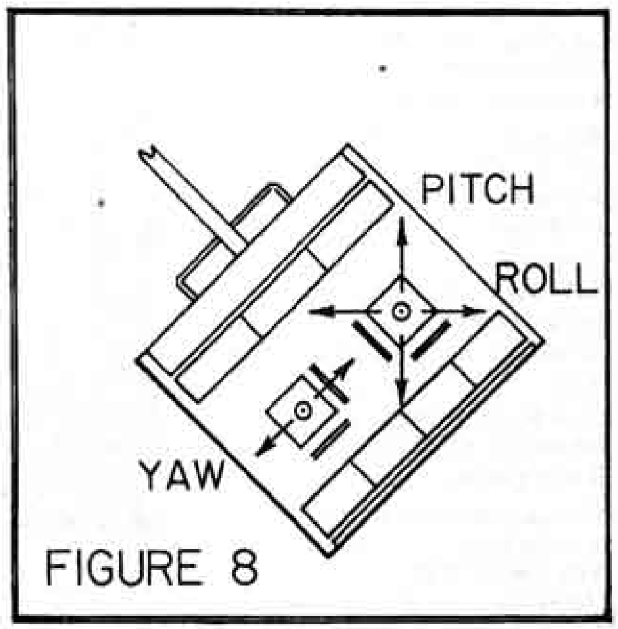


FIGURE 8

Electric Sources

...by Ed Slegers
Route 15, Wharton, New Jersey 07885

I have been getting a lot of phone calls and letters lately asking where to get some of the components to convert a sailplane into electric power. The following is a list of the manufacturers of some of the parts that I have mentioned in the past. This list is only a very small amount of the manufacturers that make electric accessories. In the future I will list the name and address of the companies that are mentioned in the articles.

Astro Flight
13311 Beach Ave.
Marina del Rey, CA 90292
Motors, chargers and batteries.

Benson Products
7119 N Chimney Rock Pl.
Tucson, AZ 85718
Very small speed controllers.

Dave's Wood Products
#7 Creekpart Ct.
Roswell, GA 30076
Obechi

Flite Lite Composites
466 Primero Court Ste. E
Cotati, CA 94931
A new line of electric planes.

Hiline Ltd.
P.O. Box 1283
Bethesda, MD 20827
Small motors.

Hobby Horn
15173 Moran St B
Westminister, CA 92684
Just about everything you will need.

JADE
12136 Braddock Dr.
Culver City, CA 90230
Electric planes.

NorthEast Sailplane Products
16 Kirby Lane
Williston, VT 05495
Almost every sailplane in their catalog.

Novak Electronics
128-C East Dyer RD
Santa Ana, CA 92707
Speed controllers.

Robbe
170 Township Line Rd.
Belle Mead, NJ 08502
Keller motors.

RCSD - Lots of good advertisers listed.

Tekin Electronics
970 Negocio
San Clement, CA 92672
Speed controllers and chargers.

Weston Aerodesign
944 Placid Court
Arnold, MD 21012
Hi tech electric planes. All the parts needed to get airborne. Also, a fine line of composite material.

Can you electric power a large sailplane? Yes. In the picture is a Soarcraft Glasflugar 604. Wingspan is 12 feet. The plane belongs to Graig LaChance of Moorpark, California. Holding the 604 is Graig's daughter Mrs. Amber Way.

Good Flying! ■

R/C Soaring Word Search

...Designed by Curt Nehring, San Dimas, California

F	R	E	Q	7	R	E	B	M	A	C	X	E	P	O	L	S
3	O	P	A	Z	R	O	T	A	V	E	L	E	D	W	P	F
5	R	Z	T	F	I	L	E	G	D	I	R	S	I	D	F	U
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T	B	K	T	R	A	T	S	I	H	M	X	A	U	D	B	7
S	R	E	V	E	I	R	T	E	R	Y	L	F	D	I	D	3
D	A	R	S	P	O	I	L	E	R	A	P	3	D	K	U	S
A	C	R	E	M	I	T	H	C	Z	O	O	M	E	S	O	B
C	X	P	I	L	O	T	Y	G	K	N	I	S	R	Z	L	I
I	F	W	S	S	A	L	G	R	E	B	I	F	3	B	C	R
N	R	E	T	E	M	O	W	T	O	W	P	O	P	E	N	5
Z	7	5	3	A	I	R	F	O	I	L	T	H	S	A	R	C

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Ballast
Balsa
Bird
Camber
Crash
Carbon Fiber
Cloud
CG
Downwind
Elevator
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Flaps
Fly
Foam
Fiberglass
F3B

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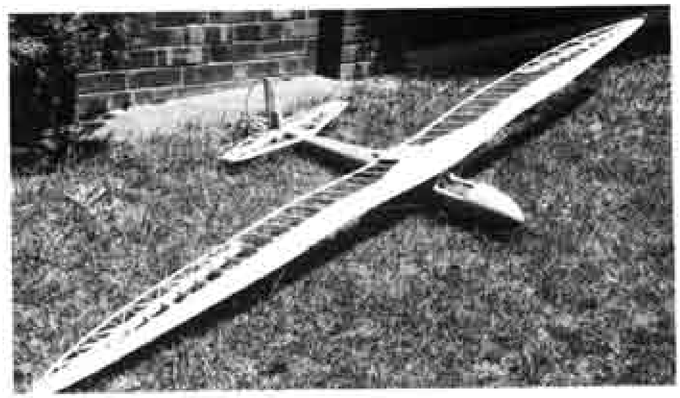
Ribs
Ridgelift
Retriever
RC
Rudder
RX
RCSD
Soar

Soaring
Sink
Servo
Spar
Skid
Spoiler
Slope
Thermal
Tow
Timer
Tail
Two Meter
Wings
Wins
Winch
XMTR
Zap
Zoom
357

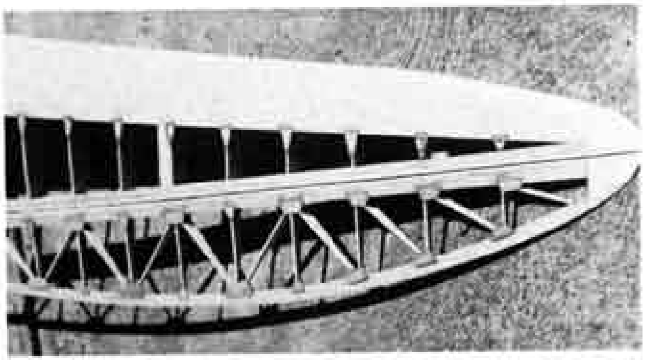
Flying Down Under

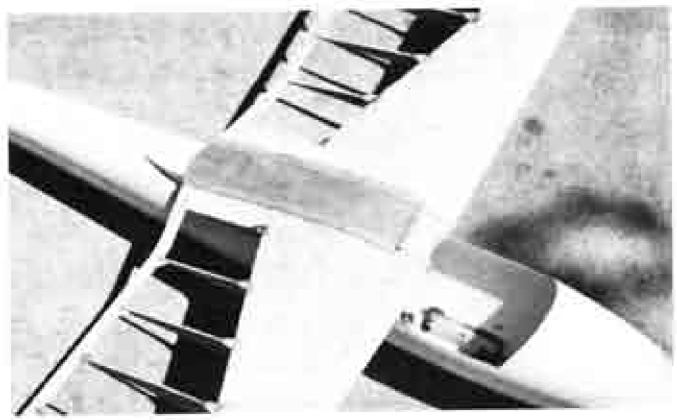
...by Frank Smith, Burwood, Victoria, Australia

Back in December of 1990, I finished the construction of my Triton Models Kirby Kite, but have put it away without covering same for lack of a suitable colour scheme to finish same in, etc. I still have not been able to obtain anything suitable thus far. Some time back, I contacted the owner of the only Kirby Kite in the U.S.A. for colour photos and data on his glider, but he was unable to give me anything, saying that the Kite was in storage awaiting to be restored, etc.; although he didn't have any photos, he could send me rough drawings, though. Note the 0.2 mm ply cover I made for the centre section; just like a full-size job. The tow-hook mounts in the fuselage; I installed an aero-tow release, too. Behind the aero-tow release in the cockpit floor panel is a cutout for the rudder, elevator, servos, etc. Directly behind these are a recess to mount the receiver. The battery pack will be mounted up forward and will be held in place with ruber bands on 4 small cup-hooks. I have sprayed the fuselage with gray primer after rubbing it down.



Photos by Frank Smith





(The cover shot is of John Gottschalk's ELFE S-4. on finals at Swan Hill, Victoria, Australia, May, 1990.)

The 1.6 semi-scale model of the GO.1 WOLF was built from plans that were published in November, 1989 FMT magazine. I modified the FMT plans a little and enlarged same to 1.6 scale (2,333 mm span), and finished the model in Hungarian markings. As a member of the Vintage Glider Club, I was able to obtain photos and the history of the only Go.1 WOLF in Hungarian service from a fellow club member, Imre Mitter, from Hungary. The model is very nice to fly and is a fine little sport scale job; aerobatics are just great with same on the slope, etc. Its roll rate is very nice and smooth too and, with those big ailerons, it's not hard to see why. One does not need much movement on same, either.

GO.1 WOLF

My 1.4 scale GB.2b, which I like a lot and am seriously thinking of building a 1.3 or even larger scale model of this type. In fact, a lot of my club mates keep hinting that I should start soon.

Saltos of Bill Denhelp & H. Schmidt, Grunau Baby 2B by Frank Smith, ASK-18 by S. Morris

L-Spatz (L. Vine), L-Spatz (S. Cooke), LS-4 (W. Jones), Kestrel & Kirby Kadet (G. Hearn)

1.4 scale model of Australian "Coogee" enlarged home built version of Hutter H-17, 1939-1941. Built by Wayne Proctor.

Another model project that I have been working on of late is that of a Japanese glider, 1937-1939 vintage, that I designed last year, this being a "C-2". The drawings I did of same worked out at 1.5.8 scale (2,500 mm span); a bit odd, but that's how they worked out. It flew quite well in August, 1990, and I was most pleased with it.

Some Thoughts On Learning to Thermal Soar

...by Bill Baker, Norman, Oklahoma

(Bill sent us the following article which appeared in the *Hotdogger*, the newsletter for the Central Oklahoma Radio Control Society. Ed.)

I can't say I never get enough of soaring, sometimes I do, but before long I want to do it again, maybe even need to do it again.

Something about climbing out with no power other than what the sun has made satisfies a deep felt need. It is all the more satisfying when the lift is just barely strong enough, so a slight mistake will likely result in losing altitude, maybe too much to recover; rather like catching a fighting fish on very light tackle. It can be done, but very carefully!

Numerous books and magazine articles have been written on the subject, a fine example in the soaring column of the December 1991 *Model Builder* magazine. What I want to add is just a couple of observations on why some flyers seem to have trouble learning to soar and therefore miss out on the fun.

Driving your car along a straight road requires frequent small corrections to the steering wheel that soon become automatic. When you fly your power model from downwind to upwind, you fly perhaps the same way; you input a lot of small corrections to make it fly straight. If this habit carries over to your sailplane flying, you will be flying in the down air between thermals most of the time, and may hit the ground about as quick as the high start parachute. Assuming a model is in good trim, if the left wing lifts and the model tries to turn to the right, it is nearly certain the thermal is to the left. You have to recognize this, and force the model into the lift. If you turn right (the way the model wanted to go) you will likely enter even stronger down air. So, that is point one: searching for lift means watching the model carefully for changes in flight path that tell you something about the air it is flying in. "Correcting" the flight path to fly straight means you will miss most of the thermals (all of them except the ones that hit head on), and you will miss a lot of information that is there for you to read.

There are other signs to read, soaring birds are obvious, but non-soaring birds are also useful sometimes, as they make a living eating bugs that travel cross country in thermals. Dust, plant seeds, insects, lots of things to see when you learn to look. Even the movement of tall grass and weeds will show the presence of a thermal to the experienced eye.

Point number two is that the experienced power flyer is oriented to the ground in performing his maneuvers; whether a Cuban Eight in a cross wind or a landing approach, we learn to compensate for wind strength and direction to frame our maneuvers for visual effect, that is relative to the ground as reference. That won't do for flying in thermals that are moving downwind; if you make your turns hoping to stay in the lift relative to a point on the earth, the thermal will pass by, to be replaced by down air, usually not as strong down as the thermal was up, but still not what you wanted. You have to learn to fly with the thermal, making trim and stick input to stay with it, guided by the visual clues of what is needed. In general, once you are in the lift, you will do much better to use rudder trim to circle and quit shaking the stick around. The glider can then fly circles relative to the air that are round, but may not look all that round.

The third point is: I think most

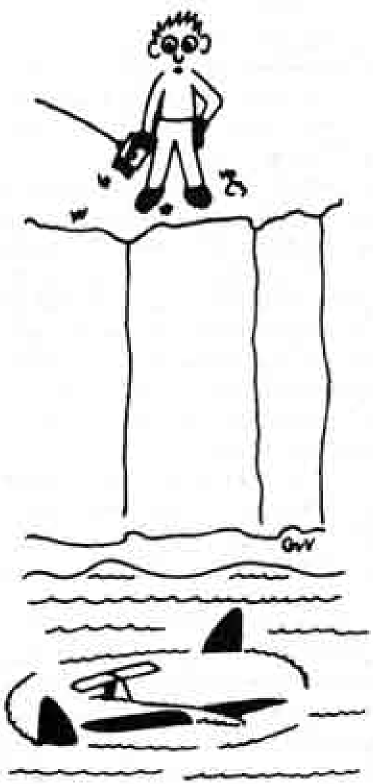
would-be-but-not-there-yet thermal flyers do not understand the importance and use of elevator trim. You need to fiddle with the linkage so that neutral trim on rudder and elevator ON THE TRANSMITTER correspond to model trim IN THE AIR such that the glide is about as flat as possible and no strong turning tendency; a bit more up trim will be too much, the model will get too slow and mushy on the controls or maybe even stall. O.K., now learn how much down it takes to produce a fast glide, not really a dive, but a faster speed than your "Best" trim. That is the way you get upwind and out of down air as soon as possible; use the down elevator trim. Now the tricky thing is that these elevator trim positions vary with circle diameter, so that your best glide trim becomes too fast, maybe even a shallow dive when turning tight, and you will need to add up trim until you reach the "too-much" point, and then back off. If you stall, you will fall maybe clear out of the thermal, but to climb you need to turn very tightly, to make use of the strongest lift which is in the center of the thermal. The "trick" (or the problem) is to vary the diameter of the turn, and the elevator trim, in response to the thermal or make use of it best. As you climb higher, the thermal often is larger and stronger and you can open the circle up, and remove some of the up trim.

Point four is just to sum it all up: Thermal soaring is a mind game. It takes concentration, observation, and much decision making. When I make an hour flight I am really beat. Even little twenty and thirty minute hops are challenging in most weather conditions.

Most of my sailplane flying has been from a high-start, but in recent years, I am using electric power, the major advantage being not needing the space required for a high-start line. ■

A Soaring Memory

...by Greg Vasgerdsian © 1991
Concord, California



I remember that day,
A long time ago.
We went to the coast,
And a glider we did throw.

Out over the cliff,
At Bodega Bay.
The Hobie Hawk took off,
And went every which way.

Lack of experience,
Don't know what to do.
The Hawk missed the cliff,
But into the ocean it flew.

Lucky for foam wings,
It actually floats!
Can we retrieve it?
We don't have a boat.

Two hours later,
Exhausted and wet.
The Hawk was recovered,
And home we went.

To this day a smile,
When I'm on a long walk.
And remember that glider,
Renamed the Moby Hawk.

Winch Line

...by Gordon Jones

Gordon Jones, 214 Sunflower Drive, Garland, Texas 75041; (214) 840-8116

Foam Wing Construction - Part 4

Now that the cores have been prepared, we are ready to sheet them. There are several materials that are excellent for sheeting foam core wings: balsa in varying thicknesses, obechi, various veneers, and I have even heard that some adventurous souls have used some of the composite foam materials as sheeting. Each of these materials require some preparation in the form of sizing, and assembly in the case of the balsa.

Balsa is the most popular sheeting material in use today. It is fairly light, if you select it carefully, and offers an excellent strength to weight ratio. It is available in various thicknesses with 1/16th being the most popular. 1/20th is used by some modelers for ultra-light wings and stabs. Balsa is available in 12 inch sheets from some suppliers which alleviates the need to assemble 3 or 4 inch planks into a sheet of the required size.

Obechi is gaining in popularity in the United States, and has been used overseas for a number of years. It comes in large sheets and is a strong material once applied to the surface. Obechi takes a little getting used to at first, but with a little practice can make the sheeting process easier than sheeting with balsa. The strength to weight ratio here is excellent and there are some who say it far surpasses balsa in this category.

Veneers, like Obechi, has been used overseas for a number of years and makes a beautiful looking wing even uncovered. Veneer comes in a variety of thicknesses and grains. I have not had an opportunity to use Veneer sheeting, but in talking to other modelers who have, they have found it to be strong and easy to work with. The one drawback to Veneers is the cost, it's not cheap.

Sheeting foam cores is basically a three step process. First, prepare the sheeting material, then apply the resin/epoxy/other adhesive, and put the sheeted cores in a press or vacuum bag and let cure. The following steps describe a wing sheeted with balsa as this is the most time consuming technique. If you are using Obechi or veneer sheeting, the process is not as complex as the sheets are already oversize and require only that they be cut to size. When using obechi or veneer be sure to use masking tape over the places that you trim so the material does not split. Other than that, the process is not any different. Let's begin.

Lay out the 1/16" wing sheeting material edge to edge and insure that the edges match without gaps. If necessary, trim the sheets just enough to match the edges. Select and match sets of sheeting for the top and bottom of each wing and tip panel. Align the 1/16" sheeting material edge to edge; then tape the sheets together along the seams where they meet. Another method is to glue the sheets together, but I have found that this is not really required as the excess resin will fill between the sheets nicely and the tape will provide a nice smooth surface. Be sure to press the sheeting together to obtain as tight a fit as possible.

Align two taped sheeting panels tape side up on the work surface. Leaving a gap of approximately 1/8" to 1/4", then tape the panels together to form one complete sheeting panel for one wing core. Check to see that the sheeting panel will fit the core properly by inserting the core between the sheeting and folding it over the core. It should fit loosely with the trailing edge coming together. Be sure that the trailing edge is straight as this gives you a reference point for alignment while trimming the sheeting.

Lay out one wing sheeting panel on the work surface tape side down. Place one foam core on the sheeting panel and align the foam core approximately 1/4" from the edge of the root end of the panel. In addition, align the foam core approximately 1/4" from the trailing edge of the sheeting panel. Mark the sheeting panel using the foam core as a guide along the leading edge and tip edge. Be sure to leave approximately 1/4" excess when marking the sheeting. Remove the foam core and mark the sheeting as a "bottom".

Rotate the sheeting panel and core 180 degrees; then roll the foam core over on the unmarked sheeting panel. Again align the foam core on the sheeting panel approximately 1/4" from the edge of the root end of the panel. In addition, align the foam core approximately 1/4" from the trailing edge of the sheeting panel. Mark the sheeting panel along the wing tip end of the sheeting panel leaving approximately 1/4" excess sheeting.

Gently roll the foam core forward toward the leading edge until the leading edge of the foam core is flush against the balsa sheeting panel. (This compensates for the curvature of the top of the foam core.) Mark the leading edge of the sheeting panel using the foam core as a guide leaving approximately 1/4" excess sheeting. Using a new X-acto blade or razor blade carefully cut the sheeting panel along the lines you have just marked on the panel.

After cutting the sheeting panel, trial fit the foam core in the sheeting panel. Remember you want approximately 1/4" all around. Be sure that you have approximately 1/4" from the trailing edge of the foam core to the joined trailing edge of the sheeting panel. If necessary, trim the sheeting panel until you obtain a good fit.

Mark and cut the remaining sheeting panels being sure to produce a right and left wing panel(s). Using the foam core as a guide, mark the location of the top and bottom of the spar on the sheeting panels. This will provide the location of the unidirectional carbon fiber when you are applying the sheeting to the cores.

Measure and trim the unidirectional carbon fiber and 3 ounce fiberglass cloth to match the amount required for the spar and trailing edge of the wing. For the carbon fiber tow allow enough for an overlap of the spar approximately 1/2 inch on either side and at least 3/4 of the length of the wing panel. This size will provide enough support for the spar assembly. The 3 ounce fiberglass cloth is used to strengthen the control surface area and the trailing edges. Cut two pieces that allow approximately 1 inch over the size of the control surfaces, or about 2 inches for a non-control surface trailing edge.

Weigh one wing sheeting panel, the carbon fiber, and fiberglass cloth for one wing panel. This weight will determine the amount of epoxy resin to be prepared. Next, mix enough epoxy resin to complete one wing panel.

Lay out one prepared sheeting panel on cardboard or other material to protect the work surface. Apply the epoxy resin to the sheeting panel on the work surface. Using a spreader spread the epoxy resin evenly covering the entire sheeting panel. Use the squeegee to scrape off the excess epoxy resin until all that remains is a slight sheen. This reduces the amount of epoxy resin weight and provides an even application.

Lay one strip of 3 ounce fiberglass cloth in place along the trailing edge of the sheeting panel. Make sure that the edge of the fiberglass cloth is even along the trailing edge of the sheeting panel. Pour a slight amount of epoxy resin on the fiberglass cloth and "wet" out the fiberglass cloth. Squeegee off the excess epoxy resin. Repeat this process for the remaining fiberglass cloth strip.

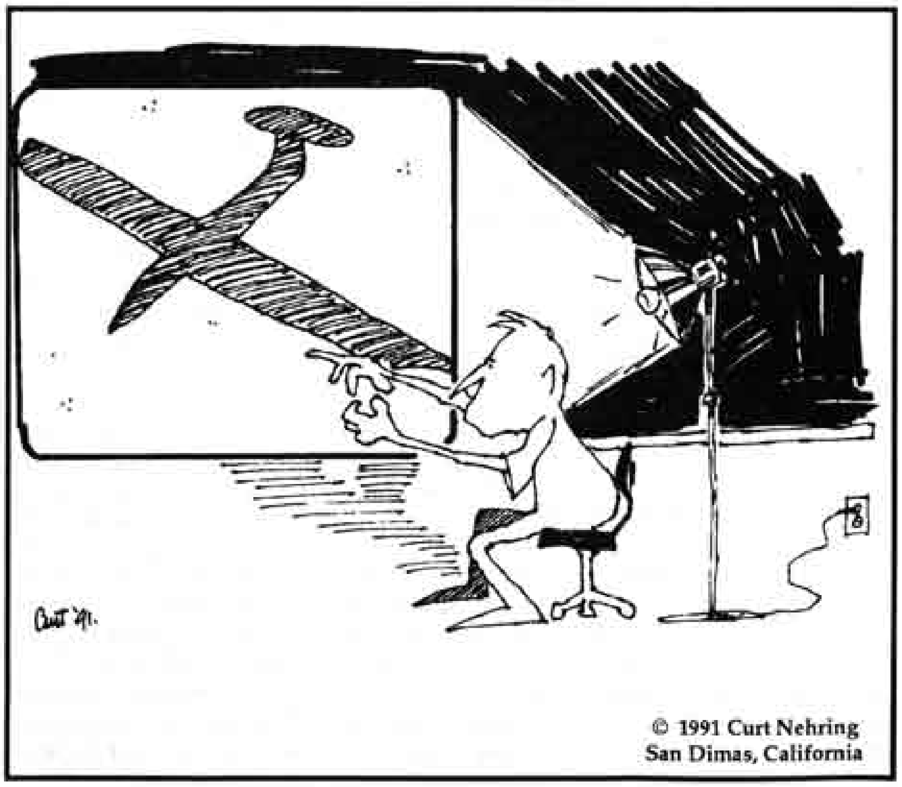
Lay the unidirectional carbon fiber tow along the location marked on the sheeting panel. Pour a slight amount of epoxy resin on the carbon fiber and "wet" out the carbon fiber. Make sure the carbon fiber is completely "wet". Squeegee off the excess epoxy resin. Repeat this process for the remaining carbon fiber strip. Another option for the carbon fiber tow is to apply it directly to the core bottom side first; then place the core on the sheeting. Then add the remaining carbon fiber tow strip to the top of the core. Either method works well.

Carefully align and place the foam core on the sheeting panel. Recheck the alignment of the panel; then flip the top sheeting panel over on the foam core. Recheck to see that the alignment of the foam core is correct on the sheeting panel. Insure that the 1/4" overhang has been maintained at the trailing edge.

Press the sheeting surfaces to the foam core using either the "press" method or the "vacuum bag" method. Be sure you are familiar with whichever method you decide to use prior to sheeting the wing. Either method works well and will provide the required results. A couple of notes at this point: first, if you are going to use the vacuum bag method be sure to use the correct amount of vacuum. White foam requires considerably less vacuum than blue or gray foam. About 5 - 8 inches is all you need; any more will crush the foam and distort the cores.

Once you become familiar with the techniques for cutting and applying the sheeting you will find that it takes far less time than you would think. After awhile you will be able to cut the cores, and prepare the sheeting and cores in about three hours per wing. Not bad, huh?

In April, we will look at trimming the sheeted cores and finishing out the control surfaces, servo cavities and such. ■



Launching Techniques

...by Bruce Abell
17 Ferguson Street, Cessnock, NSW 2325, Australia

G'day! Well, here's some more comments arising from the reader survey.

Walter Panknin asks for a good, in-depth article on launching techniques! WOW!! This is a real complex subject, in some ways, but **I DO AGREE WITH HIM** that this subject deserves a lot more attention than it has had to date in any of the publications on R/C soaring that I have read, so perhaps my "tuppence-worth" might stir some others to enter the fray, so to speak.

First, let's consider what type of model we are about to launch.

Slope

This is reasonably straight forward, the only critical point to watch is to make sure the model is launched in a slightly nose-down attitude, otherwise it will balloon up and stall when launched firmly into the wind.

It is also best to hold the model with one hand holding the fuselage, and the other steadying one wing. This, of course, means having someone launch for you, but this should not be a problem as it is always advisable to have someone with you when flying.

Hand-Launch

I'll leave this to someone more experienced than me, as I've never tried my hand at this aspect of the hobby.

Aero-Tow

My own personal experience of this goes back some 8-9 years ago when a mate (flying a Senior Telemaster) and I (flying a 2 metre O/D glider) tried our hand at it with only moderate success. However, we did do enough to give us the basics of one method, which I will describe.

A nose-release on the glider is, in my opinion, mandatory!

Towing from a belly-hook can result in the tow-line wrapping around the nose of the glider if the glider overtakes, drops below the tug and then climbs while the line is slack. This can also happen under several other conditions, so the belly-hook tow position is fraught with danger!

If the tow-line is attached to the rear (tail) end of the tug (Again, a controllable release is mandatory.), then there is the problem of over-control on the part of the glider pilot, pulling the rear of the tug either up or down, causing severe speed variation and resultant jerking on the tug by the glider.

The best method we found to overcome this was to mount the tow-point on the tug at around 75% of the wing chord on the **TOP** of the aeroplane. This allows the glider to move up, down or sideways without unduly affecting the attitude or direction of the tug. However, this now poses another major problem!

Supposing the glider drops below the high-tow position that is normal with this set-up. The tow-line can now get wrapped around the tug's tail unit and even lock-up the elevator or rudder controls!!

The solution is relatively simple and involves fitting a wire brace from the top of the fin to the starboard tip of the tailplane, back underneath to the lowest point of the sub-fin (Tailwheels are **OUT**!), back to the port tip of the tailplane, and then finishing back at the tip of the fin! This will allow the tow-line to slide around the tail unit of the tug without fouling the controls.

Good co-operation and understanding between the tug and glider pilots is essential! Each must tell the other what control input and **HOW MUCH** he is going to use **BEFORE** initiation of said input and, wherever possible, these must be minimal (e.g., turns to be wide and gentle and changes of attitude also to be minimal by the tug pilot). The glider pilot must, at all times, attempt to stay slightly above the tug out of the slip-stream, and turn **WIDER** than the tug, as turning inside the tug will usually lead to loss of tow-line tension and resultant jerking as the slack is taken up.

Finally, a set of procedures for release **MUST** be adopted and the full-size technique of the glider climbing, turning right and releasing while the tug dives and turns to the left will give maximum separation in minimum time.

Bungee (Hi-Start)

This is probably the most commonly used method of launching a thermal glider for sport/fun flying, but is a no-no for competition because of the problem of line crosses when the line falls back to the ground, but a discussion of launching technique is certainly in order for the benefit of the non-competition oriented modeller.

After the Hi-start itself, the next most important component is a **releasable tow-hook!!!** I have seen too many models (my own included!) written off by being dragged across the ground, shedding pieces along the way, after a launch failure! The releasable tow-hook will not always save a model from damage due to a bad launch (stall on the line or whatever), but it will allow the pilot to release all that energy stored in the stretched bungee from off the model before it strikes the ground, thereby limiting the damage to just the crash!

The actual launching technique is to stretch the bungee to around 3 times its length (100 ft. of bungee + 300 ft. (?) nylon line), i.e. by 200 ft., launch by actually throwing it into the air in around a 30° nose-up attitude as though you were launching a hand-launch glider, and then gradually feeding in "up" elevator **AFTER THE MODEL HAS ATTAINED AT LEAST 60/70 FT. ALTITUDE** until full "up" elevator is selected when the model is around 3/4 of the way to the top. Feeding in "up" elevator too early can result in a stall on the line with the afore-mentioned disastrous results.

Tow-hook position is critical if launch height is to be maximised!

The usual position is that the angle formed by a line through the tow-hook and the centre of gravity and a line vertically through the C. of G. should be around 10° to 15°, but I **always** start off with the hook further forward than this and leave it there until the model has been fully tuned and the C. of G. position finalised.

This results in a fairly flat launch which is safe, but I then start moving the tow-hook back until I reach the point where the model launches almost straight up. However, care must be taken, as moving it back too far will result in a snap stall.

Another technique I have seen used very successfully by a top pilot, is to have the tow-hook slightly **BEHIND** the C. of G. and fly the model up with "down" elevator in the early stages, but I don't recommend this unless the pilot is very skilled and has fast reflexes.

By utilising the "up" elevator technique, coupled with the tow-hook marginally in front of the C. of G., the bungee can actually be stretched considerably in a brisk breeze, thereby gaining a lot of extra height before coming off the line. This is where, too, the releasable tow-hook is an advantage, as otherwise the model has to be dived and then pulled up into a climb to release the model from the line. I have found that an excellent adjustable tow-hook that comes off the line easily, can be made from a screw-hook available from the hardware store. Re-bend it as shown and screw it into a hardwood block securely glued inside the fuselage. (See Figure 1.)

Winch

Now here is where I will probably start a controversy!!

My experience with winch launching over the past 10 (or more) years, is that **braided line is a NO-NO!!!**

In Australia, where **ALL** R/C glider competitions (except F3J) use winches (with the **occasional** hand-tow) and are run to a group scoring system (If ye Editor gets enough inquires, I'll set out this system for a future *RCSD* issue.), we gave up on braided lines and went to nylon monofilament line many years ago. Braided line is never seen on the flying field at all, now!

Why?

Well, let's say the wind is around 12 to 15 knots. (I rarely seem to find any other flying conditions!!) So, you've ballasted the bird up to handle these conditions. You take up slack in the line and run the winch up to get sufficient line tension for the launch. Now, the moment of truth is here! The braided line has **NO STRETCH**, so it cannot store energy and, if the model is released now, without **IMMEDIATELY** applying power to the winch, the model will only travel a few feet before the tension is gone from the line and it drops off the tow-hook!! If, however, this initial danger is averted through either luck or skill, further danger awaits.

Let us suppose the model is about 1/3 of the way through the launch and a sudden 20/25 MPH gust comes through. There being no stretch capacity in the braided line, **ALL THIS SUDDEN SHOCK HAS TO BE ABSORBED BY THE MODEL!!** This puts a tremendous load on the wings and wing joiners (if used).

However, the nylon monofilament handles and overcomes both of these problem areas. In the case of the initial launch, it stretches and stores this considerable energy so that there is no **sudden** loss of power in the early stage. Then it will once more stretch to absorb a large portion of the energy imparted by the sudden gust, thereby considerably reducing the load on the wings of the model. A further "bonus" is that this stored energy can now be converted to extra launch height in two ways.

1) The winch does not need to be run as much because this energy "stolen" from the gust of wind can now be transfered to the model, so less line is wound in.
2) The stored energy in the stretched line at the top of the launch can now be converted to height by "pinging" the model off the line in the manner mentioned in the bungee launch technique.

The size and breaking strain of the monofilament line has to be selected according to the size and type of model to be launched. For example, a 2 meter model is not going to exert anything like the load on the line that a fully ballasted F3B bird will, so a much lighter line can be used for the former than that needed for the other. Also, as the model has to carry the weight of the line during the

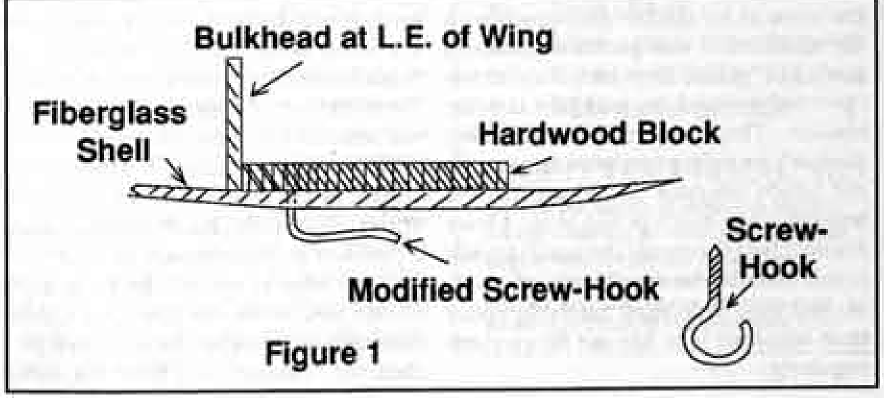


Figure 1

launch and the stronger (Read, thicker!) line creates more line drag, the 2 meter and lighter ("floater") models need a finer line in order to attain maximum height off the launch.

Typically, the line sizes vary from around 45 lb. to 100 lb. breaking strain, but I have found that a 70 lb. line gives me a good launch height on my 2 meter "Scimitar" and "Dragonfly" models and will also withstand the load of my 120" Open Class "Airborne 88'er" ballasted to 12 ozs./sq. ft. when launched in 15 knot winds.

The ideal situation, then, is to have the winch set up to accept different drums with different strength lines on them. This gives a bonus as well, because it is usually much quicker to change a drum and run out a fresh line than to untangle the snarl-up of a back-lash caused by a line break.

Another variation is to use a heavy line of around 120 lb. from the winch drum out to the turn-around pulley and back about 20 metres before joining it to the lighter launch line. This overcomes the likelyhood of breaking the line between the winch and the turn-around due to abrasion where this portion of the line runs over the ground. However, this does somewhat reduce the amount of stretch available, so I recommend this be done where launching is regularly done over bare or rough ground.

The actual launching technique is much the same as for the bungee launch with the addition of the pilot (or assistant) having to "pulse" the winch (I use a foot-operated switch.), to maintain the line tension. This is where "practice makes perfect", as only experience can enable the winch operator to know when the tension is too much or too little. I have found it best to operate the winch myself in this situation because I know my models and their launching needs far better than someone who has not flown them regularly.

By applying the techniques described for the bungee launch, our model arrives at the top of the launch with a bit of "up" elevator and here is where we now change the technique. The winch is now energised and a small amount of "down" elevator applied to the model to put it into a 20° to 30° angle of dive. With the winch running, the model immediately accelerates and, as soon as sufficient speed is attained (Usually, 1 to 2 seconds is all it takes.), "up" elevator is applied and the winch stopped. In this situation, an open tow-hook is far better than a closed one, as the model will come off the line cleanly without the risk of spoiling the resultant "zoom" off the top of the launch if the pilot mistimes the tow-hook release. A "clean" model with good penetration will gain an extra 50 foot or so of height in this manner but, once again, practice is very necessary and good understanding between the pilot and the winch operator is needed, too. Also, here is another good reason for the pilot to be the winch driver for his own launches.

Hand-Tow

This is probably the most misunderstood launching system of all!

Basically, it is very simple. One end of the line (175 metres long for F.A.I. events) is hooked onto the model's tow-hook in the same manner as for the bungee and winch systems while an assistant holds the other end and, on a signed (usually raising and lowering the model several times) from the pilot, starts running into the wind while the pilot launches the model as if for a bungee or winch launch. From then on, the pilot treats the launch the same as for a bungee launch.

However, the "runner" has the responsibility in this case of keeping up the air speed of the model, but this is not as great a problem as is commonly believed.

If the wind speed is 5 knots or more (And, how often do you find lighter breezes than this other than on the slope?) then the "runner" will find that, other

than for the initial 15 - 20 yards, he does not have to run very fast at all and that he will even, very often, stand still or actually walk back towards the model to keep the line tension (nylon monofilament, of course) steady. It is quite common in Australia to see F3B models launched by hand-tow in winds of around 10 - 12 knots!

I mentioned that the hand-toss is once again nylon monofilament and the line size can be less for this system than the winch size because the "runner" has full feel of the tension all the time and can actually "play" the model like a fish as he feels the tension increase or decrease.

When the model is nearing the top of the launch (or even in light breezes) the pilot **MUST PULL IN A FAIR DEGREE OF "UP" ELEVATOR** to help maintain line tension and save his "runner" energy. Then, when the model is directly overhead, the "runner" signals to the pilot's helper (usually by holding his free hand above his head) and the pilot can then "ping" off the top by releasing his tow-hook or diving and climbing as previously mentioned.

It is necessary, too, to have a helper alongside the pilot who continuously tells the pilot what the "runner" is doing because he then knows whether to pull in a bit more "up" or ease off to reduce the line tension.

After the model has released, the "runner" must wind in the tow-line to prevent line crosses, so the line has to be attached to a hand-winch. These are available commercially or can easily be made from a small hand-grinder and with a handle attached to the base and a small drum and line guide replacing the grinding wheel.

Well, I've rambled on a lot more than I had originally intended, but this is a very complex subject and I'm sure that a lot of *RCSD* readers have other ideas on launching techniques that they will, hopefully, share with us all.

One final warning, though, is in order I feel.

The system that is in common use in the U.S.A. of using a retrieval system for the line was tried and discarded in Australia years ago as being too much of a handicap to attaining maximum launch heights. The retrieval line, no matter how light, means extra load has to be lifted by the model and there is also extra drag from it. Also, this line tends to drag the tow-line off the tow-hook on the model in a steep launch.

If the Editor receives sufficient enquiries, I will submit an article on this aspect of the launch system as we operate in Oz with a description and sketches of how to build a suitable winch complete with an automatic **MECHANICAL** line tensioner.

Green Air! ■

Carbon Spars

...by Graham Woods
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Graphite Spars

Many people will have heard of graphite spars but few will have made them, thinking the process too difficult. There are really two ways of introducing such spars into a foam wing; the first by preparing the spars outside the wing and the second, making the spars in situ.

If you are to have the spars without an integral graphite shear web then they are just prepared by laying up rovings in a 'mould' of the size you want to produce the solid material and then using it as you would a piece of spruce, say.

The method I'm going to describe here is the 'in situ' method and is entirely suitable for blue foam/grayboard before vacuum bagging.

Cutting a Groove

Producing an 'I' shaped spar using graphite fibre rovings means that we need to create a pair of shallow indents in the top and bottom surface of the foam to take the rovings.

This can be done in two ways: either by using a small loop of wire, heated by an electric current (like a wing cutting bow), running it along a straight edge cutting out a 'sliver' of the surface foam or by sanding out the indents with a specially made sanding block.

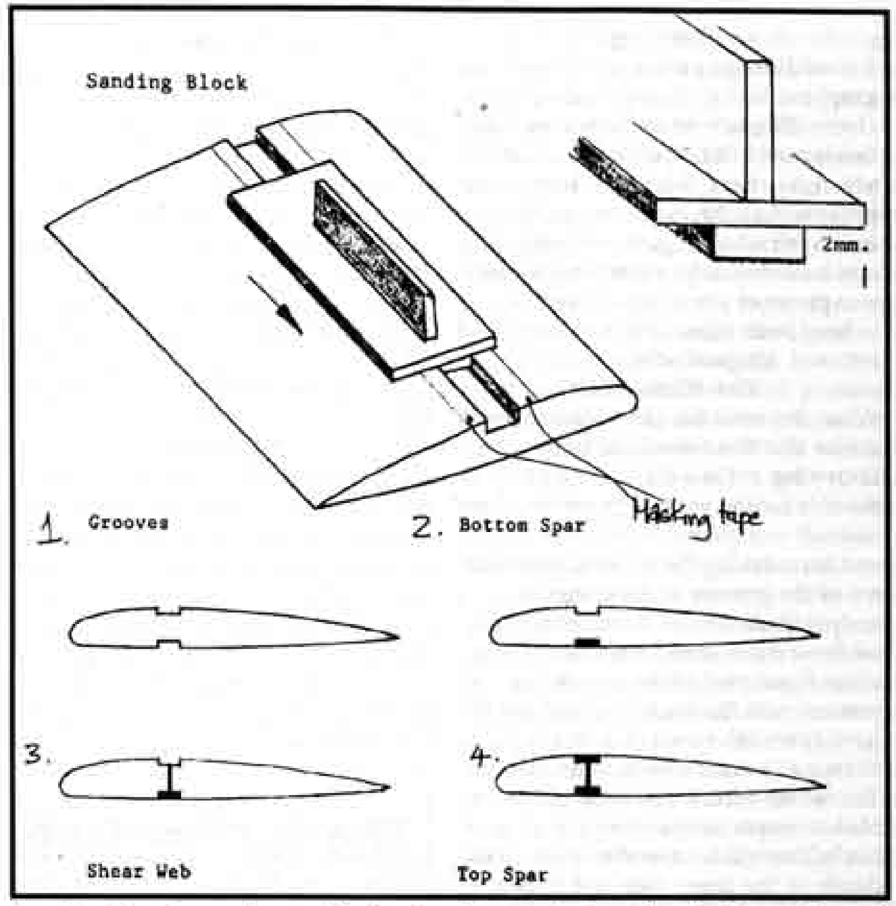
In either case it is very important to ensure that the indents have an even depth along their length, else filling with rovings will cause some problems, i.e., excess depth and shallowness in places. Using the electric method is quite straightforward but such a small loop tends to get rather hot and burns its holder and fingers too! An alternative which I have tried and works, is to use a Weller type soldering iron and put a loop of suitable wire into the terminals.

The 'special' sanding block is simply made using any wood you may have to hand. See diagram. It is important that the first application of the block is done carefully and the groove regularly dusted to remove the foam dust; white foam will need the 'gentle touch' to ensure those 'balls' are not pulled from the foam, so a fine paper is called for. I might mention here that masking the slot either side is a good idea since the block will eventually ground itself on the section surface. In this way an even depth of sanding should be achieved along the length of the wing panel.

(You can start either with the top or bottom surface, it doesn't seem to matter, although first-timers would probably be advised to start on the bottom since mistakes here are less noticeable to fellow modellers!)

Graphite Rovings

Graphite rovings are available in a variety of thicknesses 3, 6, 12, 24, 40K - the K denoting the number of fibres, in thousands, per tow, 12K being the most generally available. Such a thickness, wetted with resin, has a cross-sectional area of around 1.4mm^2 so a spar of, say, 10mm wide and 2mm deep would need something like 14



lengths of rovings and so on. Bearing in mind that the actual skin of the wing has some strength, two such spars and a shear web would probably give enough strength for a three metre model although this is something for you to decide for yourself; here I am only concerned with the method. It is better to err on the excess side though, just in case!

Sticky Moments

Cut your lengths of rovings first, oversize, and a couple extra, too. Don some nitrile rubber gloves and mix plenty of resin; there's quite a bit of wasteage.

I wet the rovings by just running the rovings through the resin and then using thumb and first two fingers to squeeze out the excess. An alternate way is to lay the tows in the slot, one by one, and wet them out using a brush. Some others of you may prefer to make an elaborate 'machine' with rollers, etc., but I prefer to do it by hand. The rovings can either be laid singly or in groups; however you decide to do it, try to lay the tows evenly.

However careful you have been, you are likely to find that in some places you have overfilled and in others, underfilled; let me say that it is easier to fill gaps with micro-balloons and resin than to try and sand hard high points against soft foam. So it is better to underfill the groove! A layer of Mylar, Melinex, polythene or old Solarfilm is laid over the wet spar, to prevent sticking, and the outers replaced before the resin/spar is set aside to lay FLAT while the resin cures. (Don't forget to remove the masking tape.)

Webbing

It would be a pity to use ply, better to use graphite. You will need some graphite cloth $200g.m^{-2}$ to make the webbing, two layers in fact. You can use odd pieces you may have left over from other projects. Lay the cloth up on a flat surface, with release agent, wet with resin, and leave to set. You can put it between two pieces of plastic if you wish.

Sand both sides, after hardening and removal, for good adhesion.

The Shear Web

When the resin has gone hard you will notice that the foam core is no longer floppy but stiffer. Now is the time to cut the slot for the vertical graphite shear web.

After marking the position in the centre of the groove, make a cut with a scalpel blade. Tape the core on the outer while you are doing this since you are almost going to cut the core in half. As you cut with the blade you will feel the hard spar under the knife; at this point change to a razor saw to widen the cut. The width of this cut depends on the blade so be prepared to change to a thicker blade. You will now need to work out the depth of the shear web and it doesn't matter if it intrudes in the other slot by a millimetre or so, better if it does in fact. You can now cut the shear web to size using a heavy duty Stanley knife.

The Second Spar

When you are satisfied with the shear web you have prepared, cut your next set of rovings for you are going to insert the web and lay the second spar together. Try and get some resin in the slot for the web and brush the web with resin and insert it, then lay up the second spar in the same way as you did the first.

It is very important now to replace the core in the outers and lay them FLAT since the core is only 'hanging' in place and the outers will ensure the section is true.

Finishing

On removal of the panel you will notice straight away how stiff the floppy foam panel has become. You will undoubtedly see some hollows on the spar surfaces which can be filled with resin and microballoons, then with Fine Surface Polyfilla. Remember that any resin standing proud will be harder than the surrounding foam and extremely difficult to sand away, so be warned. ■

Flying in Wind and Weather

...By Martin Simons

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The model in turbulent air

When a model is in the air near the ground, it may run into a vortex at almost any time. If it is going in one direction, what it feels may be a 'gust' followed by a 'lull' with the associated wind direction changes, but if it happens to be heading in another direction when the vortex arrives, it feels a 'lull' followed by a 'gust'. This has little to do with whether the model is heading generally upwind, downwind or cross wind. The vortex is travelling along in the general stream, but it is producing its own circulation and it is the model's position and heading with respect to this very local whirl, that determines the result.

Imagine two models in line abreast, separated by a hundred feet, both flying upwind on their way in to land. If a vortex passes somewhere between them, one will meet a gust from one side, then a lull, the other will run into a lull, then a gust from the other side. If they had been flying downwind, under similar circumstances, their experiences would be in the reverse order, but still a lull with a gust for one, a gust with a lull for the other.

Much the same applies if the model is heading across wind, or at any angle. For a short time, the vortex dominates and the model feels the effects, irrespective of heading. Flying with or against the wind, or across the stream at some angle, does not make it more or less likely that a gust or a lull, or a side gust, will be felt.

All practical sailplanes (and powered aeroplanes) have a certain built-in weathercock stability. Because of the vertical stabiliser (or V tail), when a gust strikes from any direction, they will tend to yaw round to face more directly into that gust. However, as just emphasised, since most gusts arise because of vortices, there is no consistent tendency for a model to turn to face the mainstream wind direction. It will yaw into any gust which strikes it, and as many will come from one direction as from another, whichever way the model happens to be flying at the time. (This will be considered again later.) What can be said is that when a gust strikes, the model will tend to yaw to face it more directly, head on (Figure 6).

In Figure 7, a glider is shown in level flight. It is assumed here that the model is in trim to begin with. That is, the total of all the pitching forces has been balanced out by positioning the elevator and other controls. The total aerodynamic lift exactly supports the weight and all pitching forces, whatever their origin (wing camber, drag, flaps, etc.) have been brought into balance by suitable positioning of the elevator so there is no ten-

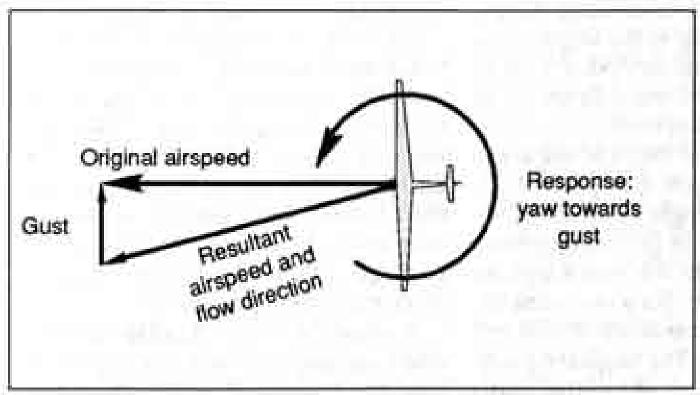

Figure 6 Weathercock stability

dency for the model to pitch either nose up or nose down so long as it is in smooth air.

Suppose that there is a moderate gust which comes from directly in front of the model, or which, because of its weathercock stability, the sailplane yaws to face directly. The arrow representing the speed of the model through the air is shown, and the gust is indicated by an arrow pointing the other way, the speed of the gust suggested by the length of this arrow. As the gust arrives, the model briefly feels an increase of airspeed. The effect is not instantaneous because, as mentioned, gusts are not 'sharp edged', but the change is often too quick for the pilot to take action until after the worst moment has passed. The model's mass inertia resists any change of its equilibrium. Momentarily the air is moving over the wings faster than before.

Although it may be thought that a gust from directly in front will affect the wing (of an orthodox model) before reaching the tailplane, the time interval is so brief as to be virtually negligible. Both wing and tail (or foreplane and mainplane of a canard design) will feel the increased speed of flow practically simultaneously. The total combined lift of a wing and tail combination acts at the aerodynamic centre of the aircraft. This point is fixed for all practical purposes. Naturally, the aerodynamic centre (also often called the neutral point) lies closer to the larger lifting surface, and in the orthodox type of model, will be very much closer to the wing than to the tailplane.

The magnitude of the lift acting at this point depends upon the speed of the airflow and the angle of attack of the aircraft as a whole. A gust coming more or less 'head on' in the way supposed will increase the lift. For a short time the total of upward forces on the aircraft will exceed the weight. The original equilibrium situation is thus upset and the model will be seen to rise sharply.

With a stable aircraft, the aerodynamic centre of the complete aircraft (wing and stabiliser) is aft of the centre of gravity. The secondary effect of the sudden increase of lift **behind the c.g.**, is therefore to cause a **nose down** pitch following the initial upward disturbance. This is the model's inbuilt stability attempting to restore normal equilibrium, but it cannot do so instantly. If the pilot does nothing, the initial upset is normally followed by a nose down correction which goes a little too far, then the model sets out to correct itself again with a nose up motion, which also goes a little too far, and there follows a series of dynamic oscillations, nose up and nose down, with associated rising and falling of the flight path and variations of airspeed.

The so-called 'phugoids' may damp down gradually given sufficient time. A very efficient sailplane with low drag may not damp down the oscillations quickly or at all, since the damping depends to quite a large extent on the variation of total drag with airspeed. Such an aircraft exhibits slight dynamic instability. (A pendulum with a very free, 'low drag' pivot, will swing much longer than one with a poor bearing, and only a very slight occasional push will be enough to keep it swinging indefinitely.) In any case, more than likely, on a windy day, another disturbance will strike the model and set the oscillations going again.

What is more important, is that if the initial disturbance is severe, the wing may stall. Obviously if this happens near the ground, a crash is likely. The sailplane is coming in to land, when the likelihood of turbulence is greatest, and there is least height available to recover from a stall. This has to be added to the problems associated with the wind gradient, mentioned previously.

The model may enter a lull at any time, when heading into wind or any other way. Now airspeed briefly decreases. Lift at the aerodynamic centre of the

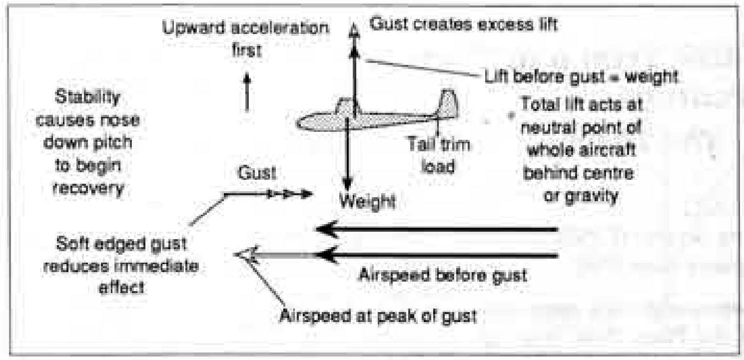

Figure 7 Sailplane in a head on gust

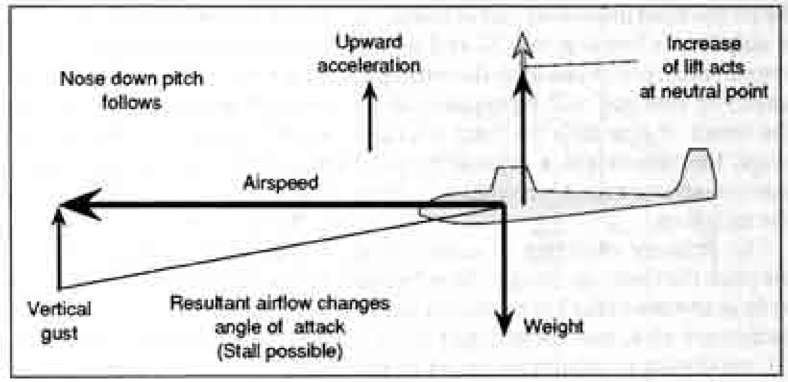

Figure 8 Sailplane in vertical gust

sailplane becomes less than the weight and the sailplane is seen to lose height rather sharply. If the lull is severe, the airspeed of the model may fall below stalling speed and, if this occurs very near the ground, that is that. But if there is a little height to spare, since the centre of gravity is ahead of the aerodynamic centre, stability tends to make a correction. Again, an oscillating recovery follows. The general effect of either a gust or a lull, to the pilot on the ground, is therefore very similar. Gusts and lulls produce nose up and nose down pitching motions.

Vertical gusts

When a model flies into a vertical gust, or upcurrent, as the arrows indicate in Figure 8, even if the upgust itself is at ninety degrees to the line of flight, the resultant flow actually striking the model is inclined upward at an angle. It is a bad mistake to suppose that on entering an upcurrent, the model suddenly meets flow from directly underneath. There is an increase in the angle of attack and hence an increase in lift. There is also a slight increase in airspeed. If the upgust is very powerful, the increase in angle of attack may be enough to stall the wing. A more normal result is a fairly sudden increase in lift force which, as before, creates an imbalanced situation with an excess of lift over weight and hence a sharp upward acceleration. A stable model will try to correct this by returning the angle of attack to normal, pitching nose down again.

Correspondingly, a down gust causes a reduction of angle of attack, a decrease in airspeed and a downward motion, followed by a corrective nose up pitch, very much the same as entering a lull. ■

CG, Elevator Trim and Decalage

Part 1 - The Theory

...by Frank Deis
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Pikes Peak Soaring Society (PPSS)

(This three part series originally appeared in the Journal of the Pikes Peak Soaring Society, *The Spoiler*, and is reprinted with the permission of Frank Deis.)

By far the most important part of trimming a sailplane is locating the CG and setting the elevator trim. If you miss the setting on anything else you will be aggravated by the result. If you miss the pitch trim settings, the results are a dramatic loss of performance or even an inability to control the sailplane.

The primary objective in establishing the pitch trim settings is to get the sailplane to fly at any one of the key pitch trim points (minimum sink, max lift to drag ratio (L/D), maximum or minimum speed or the limits of the useful speed range) with your hands off the controls except for making only slight changes to the elevator trim settings. These six points are not real easy to find for a given sailplane, but they are not impossible to find either, so hang in here for awhile.

Let's start with the simple case first and just talk about the wing. Figure 1 shows the lift and drag data for the Selig 3021 airfoil on my Falcon 880. (If you have "Soartech Note 8" you can do this for almost any airfoil.) From the lift and drag data you can draw the "L/D" chart. Simply pick an angle of attack and read the coefficient of lift (CL) and the coefficient (C_D) corresponding to it from the charts, divide the C_L by the C_D (This gives the lift to drag ratio.), and plot it on a chart.

Figure 1 shows that the wing will fly the greatest distance if flown at an angle of attack of 7.3 degrees. Pretty simple so far?

I repeated these calculations for two other very different airfoils (all for Reynolds Numbers of about 100,000): the Eppler 205 and the old Clark-Y. The results are shown in Figure 2. Note that the maximum lift to drag ratio for the wing alone typically occurs between 7 and 9 degrees.

The next question is how to force the wing to fly at this angle. That is what the rest of the sailplane is for (fuselage and horizontal stabilizer). Because the horizontal stabilizer is on a long lever arm - the fuselage - it is reasonable to assume that its angle of attack tends toward zero. (This is not strictly true as we will discuss later, but it is a good assumption for the time being.) The wing is therefore forced to fly at an angle of attack equal to the angular difference between the wing and the horizontal stabilizer. This angle is called the decalage and this is why it is so important.

If the world were a simple place, we could set the decalage equal to the angle of attack corresponding to, for example, the maximum L/D from Figure 2 and move the center of gravity (CG) around until the sailplane flew straight and level and it would be in perfect trim! Don't try this because you will likely demolish the sailplane before you get the CG set and if you do get the CG set it will be in the wrong place.

A number of little things mess up this ideal world. First of all, sailplanes don't consist entirely of infinite span wings. They have wing tips, fuselage, and horizontal and vertical stabilizers, as well. Furthermore, the lift and drag characteristics change with airspeed (or more properly, with Reynolds Number). These all combine to change the angle of attack corresponding to the key pitch trim points so that they don't correspond exactly to the values for the wing alone. To find the correct values for my Falcon 880, I loaded its characteristics into the MAXSOAR performance analysis computer program on my Macintosh II. (MAXSOAR is very good, by the way.) I then searched around in the Hypercard scripts and fields until I found

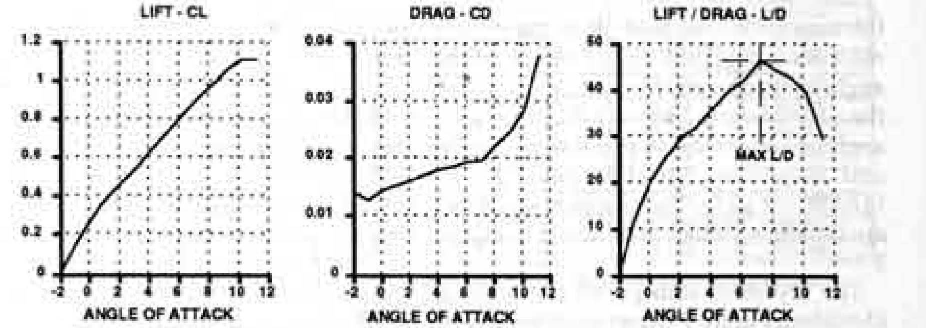


FIGURE 1 LIFT TO DRAG CALCULATIONS FOR SELIG 3021 AIRFOIL

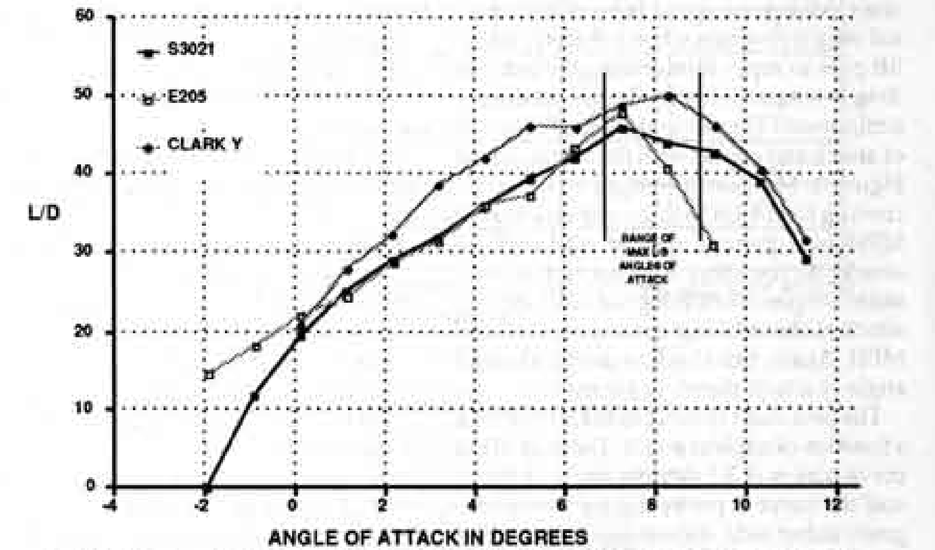


FIGURE 2 TYPICAL ANGLE OF ATTACK FOR MAXIMUM LIFT TO DRAG RATIO FOR SEVERAL COMMON AIRFOILS

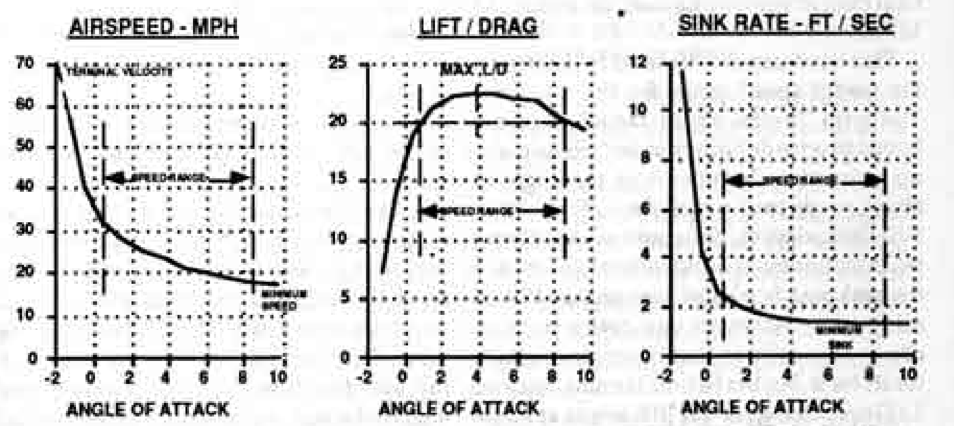


FIGURE 3 PERFORMANCE PARAMETER PLOTS FOR THE FALCON 880 AS TAKEN FROM MAXSOAR

the data table that held all of the performance information I needed except for the angle of attack data. For that I had to go to the airfoil data in "Soartech 8" and get the angles of attack corresponding to the C_L and Reynolds Number data in the MAXSOAR table. The results of this effort are shown in Table 1 and plotted in Figure 3.

The key pitch trim points can now be identified. Figure 3 shows the three charts taken from the table. First is the airspeed chart. Maximum speed (also called terminal velocity) occurs when the coefficient of lift goes to zero - thus driving the induced drag to zero and, hence, the overall drag to a minimum. This occurs at -2 degrees angle of attack and checks with the airfoil data in Figure 1. My Falcon (weight = 80 oz), according to MAXSOAR, should do about 70 MPH in a vertical dive at this angle of attack. At the other extreme is the minimum airspeed bottoming out at an angle of attack of about 10 degrees and a speed of 17 MPH. Again, this checks out with the stall angle of attack shown in Figure 1.

The next chart shows Lift to Drag ratio as a function of angle of attack. The peak of the curve occurs at 3.7 degrees angle of attack and the curve is pretty flat for several degrees either side, so missing it by a little won't hurt much. Note that the Falcon Flies almost 40 % faster at the maximum L/D trim than at minimum speed, i.e. about 23.5 MPH.

This chart can also be used to determine the useful speed range for the sailplane. The term "useful speed range" does not have a precise definition so feel free to make up your own. I define it as the angle of attack range over which the L/D is within 10% of maximum. You could use a different percentage or you could define it in terms of the sink rate (e.g., sink rate within 10% of minimum). However you define it, these charts allow you to find the angle of attack limits for it. For the Falcon, the sink rate and L/D only change about 10% across an angle of attack range of 1 to 8.3 degrees, but the airspeed changes about 67% from one extreme to the other. Thus, the Falcon can be flown at a variety of trims within this range with minimal loss of performance. Outside this range, things deteriorate rapidly.

The last chart is the sink rate plot. It indicates that minimum sink rate occurs at 7.1 degrees angle of attack and an airspeed of 21.5 MPH, just slightly slower than the maximum L/D. So, I don't slow the Falcon down much when I get into a thermal. (I do increase the camber a degree or two because I just cannot stand thermaling at high speed!)

I repeated this process for the Pantara with its Eppler 205 airfoil and the results are summarized in Table 2 along with the Falcon results.

So what should you remember from all this? The following pretty well captures the story:

- Maximum speed occurs at a slight negative angle of attack.
- Maximum L/D occurs around 4 degrees. (This goes as high as 6 degrees on airfoils like the Clark Y.)
- Minimum sink occurs at an angle of attack 3 to 4 degrees higher than maximum L/D.
- Minimum speed occurs 3 to 4 degrees higher than minimum sink.
- Total elevator trim range required is 10 - 12 degrees.
- Missing these settings by a degree or so is not a big deal.

If we could find any one of these points, we could easily get the trim settings for the others.

Recall that we were talking about things in the real world that mess up the ideal world.

We have covered the differences due to finite span, Reynolds Number, etc. The other big affect is caused by the downwash off the wing. The airflow actually turns downward about three degrees as it passes over the wing. This varies a little from airfoil to airfoil and for different wing loadings and angles of attack, but it stays pretty close to 3 degrees as a rule of thumb when the wing is generating lift. This means that the stabilizer encounters the air at a -3 degree angle even if it measures parallel to the wing cord. (This is not necessarily true for "T" tails.) Thus, if the wing and stabilizer cords are parallel (i.e., zero decalage), the stabilizer will force the wing to fly at about a 3 degree angle of attack. (In effect, the first 3 degrees of decalage is free.) This is still less than the 4 to 6 degree angle of attack we are looking for maximum L/D. If the decalage angle is set to the angle of attack desired minus 3 degrees it will be in the ball park. The exact number depends on lots of things but it usually works out to be 1 to 3 degrees.

Table 3 shows the decalage angles I measured on several sailplanes belonging to club members. These may not all be in perfect trim, but they do perform to their owner's satisfaction. Notice that the measured decalage angles are typically 1 to 3 degrees. Amazing isn't it!!! This stuff actually works!

Part II deals with the practical applications of all this including the dive test. ■

ALPHA	CL	CD	RN	SINK RATE	L/D	AIRSPEED
-1.250	0.100	0.014	346102.000	11.630	7.169	56.900
-0.400	0.200	0.014	244731.000	4.230	13.938	40.200
0.450	0.300	0.016	199822.000	2.540	18.928	32.069
1.450	0.400	0.019	173051.000	1.975	21.109	28.400
2.600	0.500	0.023	154782.000	1.682	22.174	25.400
3.700	0.600	0.027	141296.000	1.523	22.348	23.200
4.750	0.700	0.031	130814.000	1.412	22.329	21.500
5.900	0.800	0.038	122366.000	1.343	21.948	20.100
7.100	0.900	0.042	115367.000	1.283	21.661	19.000
8.300	1.000	0.049	109447.000	1.301	20.264	18.000
9.700	1.070	0.056	105806.000	1.303	19.193	17.400

TABLE 1 PERFORMANCE PARAMETER FOR THE FALCON 880 AS TAKEN FROM MAXSOAR

	FALCON	PANTARA
MAX SPEED	-2	-2
HIGH END - SPEED RANGE	1	1
MAX L/D	4.25	3.7
MIN SINK	7.1	8.2
LOW END - SPEED RANGE	8.3	9
MIN SPEED	10.3	11

TABLE 2 ANGLES OF ATTACK CORRESPONDING TO THE SIX KEY PITCH TRIM POINTS

SAILPLANE NAME	DECALAGE ANGLE
ASW 19	2.00
CHEETAH	0.75
FALCON 880	3.00
GENTLE LADY	1.00
ICON	3.00
FLOATER	3.00
LEGIONAIR	2.00
OLYMPIC	3.00

SAILPLANE NAME	DECALAGE ANGLE
OLYMPIC	3.00
PANTARA	1.50
RISER	3.50
SAGIETTA	2.00
SHUTTLE	3.00
SYNERGY	1.50
TFB	2.50

TABLE 3 TYPICAL DECALAGE ANGLES FOR CLUB SAILPLANES

R/C Soaring Resources

Do you hold seminars and workshops? Would you like to be included as a contact to answer questions on soaring sites or contests in your area? If so, please contact *RCSD*. Our address and telephone numbers are on page 1.

Seminars & Workshops

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

Free instruction for beginners on construction and flight techniques. Sunday - Thursday. Bob Welch, 1247B Manet Drive, Sunnyvale, California 94087; (408) 749-1279

Fall & Winter 1 day seminars on composite construction techniques. Free with purchase of Weston Aerodesign plan set ($35.00) or kit. Frank Weston, 944 Placid Ct., Arnold, Maryland 21012; (301) 757-5199

Reference Material

Madison Area Radio Control Society (M.A.R.C.S.) *National Sailplane Symposium Proceedings*, 2 day conference, on the subject and direction of soaring. 1983 for $9.00, 1984 for $9.00, 1985 for $11.00, 1986 for $10.00, 1987 for $10.00, 1988 for $11.00, 1989 for $12.00. Delivery in U.S.A.is $3.00 per copy. Outside U.S.A. is $6.00 per copy. Set of 8 sent UPS in U.S.A. for $75.00. Walt Seaborg, 1517 Forest Glen Road, Oregon, WI. 53575

BBS

BBS: Slope SOAR, Southern California; (213) 866-0924, 8-N-1

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

Reference listings of *RCSD* articles & advertisers from January, 1984. Database files from a free 24 hour a day BBS. 8-N-1

Bear's Cave, (414) 727-1605, Neenah, Wisconsin, U.S.A., System Operator: Andrew Meyer

Reference listing is updated by Lee Murray. If unable to access BBS, disks may be obtained from Lee. Disks: $10 in IBM PC/PS-2 (Text or MS-Works Database), MacIntosh (Test File), Apple II (Appleworks 2.0) formats.

Lee Murray, 1300 Bay Ridge Road, Appleton, Wisconsin, 54915 U.S.A.; (414) 731-4848

Contacts & Special Interest Groups

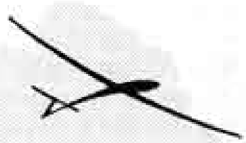
California - California Slope Racers, John Dvorak, 1638 Farringdon Court, San Jose, California 95127 U.S.A., (408) 259-4205.

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

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

Texas - Texas Soaring Conference (Texas, Oklahoma, New Mexico, Louisiana, Arkansas), Gordon Jones (Contact), 214 Sunflower Drive, Garland, Texas 75041 U.S.A., (214) 840-8116.

Maryland - Baltimore Area Soaring Society, Steve Pasierb (President), 21 Redare Court, Baltimore, Maryland 21234 U.S.A., (410) 661-6641



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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.

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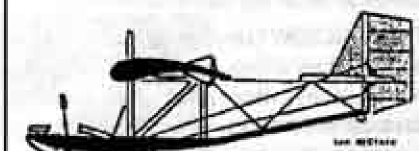
Wilmington,OH45177
(513)382-4612

T.W.I.T.T.

(The Wing Is The Thing)

T.W.I.T.T. is an organization of engineers, scientists, pilots, sailplane enthusiasts, model builders and many other persons having an interest in flying wing/tailless aircraft technology. Write to T.W.I.T.T., P.O. Box 20430, El Cajon, CA 92021 to find out how you can participate.

Send SASE for membership application and flyer: "What is T.W.I.T.T." or, send $2.00 for full information package including one back issue of our newsletter, postpaid. Full membership is $15.00 per year and includes twelve issues of the newsletter. Back issues of newsletter are $.75 each, postpaid.



The Vintage Sailplane Association

VSA is a very dedicated group of soaring enthusiasts who are keeping our gliding history and heritage alive by building, restoring and flying military and civilian gliders from the past, some more than fifty years old. Several vintage glider meets are held each year. Members include modellers, pilot veterans, aviation historians and other aviation enthusiasts from all continents of the world. VSA publishes the quarterly magazine BUNGEE CORD. Sample issue $1.-. Membership $10.- per year. For more information write:

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

NEW PRODUCTS

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

Landing Skids

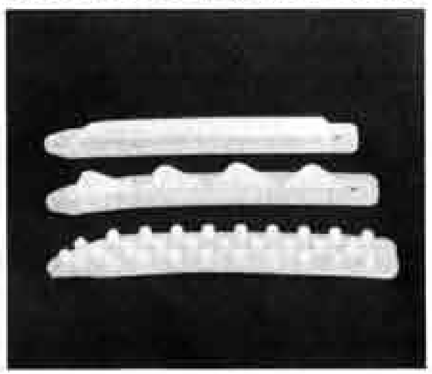
...from Tim McCann

I now have three skid designs to meet meet R/C sailplane applications. All three designs are INJECTION MOLDED (not poured) of tough, lightweight, virtually unbreakable polyethylene plastic and provide an alternative to individual "teeth" which are difficult to attach and frequently break off. All three skids are PRE-DRILLED for easy attachment.

The "SHARKSTOOTH" skid was designed with the competition flyer in mind. This one-piece skid is effective on most landing surfaces and protects the bottom of aircraft from damage. First introduced in 1986, the "SHARKSTOOTH" skid continues to be in big demand.

The "KNOBBY" one-piece skid is a new design that offers excellent stopping power, easy attachment, and landing damage protection. This skid was designed for the rigors of competition flying with the performance of "teeth" in a toothless design.

The "SMOOTH" skid provides excellent protection from landing damage. The low aerodynamic profile and superior abrasion resistance make this skid perfect for cross-country sailplanes, slope planes, electrics or any plane that makes belly landings.



The "SHARKSTOOTH", "KNOBBY", and "SMOOTH" landing skids are available postage paid (in the USA) for $5.95 ea. from Tim McCann, P.O. Box 8155, Stockton, CA 95208. ■

X-347 Modification

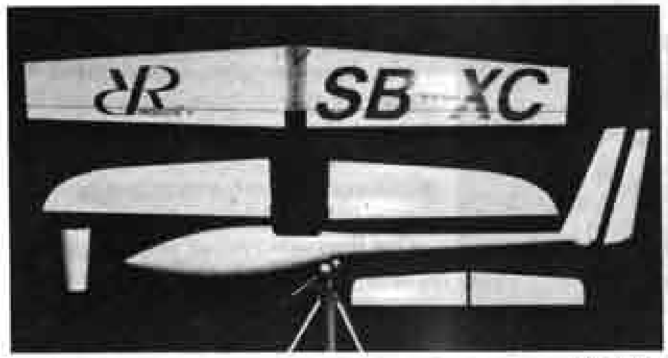
...from Mid Columbia R/C

JR Radios now offers a modification to the X-347. This modification is a three position switch for trailing edge control in addition to the standard two position CROW switch. The switch option allows the user to program the radio for functions such as trailing edge control or special flap settings (i.e., a launch setting, a thermal setting, and a zero setting). Again, the settings are programmable, so the user can decide what suits them best. Contact your JR dealer for further information. ■

SB - XC, A Rich Spicer Design

...from RnR Products

If you or your team has been considering a state of the art cross-country ship for '92, this is it. the SB-XC is a high performance cross-country sailplane using the latest RnR Products molding technologies. The SB-XC incorporates full camber changing of the flaps and ailerons which provides a maximum speed range, from coring the tightest thermals to outrunning the competition. The SB-XC utilizes the S2048 F3B airfoil section for an outstanding L/D ratio, critical to cross country competition.



Quick Assembly
Photo illustrated manual, 30 hours average building time, no painting required - all molded parts are pre-colored

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Molded Wings
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Molded Stabilizer
Unidirectional fiberglass skins over foam core, stabilizer pivot and drive tubes installed, high strength/weight ratio

Molded Fuselage
Epoxy/fiberglass, aerodynamic shape ample room for radio and telemetry gear, long tail moment for stability at altitude , scale appearance

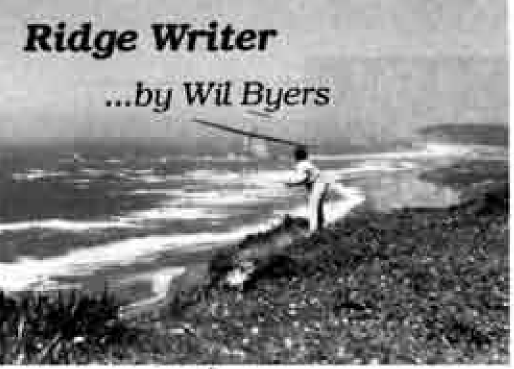
Specifications

Airfoil	S2048 fully cambered
Wing Span	180 in.
Wing Area	1656 Sq. In.
Weight	10.5 Lb.
Wing Loading	14.6 Ozs./Sq. Ft.

Fly the SB-XC and experience the best miles/dollar value of the only fully molded cross-country sailplane on the market, today! Price is $795.00. RnR Products, 1120 Wrigley Way, Milpitas, CA 95035; (408) WINGS 51. ■

Ridge Writer

...by Wil Byers



RT. 4 Box 9544, W. Richland, Washington 99352; (509) 627-5224 (7:00 PM - 10:00 PM weekdays, after 9:00 AM weekends)

Race Rules for Fairness

Slope soaring pilots are not known for their efforts in the contest arena. This is probably because slope soaring isn't a format that lends itself easily to contest organization. Further, not many slope enthusiasts put forward effort on behalf of contest organization. Who is to say if this is positive or negative for growth in the slope soaring community; it just appears to be the way it is.

However, over the past year and a half some members of the sloping community have attempted to promote slope racing. They are people such as Rich Beardsley of the California Slope Racers and John Dovorak of the South Bay Soaring Society. Other clubs have also been active in promoting slope racing including the Portland Area Soaring Society, the Seattle Area Slope Soarheads, the Tri-City Soarers, and more. Their efforts in 1991 were not without success and it appears that slope racing as a contest format is very viable.

The standard format here in the U.S.A. is that of racing man on man. This style of racing dictates that four models at a time race together per heat. It awards points based on 0 points for first place, 1 for second, 2 for third, 3 for fourth, 5 for did not finish (DNF), and 6 for did not start (DNS). This form of racing is a very exciting for spectators to watch. It is additionally sensational to participate in as a pilot. It does, however, have its drawbacks, because when this number of planes fly at race speed in the same lift they can and do collide. These collisions can be destructive to the models, the pilot's ego, and can sometimes be dangerous to those who spectate.

One final observation about this kind of contest format, is that it may not always provide a fair matrix for scoring. That is, sometimes pilots will scratch from a heat, will crash during the race, or will end up in a heat that does not have four racers in it because of an odd number of racers. Thus, the racers left in the race can, if the opportunity provides itself, relax somewhat and finish the race to pick up the points available. I.E., during a race two race models collide putting their pilots out of the heat. As a result the second place racer only need finish the race to pick up one point and a second place finish for the heat. This means that even if the model wasn't very fast it could still move up respectably in the standings because of the misfortune. Other factors come into play also such as psychology of who the race is with and etc., etc. Therefore, the question is, "What is a fair scoring system that will motivate pilots to push their models even when they are not being pushed by the competition of the heat?"

A number of ideas have come about because of this perceived need to improve the quality of racing. In this month's column we want to share a complete set of rules for slope racing that can offer an alternative to the four man style and its accompanying deficiency. Remember as you read through these rules that they offer an alternative that may or may not fit your club's needs, but are just food for thought.

Slope Racing Rules

1. **General**

A. A slope soaring race provides a contest format for as many as two R/C sailplanes on a closed course, at the same time.

1. The course length is no less than 500' and no greater than 800' long.
2. Pilots fly their models in a figure eight fashion around pylons, one at each end of the course, that designate the turn points.

2. **Basic Rules**

A. The start of racing commences when the Contest Director deems the lift is sufficient.

1. Sufficient meaning most, if not all, models can sustain flight and land in the designated landing area.
2. If the C.D. determines that all the flyable aircraft in a heat fail to complete the course because of poor lift, the entire heat is reflown.

B. Each contestant must have a co-pilot.

1. The co-pilot's function is to indicate to the pilot when the model has passed the pylon and provide assistance to the pilot.

C. A lap counter and flag-man is assigned each contestant.

1. The flag-man's function is to indicate when any portion of the model passes the pylon.
2. The lap counter counts laps and displays them for the co-pilot.
3. Flag-men provide an indication of when a model clears turns by dropping a colored flag that is unique to the model.
4. Turn cuts are indicated when the identifier flag is waved over the head of the flag person.

D. A pilot/co-pilot flying area is established by the C.D..

1. All pilots and co-pilots must stand within this area during the duration of the race.

E. A minimum number of laps in all heats is normally 6 or 8.

1. A lap is defined as one complete circuit of the course.
2. All heats in a round are of the same number of laps.

F. Gliders are launched one minute before the start of a race.

1. Gliders are identified to flag person by being held overhead.
2. Launches are immediately following the completion of the prior race.
3. An audible one minute "to start" countdown window is provided, the last fifteen seconds being in one second increments.
4. A model cannot cross the start/finish line before the countdown reaches zero.
5. If a model crosses the start/finish line prematurely, the pilot must restart.
   a. Restarts are accomplished by returning and re-entering the start line. Only then can the lap counter begin a lap count.

G. Pilots will be responsible for staging themselves and their models before their individual heat(s)!!!

1. There will be no launches allowed during the last thirty seconds prior to race start. As well, there will be no launches during a race.
2. Any model not launched before the first 30 seconds of the one minute countdown window will receive a DNS = 0 points.

H. Pylon cuts are not cause for reflights.

1. The first cut penalizes the pilot with an extra lap.
2. The second turn cut disqualifies the pilot for the individual race, resulting in a "Did Not Finish" (DNF) score for that heat.

I. All models must turn away from the slope during a race.

1. Immediate disqualification from the heat occurs when this rule is violated. The pilot in violation receives a "Did Not Start" DNS score.
2. Any pilot flying their race model intentionally over the head of a flag person is disqualified from the heat and receives a DNS.

J. A contestant's model finishes a race when it crosses the start/finish line.

1. It must cross the line while flying in the same direction as it did during the start.

2. The model must complete the required number of laps for that heat.

L. Race models must have two radio frequencies available to eliminate frequency conflicts.

1. The contest director determines what frequency a model can use for any race heat.

3. **MODEL CLASSIFICATION**

A. **UNLIMITED CLASS**

1. Models are restricted to a maximum projected surface area (wing and horizontal stab included) loading of 24.51 ounces per square foot.

2. Total model weight can not not exceed 11.023 pounds.

3. Models not adhering to the class are disqualified from the heat.

a. If the model had obtained heat points, the adjusted results will reflect the disqualification.

4. Competition models shall be of sufficient workmanship standards to guarantee air worthiness under race conditions.

a. This standard shall be enforced and interpreted by the race safety officer.

b. Ballast needs to be fixed in place internal to the model or its structures.

c. If in the safety officer's determination the ballast is not fixed in a safe manner he may disqualify the aircraft from racing.

4. **A.M.A. SANCTIONED**

A. Entrants shall show proof of Academy of Model Aeronautics membership.

B. If AMA membership is not verifiable, the entrant may compete, but only after paying AMA fees and completing the necessary forms.

C. **All contestants must adhere to the A.M.A. Safety Code during the event.**

D. Transmitters are required to have the AMA Gold certification sticker.

5. **EVENT WINNER DETERMINATION**

A. The contestant with the greatest number of accumulated points after the final round will determine the event winner.

B. One throw out round is given each pilot to allow for adverse conditions.

6. **POINT AWARDS**

A. Points are awarded in two categories: 1) Percentage of Perfect (POP) Heat Scores, and 2) Round POP Scores.

1. Scores awarded in each of the two categories are based on the flight times required by each contestant's model to complete the required number of laps for the task.

2. Each contestant's finishing time (in seconds) and heat position are recorded by the co-pilot and turned in to the scorekeeper per heat for logging. This is the pilot's responsibility and any lack of reporting can result in a zero score for that heat.

B. Points Positions:

1st - First to complete the required number of laps around the course.

2nd - Finished the required number of laps, but did not finish first.

DNF - Started the heat but did not finish the heat.

DNS - Did not start the heat.

C. Percentage of Perfect Heat Scores:

1st - Awarded 1000 points

2nd - Awarded (1st place time ÷ 2nd place time) X 1000.

DNF - Awarded 100 points

DNS - Awarded 00 points

D. Respective Round Scores:

1. Fastest Round Time is awarded 1000 points.

2. Other round finishers awarded points as (Fastest round time ÷ round respective time) X 1000. I.e., ((Fastest round finisher = 1:31) ÷ (1:42 = other finishers respective time) X 1000) = 892 points.

3. DNF receives 50 points.

4. DNS receives zero points.

7. **CONTEST DIRECTOR**

A. **The director has sole responsibility for interpretation of all rules!!!**

If you liked what you read in these rules we encourage you to use them. They can be modified or changed but the intent is to encourage racers to push the outside of the envelope and challenge both their skills as well as the competition. We think this scoring format will do just that since if a pilot slows his model down he suffers against the racer in that particular heat. Further his standings will move down in the round because he is racing against the times of all the racers in the round. We believe this is both fair and challenging. Also, this scoring arrangement should not be affected by weather provided multiple rounds are flown. Any comments or ideas you might have we would like to hear about. So, please pass them along to my address.

You may have guessed that this format is supported in the Northwest and particularly within my club TRICS. So, as a very early announcement we want you know the May **1993 Mid-Columbia Slope Races** will use this format. The plan currently is to offer a cash purse of $3000 plus awards to sixth place. So, start building and practicing because, with practice and some skill, you can enter the race and blow the paint off your competitor's racer. And nothing, absolutely nothing packs the exhilaration of throttling (down elevator) a slope racer down the straits and around a seven hundred foot race course, in fifty miles per hour winds, with five pounds of lead ballast stuffed in the wings. Then and only then do you get the rush of flying a wickedly silent guided missile!

Have Fun Cruising a slope! ■

Spirit 100

...by Pierre Julien
Clemson, South Carolina

My goal was to build a sailplane that would be fun to fly, use full camber control, modern airfoil and, above all, have good thermalling ability.

When I saw the Spirit 100 advertised, I thought that it would be a good next project. I wanted to step up from a Sig Riser 100 and step down from an Antares, which I still haven't figured out. I've been flying for 2 1/2 years, and I read a lot about hi-tech composite airplanes with computer radios but, let's face it...that's expensive. So, I tried to do the best with what I had: standard size servos and a plain radio. Still, I wanted full span camber control, ailerons for roll control, and a modern airfoil; here's what I modified from the original Spirit kit to get there:

1) Omitted the polyhedral break and built with only dihedral. Flaps and ailerons were glued end to end.
2) Used monokote for rudder and elevator hinges. 3M vinyl tape was used for flaperon hinge, and is available at the local hardware store. The flaperon should be placed to the trailing edge gap on the top side of the wing.
3) Reinforced wing leading edge breaks with corner braces.
4) Built both wings identical, without servos in the wing and not using the flap mechanism proposed in the kit. This is much easier.
5) Built a sliding tray mixer using the plywood top of the ballast box to insert the aileron servo. Both ends of the box are formers and are assembled in the fuselage without modifications. The top was cut out to receive the servo and allowed to slide back and forth on top of the two formers.

Everything is pretty well detailed on the sketch. The result is a sailplane with flat wing configuration sporting a SD7037 with full camber control and outstanding roll control. Nylon control rods in nylon tubes were CYA'd in the fuselage as epoxy won't stick to nylon; control horns were screwed to the flaperons in the same manner you would attach them to an elevator or a rudder. Pay particular attention to the angle of the bellcranks and the linkages for the flaperons, as they provide the differential, more "up" than "down". The maximum flap down is about 75°; maximum up is about 15°.

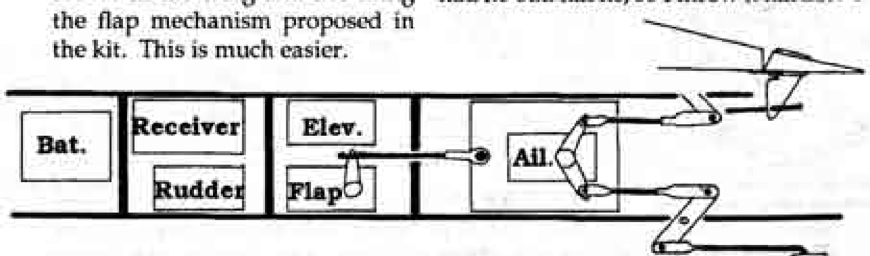
The first hand launch was eventless. This is the worst part of testing an airplane because you know nothing about its trim, yet. I trimmed the elevator down slightly for the first hand launch, so that when I threw the airplane it wouldn't climb and stall. Instinct told me to do the opposite, but this was was much better. The worst thing that would happen was for the airplane to land 25 feet away, but I knew it wouldn't dive straight down like it could if it stalled at 25 feet. For the second hand toss, I knew the airplane had no bad habits, so I threw it harder. I walked 350 feet to retrieve it, as it wouldn't stop gliding. It was now time for the hi-start.

I flew it five times that day, without flaps in light wind. It got up to 200 feet and circled for about 5 minutes. Then, I cranked in 15 degrees of flap, and it climbed straight up, very slowly and to the top of the high-start. What impressed me the most about this airplane is that, with as much as 30 degrees of flaperons down, it would not stall or lose altitude, but simply slow down and stay under full control. I was able to verify that when coming in for a landing. As I let it glide 6 feet from the ground I would gradually drop the flaperons, and I was still under full control. I rolled and turned and landed smoothly. On the 5th flight, the wind had picked up quite a bit, so I launched with about 10 degrees of flaps and a little down elevator. The Spirit lifted like a kite, very slowly; no flexing of the wings was noticed and I could test how it penetrated. Landing wasn't easy with that wind but, remember: keep the nose down and the speed up to stay in control.

By now, I've tried thermalling with flaperons in up, middle and low position, and the most efficient glide seems to be with no flap deflection. Flaps up makes for fast flying and crisp control response; flaps down could be useful in small, strong thermals where you need to circle tight. As soon as the turns can be opened, I suggest streamlining the flaperons for the maximum efficiency.

This is a fine airplane to build and fly. The kit and instructions are first class and for a first or second airplane, it could be built with polyhedral and 2 channel operation. A builder could keep the SD7037 wing ribs and buy some sticks to build the advance wing version later when his flying skills improve. ■

The Spirit 100 is manufactured by Great Planes and the regular price is $99.95 at Tower Hobbies. Current listings in *Model Aviation* show it is on sale for $69.99. If you can't find it at your local hobby shop, the Tower Hobbies ordering number in the U.S.A. is (800) 637-4989. It comes in two versions, by the way. ED. ■



Pushrod transfer linkage from Hobby Lobby @ $2.49/pair, #HLH210HL/SLEC.

Southeastern Championships

...Ashley Davis
Travelers Rest, South Carolina

When we last saw our intrepid group of HIGH COUNTRY soaring enthusiasts, we were departing the picturesque blueridge mountaintop outside Ashville, North Carolina which was the site of their midsummer 'Let's Have a Contest' contest; a very pleasant and relaxed gathering of flyers from the surrounding areas. But "Thank goodness it's Sunday" was the general feeling voiced by the competitors and helpers at the end of this three-day meet.

Not that the company left anything to be desired, some wonderful people from as far away as Ohio, Tennessee, Alabama and Virginia attended; 38 entries in 3 classes registered to fly as of Friday morning. And not that the weather didn't cooperate as the beginning of the "leaf season" was accompanied by temperatures in the 60's and 70's, no rain and moderate 10 to 15 knots winds on Saturday; moderate for these mountains, anyway. And not that the contest itself left anything to be desired as the HIGH COUNTRY SOARING SOCIETY stages as well organized and as smoothly run contest as one could ask for.

But this contest was billed as the regional championships and everyone came to WIN. Some did, and some didn't. Out of the 38 entries, 32 finished all rounds. Three people lost planes by not returning to the field, but 2 were eventually found. Consider the coincidence of loosing an orange, blue, green, and day-glo red airplane in the woods. One would think that would be fairly easy to spot, but Royce Salmon's plane blended perfectly with the leaves which were just beginning to start their annual display. Fortunately, his plane was found.

Several planes were lost due to what was suspected as radio interference in the first round on Friday. When the fourth plane crashed on launch or suffered extreme loss of control, C.D. Joe Rominski called a halt to flying to try and determine the cause. After all transmitters in the impound were checked to make sure none were left turned on, they were returned to the pilots. All planes were turned on and individually each frequency was tested for effects on other channels. There seemed to be no problem aside from the expected chatter on harmonically related channels. Then, the first group of flyers turned on their transmitters to check for resultant sidebands but found nothing. The winch motor was checked for noise to no avail. Reluctantly, flying was resumed but no further problems were encountered.

Friday's flying proceeded with mild conditions. Light but predictable lift cycles continued throughout the day allowing but not guaranteeing many high scores. Five rounds of each of three classes were flown beginning with open, then standard and 2-meter.

Saturday's forecast called for winds of 12-15 knots to accompany the passage of a pair of weak cold fronts. The wind made finding and staying with any thermal activity a real challenge, but ridge lift was abundant due to the steep slopes that surround this site on 3 sides. Some maxes were attained without ever making a 360 turn. Others rode lift to extreme heights and distances only to have trouble returning to a safe landing. Brett Elliot of Shelby, N.C. went beyond the call of duty retrieving other peoples airplanes from the groping trees after retrieving his own. His 2-meter Spirit landed high in a white pine and the easiest way to get it down was to fly it. So, with Landon Grindstaff at the controls, Brett prepared to fling the plane out of the tree to freedom. Just as he reared back to throw, the sound of splitting wood caused many a heart to fall with images of Brett hurtling to the ground. Fortunately, he had prepared for just such as this as his arsenal included safety belt, tree climbing spikes as well as small firearms. All of these were used at one time or another to retrieve airplanes. Many thanks, Brett !

Saturday ended with a spaghetti dinner at a local elementary school. It was prepared by the H.C.S.S. and their very generous wives. It was delicious. After dinner, AMA representative Howard Crispin spoke about the activities in the region and suggested ways to avoid conflict with other schedules so that maximum attendance could be guaranteed for events. A paper airplane contest was scheduled after dinner in the school gymnasium, but due to the intensity of the day's events no-one had any energy left, so fun was adjourned until 9:00 A.M next morning.

Results for the 3 days

2-METER	
Don Harris	5736
Woody Blanchard	5202
Mike Watson	4940
Royes Salmon	4275
Neal George	3896
STANDARD	
Don Harris	7482
Kendall McDonald	6300
Woody Blanchard	6269
Paul Morrow	5523
Davis Bolduc	4897
UNLIMITED	
Woddy Blanchard	6107
John Vennerholm	6030
Kendall McDonald	5974
Royes Salmon	5829
Mike Watson	5393

Sunday arrived cold and calm. Thermals were weak and scarce early in the day but got progressively better as the day matured. Most duration scores were quite high but landings were points hard to come by. Two L6 landing areas alleviated most of the crowding that can occur here but even the locals had what seemed to be an exceptionally hard time making consistent landings. Whispers were heard in many corners of the appearance of a rare and insidious anomaly common to some areas, the gravity surge, but no conclusive evidence was found. With the end of the fifth round flying was over and the final scores were tabulated and awards were given.

Joe and Landon have compiled some interesting statistics from the results of previous contests. Some idea of what contestants faced becomes evident when compared with these results. Average flight times dropped, average landing points decreased by almost 50%, as did landings in the required area. As Don

Harris so aptly put it, "It's how well you adapt."

The aircraft flown represented the total spectrum. Several Windsongs appeared and did well as usual but they did not dominate. Modified Falcons (100"), Phoenix, Alcyon, Sailaires, Paragons and Saqittas competed with no clear leader - clearly this was a pilots contest.

Thanks to many and congratulations to all! ■

Schedule of Special Events

Date	Event	Location	Contact
Feb. 1-2	Southwest Winter Soaring - Unlimited	Scottsdale, AZ - 444 (D)	Iain Glithero (602) 831-1905
Mar. 15*	Hand Launch	Irvine, CA	Scott Smith (714) 651-8488
Mar. 21-22	4TH Annual Masters of Soaring	Covina, CA D (818) 915-5441	Pete Olson E (714) 597-2095
May 29-31	Mid Columbia Scale Int. Fun Fly	Richland, WA	Roy (509) 525-7066 Gene (509) 457-9017
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July 25/26	World Inter-Glide 92	Fairlop, London	Les Sparkes 81-505-0191

*Date Changed

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Hand Launch Contest March 15, 1992

...by Scott Smith
Irvine, California

Introduction

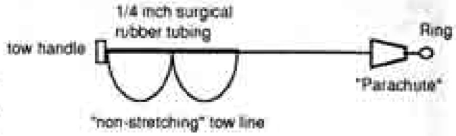
Participation in hand launch glider contests is increasing in Southern California; witness the additional participants in the Riverside contest in recent years and the fine showing in the Poway contest last September. Having attended every contest in Southern California I could find for the last three years, I have noticed two themes in the thoughts of participants after each contest: 1) "This is so much fun we should have more contests", and 2) "I wish I could get my glider up as high on launch as the "gorilla arms"."

There is inevitably discussion on how to even out the launch heights, then the next contest comes along and the "gorilla arms" continue to dominate. Certainly the arm launch format is a "classic" and should be used in contests such as the now-famous Riverside contest. (I'll be there, weak arm and all.) However, for those of us who love scrapping for thermals at low altitudes but whose arms just can't power your sailplane up to even "low altitudes", here is a contest that attempts to address that problem.

Hand Towing

Bob Reynolds, Norm Thompson, and others have experimented with me using hand towing using a 55 foot length of yellow twine, a plastic cup for a parachute (Works great!), and a toilet paper roll for a handle on the runner's end. The technique is (spectacularly) successful IF, and it's a big IF, the sailplane can be engaged into the steep climb needed for the beginning of the tow. Unfortunately, this takes technique and practice; we beginners had many exasperating moments where the ship fell off the line. The kids all had a good laugh, though.

What is needed is a way to snap the glider into the vertical climb in a less touchy way. What we came up with was a hybrid of a high-start and a tow line.



The hanging loops of non-stretching tow line are used to limit the tension on the rubber tubing when the tow line is stretched out. The length of the line is set to give a launch height the same as a "gorilla arm" can get.

When the non-stretching tow line is pulled taut, the pilot can release the sailplane. The runner should take off when he feels the line tension dropping; at this point the sailplane will be engaged in its steep vertical climb. The runner doesn't need to run that fast to keep the climb going; some participants will choose not to run at all. The runner should stop when the sailplane is directly over his head or when the sailplane has released.

Rules

The rules for this contest are identical to the Riverside contest rules with the following exceptions:

1. All towlines will be provided by the contest director.
2. Any given launch may be accomplished either by towing or by throwing. Both techniques may be used interchangeably.
3. The runner end of the line must be held by a runner; no tie-downs to any stationary object are permitted.
4. In the case of two runners running towards each other with a danger of collision, both runners shall turn and run directly into the wind. The contest director will announce the "wind direction" in calm conditions.
5. The flight time starts when the glider disconnects from the tow line. Hence, a sailplane may be towed before the beginning of the round as long as it isn't released until after the round starts. If such a pre-release occurs, then 10 seconds plus the number of seconds between the pre-release and the start of the round are subtracted from the flight duration that occurred during the round. Hence, a launch can "leave early" if a coveted thermal is spotted; however, the pilot must notify his timer before he launches.

Finally, in order to encourage novices to enter, a 2-meter class is included. The two-meter sailplanes will fly in their own rounds. <u>Contestants may fly in both classes</u>. The following restrictions apply to the 2-meter sailplane:

1. The wing must be open bay construction; no foam, sheeted, D-tube or other modifications to an open bay are allowed. Ribs must be spaced at least 2" from each other and may be no more than 1/8" thick. The center of the wing may be sheeted out to 5 inches from the center of the fuselage. The wing span must not exceed 2 meters.
2. The following kits qualify when built stock: Gentle Lady, Sophisticated Lady, Pussycat, Skyhawk, 2x6, Wanderer, Olympic 650, Two-Tee.
3. In the interest of safety (these gliders weigh twice what a 60" weighs), if a 2-meter glider collides with (or even touches) a person who is not on the pilot's crew (the runner and timer) or damages sailplanes or equipment on the ground, then that round is zeroed for that pilot. Hence, pilot be careful!

When & Where

The contest will be held Sunday, March 15, 1992, at a very large very flat dirt (Great thermals!) site in Irvine, CA. Write to Scott Smith, 2 Sugarpine, Irvine, CA 92714, or call me evenings at 714/651-8488, and I will send you an entry form with a map.

8:00 - 9:00 will be practice with the tow-lines. (It's really easy.) At 9:00 there will be a pilot's meeting. There is an entry fee of $5.00 ($8.00 if both classes are flown); AMA membership is required.

California Hand-Launch Rules

There are three rounds, each 10 minutes long. A flight ends when the glider touches any object on the ground. All points for a round are lost if the flight has not ended by the end of the round. If a flight is over the prescribed time for that flight, then the excess time is subtracted from the prescribed flight time and the result becomes the scored time for that flight.

First Round: Longest flight counts; no limit on number of launches. Longest three flight times are summed.

Second Round: Closest flight to 5 minutes; no limit on number of launches.

Third Round: 5 flights each as close to 2 minutes as possible. No more than six launches. Pilot selects his 5 best flights.

Scoring: All contestants start with 1000 points for the round. Each pilot subtracts 1 point for each second that his flight time(s) differ from the best contestant's time(s) in his 10-minute time slot. The highest sum for all three rounds determines the winner.

Tie Breaker: In case of a tie, the leaders will fly a 5 minute round to get the closest flight to 3 minutes. No limit on number of launches. ■

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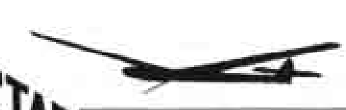

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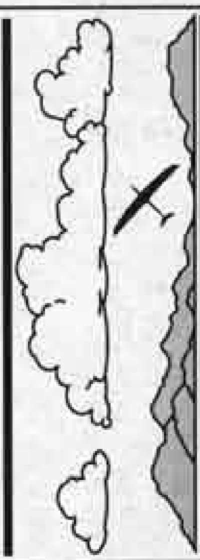

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