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R/C Soaring DIGEST

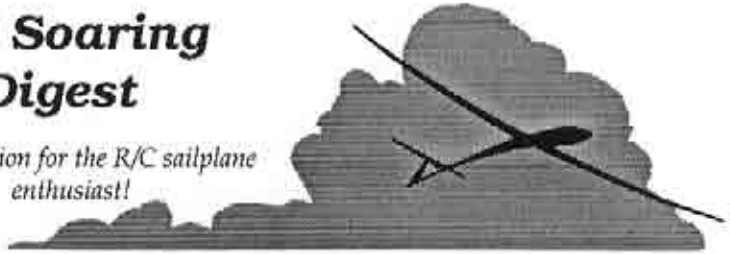
October, 1994
Vol. 11, No. 10

U.S.A. $2.50

EMPIRE POLO CLUB'S FLIGHT PARK INDIO, CALIFORNIA
Photo courtesy of Buzz Waltz. See About the Cover on page 1.

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 contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of all articles, model designs, press & news releases, etc. are the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author. *RCSD* was founded by Jim Gray, lecturer and technical consultant. He can be reached at: 210 East Chateau Circle, Payson, AZ 85541; (602) 474-5015.

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The Soaring Site

About the Cover

We received the following letter from Buzz Waltz, President of the Desert Union of Sailplane Thermalists (D.U.S.T.).

"I have enclosed a flyer for a scale R/C soaring contest that our club is going to have this coming December 10th and 11th.

"I am asking for the help and all the support possible through *RCSD*. Like all clubs, we are short on funds as well as working members, but we feel that we have a supreme flying site with 60 acres of grass, and we are going to make this an event like no other.

"Our future plans not only include two days of flying but a dealer show tailored to the manufacturers in the soaring community. This year we welcome any manufacturer to come and see what we have to offer and set up a table to show off their stuff if they like. Next year, there will be an area in Empire Polo Pavilion for a full scale dealer show. And yes, this will be a selling show.

"I would also like to list our club in the R/C Soaring Resource area in *RCSD* under Contacts and Soaring Groups. We welcome any who are visiting the desert to come see our field and fly with us.

"Our club name is D.U.S.T. and we are (one of) the oldest A.M.A. chartered club(s) in California, A.M.A. #118. I have enclosed an information sheet about us. For information and flying times contact: D.U.S.T., c/o Buzz Waltz, 3390 Paseo Barbara, Palm Springs, CA 92262; (619) 327-1775."

(The flyer is included in the event section, D.U.S.T. is listed in the resource section, and the following is from the information sheet we received from Buzz.)

"I would like to take this opportunity to introduce you to D.U.S.T., which stands

EMPIRE POLO CLUB

for Desert Union of Sailplane Thermalists and was the idea of two avid sailplane enthusiasts here in the Coachella Valley. While flying one day with a group of friends, Rex Powell and Buzz Waltz decided that an organized sailplane club was needed in the valley. At this time both sailplane and power R/C flyers were flying together at the same field. So, in 1977 D.U.S.T. was formed and chartered with the Academy of Model Aeronautics, Charter #118.

"We are the longest running chartered A.M.A. club in the valley and one of the oldest R/C soaring clubs in California.

"Several years ago, through the untiring efforts of Rex Powell, we were able to lease the rights to use the polo fields for our soaring needs from Alexander Hagen III to fly at Empire Polo Club. Mr. Hagen is an avid aviation buff and every year during his wine and balloon festival, held at Empire Polo Club, D.U.S.T. is asked to put on flight demonstrations for the general public. The area we fly on at Empire consists of 4 manicured grass polo fields which adjoin each other to give us over 80 acres of unobstructed flying. The lift around the polo field is unbelievable and flights over an hour are not uncommon.

"D.U.S.T. consists of a group of dedicated sailplane enthusiasts and our interests vary from flying models of vintage scale design to today's sleek, modern composite ships. D.U.S.T. has a little something for everyone.

"Visitors are always welcome to fly with us. We fly every Sunday from 10:00 A.M. to 1:00 P.M., sometimes longer if the lift is great! All we ask is that you be a current A.M.A. member; if you are not we have A.M.A. info. and applications.

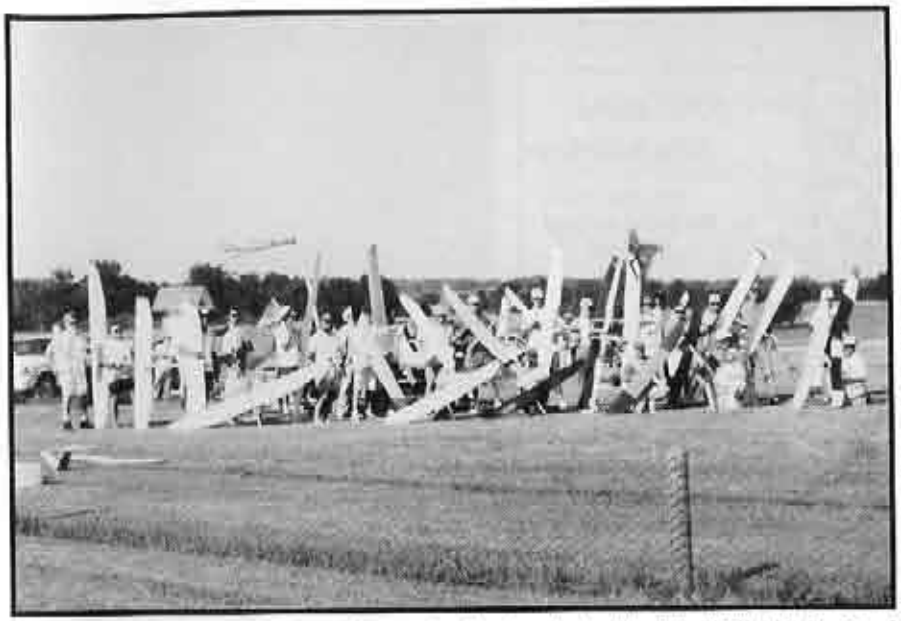
"Our dues are $50.00 per year. The money from your dues helps to maintain our equipment and pay our yearly lease with Empire Polo Club. D.U.S.T. owns and maintains 5, 12V winches and retrieval systems for launching our planes.

"In addition to club dues, you must be a current member of A.M.A. and if you are not a member, you will be asked to join. A.M.A. membership is necessary for we are an A.M.A. chartered club, and A.M.A. provides us with the liability insurance allowing us to fly at Empire Polo Club."

(The photograph is another shot of Empire Polo Club. Courtesy of Buzz Waltz.)

A Soaring Site in Australia

(Craig Foreman, Australia, sent in a reproduced copy of what has to be one of the most gorgeous soaring sites we have ever seen. Unfortunately, it will not reproduce well in RCSD. However, visualize blue to emerald



FIRST ANNUAL FLATLAND OPEN

green water, with sailboats far away in the wide expanse of water, cavorting near a huge city far in the distance. The skies are clear. The slope is alive with what appears to be low growing, wild, native flora. The water is 400 foot below with some indication of rock and sandy beaches. One can almost smell the salt in the air.)

"This is one of a few slope sites in Sydney although it is my favorite for many reasons - excellent, broad, smooth lift, hang gliders and para gliders are banned, there are three football fields immediately behind the slope for landing and the view is fantastic!

"The launch point is about 400 foot above the water. The place is called Dobroyd Head, and it is in Sydney Harbor opposite North and South Heads which form the entrance to Sydney Harbor. The slope is best in a south easterly wind working almost to east and almost to south. The slope forms a bowl shape. The middle of the photo is due east. I live about 1/2 hour away.

"Unfortunately, southeast is not common for wind in Sydney. The local fliers say about one in five weekends it works.

"A common question from other fliers I have corresponded with is, "What is your local site like?" Well, this is it. Just thought you would like to know."

F3B Team Trials

Ed Slegers called with the results of the F3B Team Selection Finals: (1) Joe Wurts, (2) Daryl Perkins, (3) Randy Spencer, (4) Larry Jolly. Congratulations, guys!

A Note from Kansas

"I recently attended the First Annual Flatland Open at Hillsdale, Kansas, and I learned more as a Landing Judge than I would of if I had competed. From the "top notch" pilots (Dale Nutter, Rusty Shaw, etc.), to the "sportsman", the field was a real classroom for me. The contest taught me things that I didn't know and understand. It showed me things like attitude, courtesy, and sportsmanship play major roles to the path of success. The winner is any person that enjoys what he or she has given to their craft. Although this was the First Annual Flatland Open, I thought it was run very well by the Johnson County Soaring Association." Lindsey J. Angell, Gardner, Kansas

(Lindsey sent in several photos taken by himself and Lee Branum. A group shot taken by Lindsey is shown here. Thanks!)

Happy Flying!
Jerry & Judy

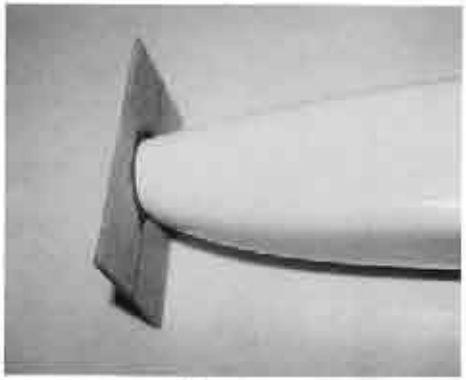
Jer's Workbench

Making a Plug Part III

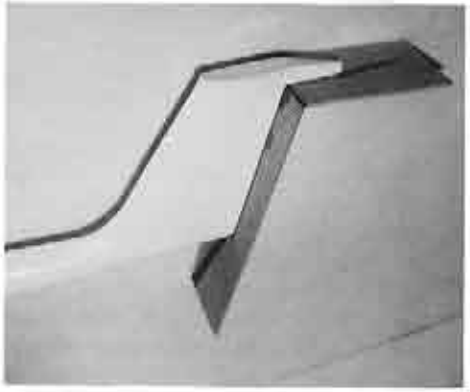
Now that the fuselage plug is done, it's time to add some dams. They are used to insure a straight, trim line and to make access holes.

This fuselage plug will have three sets of dams. For the first, a piece of 1/8 inch plywood will be glued onto the nose. When completed, this will leave a large, round, open hole in the nose. Next, some 1/2 inch balsa wood will be cut to size, fitted into the lip that goes over the wing, and glued in place. This will leave a large access hole under the wing. The last dam is made of 1/8 inch plywood and is glued onto the back of the fin which will ensure a clean, trim line.

Looking at the fuselage mold, and thinking "inside out and backwards", should give you some idea of what the finished product will look like.

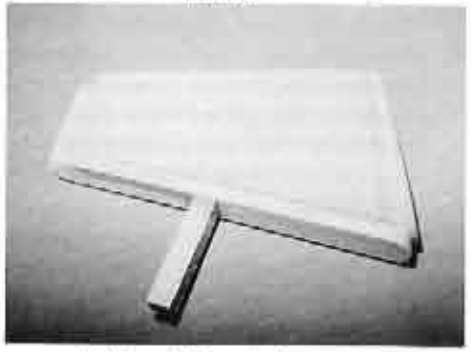


Nose dam

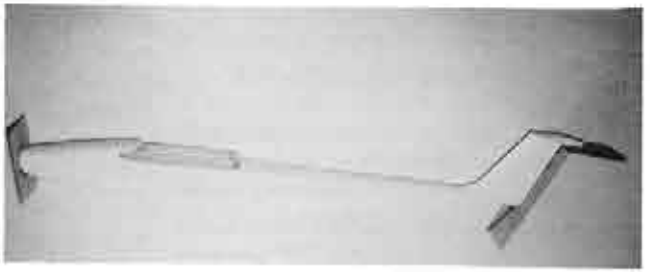


Fin dam

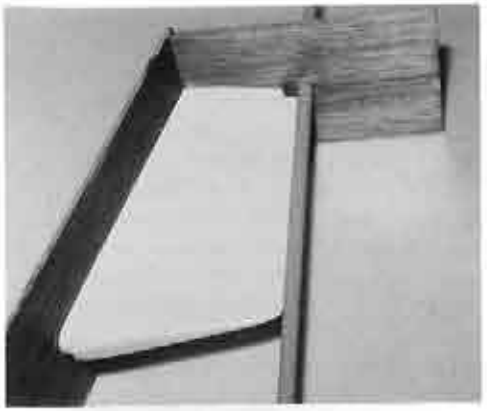
Access hole under the wing



Rudder with handle for painting



Complete fuselage plug with dams



Rudder with dams

I still have the rudder that I cut off of the fin, which was discussed earlier, so I have decided to make a fiberglass rudder, as well. After giving it some thought, I decided to have the rudder go two ways. If the rudder is made with tabs, then it can be glued into the fin for a two access control model, aileron and rudder control, only. In order to add rudder control, then the tabs will have to be cut off, and a rudder post is added and hinged in place.

I added a piece of 3/8 inch balsa wood to the leading edge and the top of the rudder. Note in the photo how it was cut in order to slip inside the fin for gluing. The odd piece on the front of the rudder is the handle, which will be used to hold onto the rudder so it can be easily painted. It will be cut off, later.

Again, using 1/8 inch plywood, a dam is glued to the leading edge and the top of the rudder for a trim line. A dowel is glued to the trailing edge which makes it easier to find the center line, and is also used for a trim line.

Next month, I will discuss the layout tray. ■

Low Tech Tow Hook

...by Steve Savoie
DownEast Soaring Club
RR#3 Box 569
Gorham, ME 04038
(207) 929-6639

Have you ever shown up at your favorite flying field and managed to break your tow hook on the very first launch? Hopefully you had a spare that could be easily replaced without special tools. Years ago I converted all my planes to one type of tow hook that is easily made and installed in minutes. Look no further than your local hardware store and purchase 1/2 pound of #16d common nails, non-galvanized.

The first step to convert the nail into a tow hook is to clamp it in a vice (exposing 1" of the tip) and bend it sharply over the vice jaws, a hammer works well. Then run an 8-32 die over the exposed 1" and cut the threads just up to the bend. Cut the remainder of the nail (non-threaded portion) to the desired length (3/4") and round off the cut with a file.

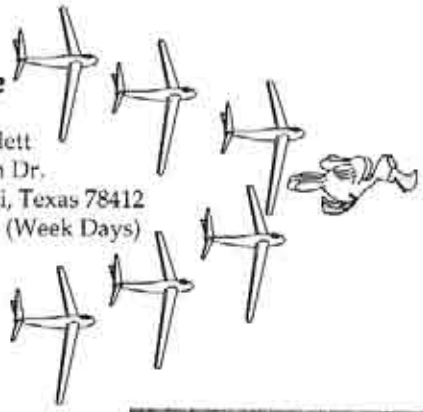
The threaded portion of the tow hook threads easily into a blind nut mounted in a hardwood block in the fuselage. Another mounting method is to install a hardwood block in the fuse, then drill and tap (8-32) the block. For extra strength wick thin CA in the tapped hardwood block and re-tap the threads once the CA has hardened.

These tow hooks are easily made and very strong, I've outfitted all my planes with these hooks and broke only one hook during a rocky slope landing. I use a (8-32) locknut to hold the hook in position. These hooks may or may not hold up to gorilla zoom launches, but I've had good luck using them on a 144" Catalina X-C. Try it, you'll like it.

■

This Old Plane

...by Fred Mallett
334 Haroldson Dr.
Corpus Christi, Texas 78412
(512) 991-3044 (Week Days)



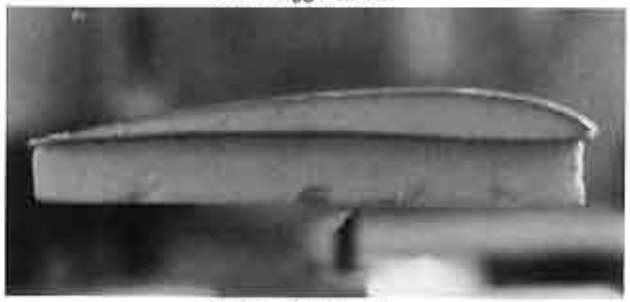
walked in. Picture it. You can guess the friend's comment, "Looks like a big corn dog, to me!"

The Plane:

Along with the unusual name, there is an unusual feature about this plane that made me want to discuss it here: the airfoil. The designer was unhappy with what he had for HLG's and decided to re-think the flight characteristics before designing another HLG.

His statement to me made lots of sense. What other type of plane must launch fast and high, then transition to a good glide for thermalling? Gas job, free flight came to mind immediately. This HLG uses an airfoil that looks more like a free flight foil than any I had seen used before. The airfoil is shown in picture 1. It is modeled after the GO432 foil, but it was modified to have more of a Phillips entry. The foil is quite thin, and has some flex when obechi sheeted with no carbon reinforcing, but holds up to HLG use very well.

Corn Dogger HLG



1 - The airfoil used.

Corn Dogger HLG

This month's plane has the most unusual reason behind its naming I have ever heard. The designer, Chris Boultinghouse of CAB Designs, was using the lost foam method when making the prototype pod. One way to do "lost foam" fuselage construction is as follows: shape the foam as desired, then fiberglass it. To get a light, strong fuselage, you want very low resin to fiberglass cloth ratio. To accomplish this, layer the glass over the foam, and wet it out with epoxy; try to use as little as possible, while still wetting out the glass completely. Next, to reduce the epoxy content, you could use paper towels as a blotter. Chris wraps the fuselage in polyester cloth (peel ply) from the fabric store, as the epoxy won't stick to it; then, to get more epoxy out, and ensure the cloth follows the foam, he wraps the polyester in an ACE bandage till it cures. Remember that this is a pod and boom. He had the boom in the pod and had just wrapped it in the bandage, holding it upright by the boom, when a friend

Corn Dogger HLG
General Specifications

Span:	59"
Length:	32.5"
Weight:	13 oz w/275ma
Type:	HLG

Wing

White foam core, Obechi sheeting

Area:	344 sq in
Root chord:	6 1/4"
Tip chord:	4 3/8"
Panel break chord:	6 1/4"
Break:	13" from root
Polyhedral:	1.5" inner , 4.5" total at tip
Airfoil:	GO432 (modified lower surface entry)

Tail

Conventional, with sub-fin

Vertical fin area:	27 sq"
Horizontal stab area:	40.5 sq"

Fuselage

Glass pod and carbon boom
Pod is pre-colored

Controls

Rudder - Elevator

Designer

Chris Boultinghouse

The remainder of the plane is quite normal, pod and carbon boom, sheet tail surfaces, your choice of wing holddown. (I used 4-40 nylon bolts.) It is designed for micro radio gear. The plane uses pull-pull kevlar controls for both rudder and elevator.

Construction:

The wing is normal foam/obechi, with the leading edges left up to you. I used basswood for the inner panel, and hard balsa on the outboard panels. I used 1.5 oz glass and C/A to join panels to save weight. The wing complete came in at 5 oz. To join panels on this plane:

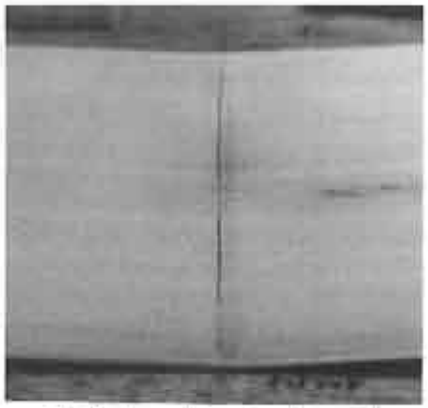
1) 5 min. epoxy the panels together (very little epoxy, sand to a good fit first).
2) Cut the fiberglass to size, and spray with 3M77. Stick in place.
3) Use rubber gloves, or clear kitchen wrap over a finger to smooth thin foam-safe C/A over glass.
4) Sand lightly, use two layers on center joint.

Note that the wing center panel comes in one piece. The designer recommends not cutting the panel in two, but instead cutting only through the top sheeting, and a thin wedge in the foam. Then bend the panel up so the sheeting rejoins at the proper angle. (Careful cutting required here.) This can be seen in picture 2 and 3.

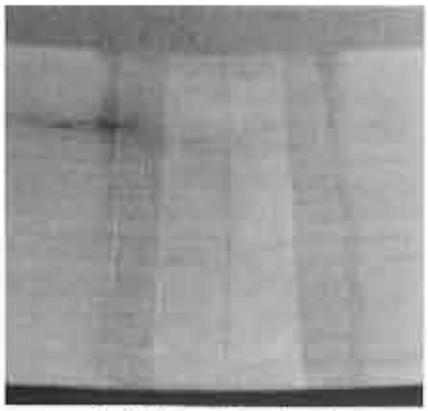
The pod is very easy to put together. A template is provided for the only former in the pod. It supports the front of the boom. If you create this former to the plan, and drill it correctly, to install it is simple:

1) Put the boom into the rear hole.
2) Put thickened epoxy on the former edges.
3) Push the former hole over the boom.
4) Pull the former into place with the boom, and add a fillet of epoxy.

The throwing stick is made from 1/8" plywood. Cut holes in the pod side 1.75" or more in front of the trailing edge of the wing for good balance, and glue in the stick. I put a couple of pieces of plywood in front of the stick to keep it from tearing



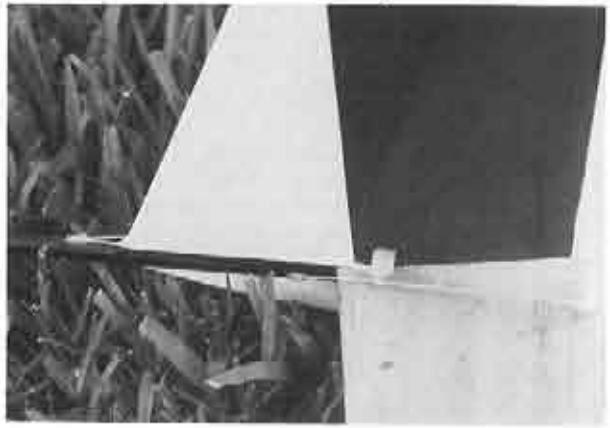
2 - Center section cut and epoxied.



3 - Center section glassed.

the fuse sides.

The controls are pull/pull. To run the kevlar, tie a knot in the end, then pull it through the control horn, as long as the knot is bigger than the hole, no need to tie it off as seen in the picture. A hole is placed in the boom in front of the vertical tail surface, and three lines are run through it. The last line comes out the boom end, and attaches to the lower horn on the elevator. Be sure the line does not rub on the boom (use a small horn) as carbon will cut the kevlar thread. Picture 4 shows a tube coming out the side of the boom, the newer planes now run three lines out the top tube, and one out the back of the boom as described above. At the servos, it is easiest to use wheel servo arms, and run both threads through the holes, then tie them in a knot to keep the arm from falling and rolling to the most inaccessible spot in your shop. To adjust the cables, put the arm on the servo, center it, then wrap both threads around the screw, pull to center the control surface, and hold while you tighten the screw. It is way too easy, I had never done a pull-pull before cause I was 'scairt of em. No more. (Picture 5.)



4 - Pull cables

Flight:

Looking at the spec sheet for this plane there seems nothing really outlandish about it, but it sure flies different than most HLG's I have flown. It is easy. Probably the easiest to thermal HLG I have used to date. That is embarrassing to say since I have designed a number of HLG's myself. If pushed to guess why, I can only point out things that are most different on this plane than other HLG's:

1) The airfoil
2) The outboard wing panels are longer than most
3) Boom type tail (less resistance to directional change)

Somehow, these all combine into a very

5 - Pull pull kevlar the easy way.

easy to launch, and thermal plane. I am continually amazed at how it handles wind. My plane came out under 12 oz with a 100ma battery, and I flew it in wind gusting to 20 mph. Since then it has become my trusty fly-it-anywhere plane due to its predictable nature, so I put in a 250ma pack for more flight time. I have lots of fun doing 80 degree banked circles under 5 feet off the ground, usually bringing it back to catch. This evening while flying in 16 -18 winds off the bay I was able to slope a row of cars with it. Fun plane, and it has placed well in contests.

If you are interested, the plane can be bought two ways, semi-kit (pre-colored pod (Pick a color, I went for transparent candy apple red.), boom, cores, plans and instructions for $60 plus shipping. A more complete kit with obechi sheeting, pre-drilled boom former, tail surfaces, and hardware goes for $80. *CAB Designs, Cedar Park, Texas (512) 259-4748.* ■

Tissue Covering

Jim Gell
26048 Pillsbury
Farmington Hills, Michigan 48334-4344
(810) 476-3506 (Eve.)

Finishing sheeted wings without using plastic heat-shrink coverings can mean savings in cost, weight, and time. One decision is how to color the lower surface of the wing to improve visibility. A method I've used with success is epoxy and colored tissue paper. If you're sheeting wings you most likely already have laminating epoxy and numerous colored tissues are available through artist supply stores and card shops. A dollar goes a long way when it comes to tissue paper.

Cut the colored tissue of choice to the planform you want to cover. Some of the folds and wrinkles can be removed from the tissue paper ahead of time using an iron. Pour out a line of epoxy spanwise onto the surface, then overlay the tissue. Wet out the tissue using an old credit card or a scraper, removing as much of the epoxy as possible. It has been my experience that the tissue is a bit easier to position once there is a little epoxy on it. Make sure that the epoxy has fully penetrated all of the tissue paper and that the paper is flat over the entire surface. Use the scraper to smooth out any wrinkles and move out any air bubbles, especially near the edges of the paper.

Keep in mind that the color of the tissue will darken from the epoxy. Because of the fibrous nature of tissue paper it is translucent such that some of the imperfection in your sheeting may show through. The finished surface is also slightly rough. I'll leave it to the aerodynamics experts to debate whether this is an advantage or a disadvantage. Also, if you used several colors of tissue you may want to make separate pots of epoxy. As you scrape away the excess epoxy some of the fibers are pulled up and will slightly color the residual epoxy.

Let the epoxy fully cure and you will have a durable colored surface that is cheap, easy and fast to apply, and effective. What else do you want? ■

on the Wing

B²

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

Four Basic Concepts
Part 1

An aerodyne is defined as any heavier-than-air aircraft which derives lift from motion. The history of aviation is filled with a nearly infinite number of aerodyne planforms, each formulated to achieve the designer's goals.

We've described a multitude of tailless designs over the past five years — from swept back, through "plank," to swept forward planforms — and in the process have examined airfoils, twist formulae, and the effects of sweep and twist on both stability and performance.

Longitudinal stability is probably the foremost concern in the designer's mind as a tailless planform takes shape. This is because successful tailless aircraft are the result of a careful balance of center of gravity, overall pitching moment, and wing twist.

Most designers find it helpful to have some basic logical and consistent "rules of thumb" to rely on during the design process. This series of articles will endeavor to examine and explain four fundamental design rules so they are easily remembered and thus be an inherent part of the tailless designer's thought processes.

We'll begin with a brief outline of the four important concepts to be considered during the design process: (1) center of gravity, (2) pitching moment, (3) sweep angle, and (4) design lift coefficient.

The following points apply to tailless planforms. For simplicity, Figures 1, 2 and 4 show only an airfoil section.

(1) Center of Gravity

Stability is dependent upon the location of the center of gravity — the more forward the center of gravity, the more stable the aircraft. The term stability factor, or static margin, denotes the distance between the center of gravity and the aerodynamic center. The aerodynamic center lies at 25% of the mean (average) aerodynamic chord. Stability factor, or static margin, is defined in terms of percent of mean (average) chord as well. A stability factor of 0.035, for example, places the center of gravity at $0.215\bar{c}$; that is, $3.5\%\bar{c}$ ahead of the aerodynamic center which lies at 25%.

$$0.25 - 0.035 = 0.215$$

If the center of gravity is at the neutral point (aerodynamic center), the stability factor is zero, and the aircraft will not recover from a stall but will instead descend like a parachute, or like it is dethermalized. The static margin provides the restoring moment needed to bring the stalled wing out of the stall. In normal flight, therefore, with a positive static margin, the nose of the aerodyne is being constantly pushed down because the center of gravity is ahead of the aerodynamic center. For controlled flight there must be an opposing force, otherwise the airfoil will be rotated nose down. See Figure 1.

While the force pushing the nose down is independent of air speed, the opposing aerodynamic force is directly related to air speed. Thus, the nose drops as air speed decreases and rises as air speed increases.

The more forward the center of gravity, the more stable the planform. This is true even if the center of gravity is behind the aerodynamic center. In this case, moving the center of gravity forward increases the aerodyne's stability, although the aerodyne itself is still unstable. As a general rule, so long as the planform is not

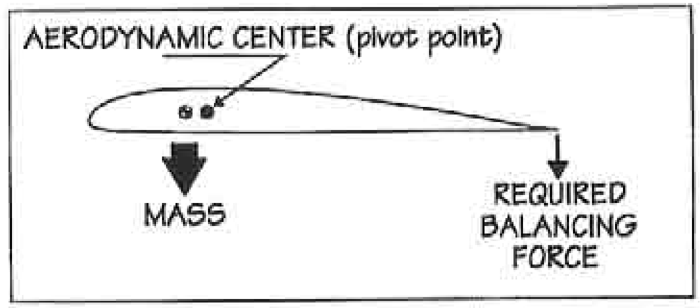


Figure 1

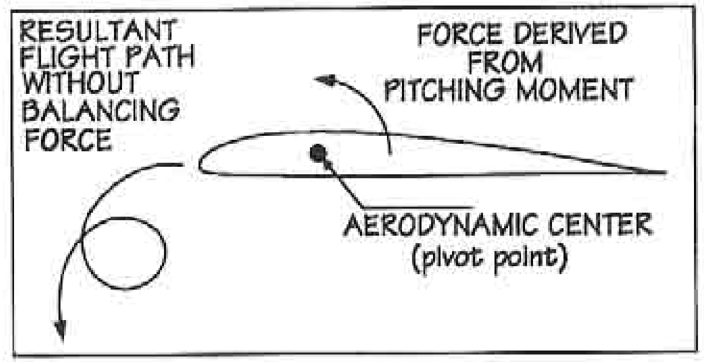


Figure 2

changed, more twist will be needed as the center of gravity is moved forward.

(2) Pitching Moment

If the wing utilizes a conventional airfoil it tends to rotate nose down during flight because of airfoil section camber as depicted in Figure 2. This will continue into a tumbling action. For controlled flight there must be a counteracting force.

Conventional high lift sections usually have strong negative pitching moments. If one of these high lift section is used at the root, a strong aerodynamic force must be produced by the wing tip to counteract the pitching moment of the root section. This is accomplished by increasing wing twist or by changing the wing tip airfoil. Since both the wing root and the wing tip are traveling at the same speed, all of the generated aerodynamic forces are always directly proportional to each other.

(3) Sweep Angle

If the stability factor (static margin) remains constant, increased sweep reduces the required twist. This is because a larger sweep angle places the wing tip further away from the aerodynamic center, providing a larger moment arm.

A couple of things to keep in mind, however...

First, rearward sweep is notorious for making winch launching difficult. This is because any yaw produces a powerful rolling force at high angles of attack. Making a small cardboard model of a swept wing planform will assist in understanding how this happens. Simply hold the cutout in front of you, viewing it as if you are standing at the turn-around. Hold the model at a moderate pitch so you are looking at the bottom of the wing. Then rotate the wing in the yaw axis. You will see the forward wing

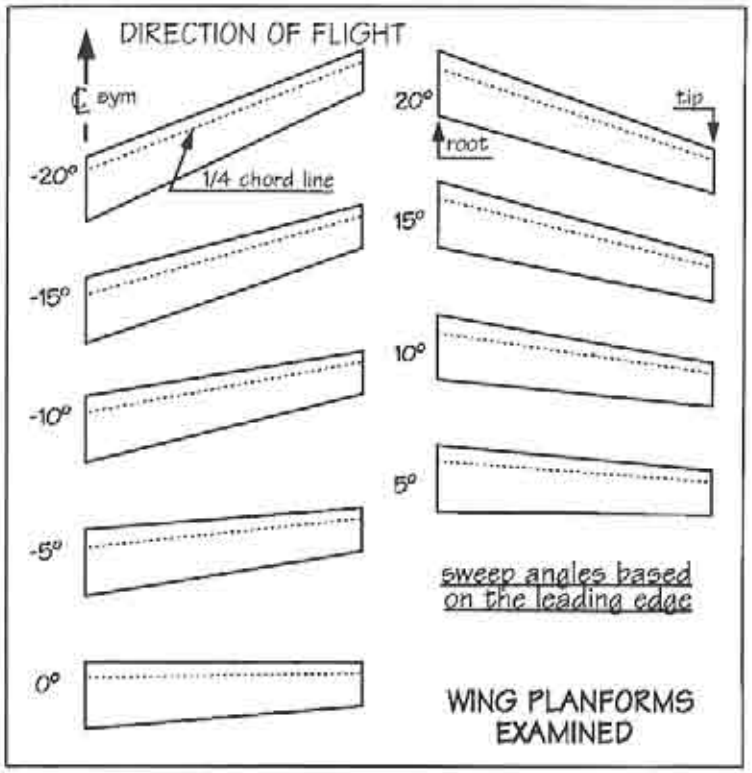


Figure 3

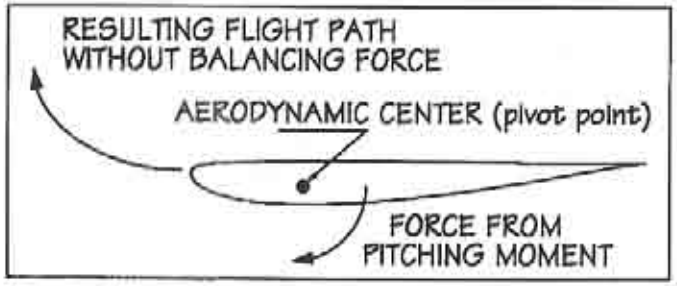


Figure 4

project a relatively larger lifting surface than the retreating wing. This larger lifting surface induces a strong roll moment which cannot be easily overcome by control surface movement. Several designers have gone to zero dihedral to control this yaw-roll problem, while others have utilized anhedral.

Second, increased forward sweep requires a larger fin area for directional (yaw) stability. This is the result of sweep forward being a destabilizing factor. To visualize this, take the cardboard outline used in the previous example and view it from above. Now imagine the wing, with the wing tips forward, yawing slightly. Notice the retreating wing increases in effective span while the advancing wing decreases in effective span. In the case of a moderate forward sweep angle, the

$$\alpha_{geo} = \alpha_{total} - (\alpha_{l0root} - \alpha_{l0tip}) \qquad \text{Equation 1}$$

where:

α_{geo} = geometric twist angle, used for construction
α_{l0root} = zero lift angle, root
α_{l0tip} = zero lift angle, tip

and

$$\alpha_{total} = \frac{(K_1 * C_{mr} + K_2 * C_{mt}) - C_L * sf}{1.4 \cdot 10^{-5} * A^{1.43} * \beta} \qquad \text{Equation 2}$$

where:

$K_1 = 1/4 * (3 + 2t + t^2)/(1 + t + t^2)$
t = taper ratio, c_r/c_t
c_r = chord, root
c_t = chord, tip
C_{mr} = moment coefficient, root
$K_2 = 1 - K_1$
C_{mt} = moment coefficient, tip
C_L = overall coefficient of lift with neutral trim
sf = stability factor (static margin)
A = aspect ratio, $b/\bar{c}$
b = wingspan
$\bar{c}$ = average chord; (cr + ct)/2
β = sweepback angle of 1/4 chord line; + for sweep back, - for sweep forward

drag differential is substantial, and only a large fin can keep the wing in a relatively straight flight path.

Additionally, the retreating wing will produce more lift, inducing a rolling moment opposite to the yaw. Dihedral can at least partially overcome this effect by producing an oppositional force, just as when a conventional tailed sailplane with dihedral but lacking ailerons enters a rudder induced turn.

(4) Design Lift Coefficient

Wing twist must additionally be adjusted to hold the entire wing at the angle of attack required to attain the desired C_L. The angle of attack must increase to achieve a larger design C_L and increased wing twist is required to hold the entire wing at the proper angle of attack.

It should be noted that large amounts of twist are detrimental to performance due to increased drag. Wing twist should be used to obtain the $C_{Lcruise}$, not C_{Lmax} or $C_{Lthermal}$. High and low flight speeds are achieved through control surface trim. This results in the lowest overall trim drag.

In condensed form, here are the four basic rules which must be kept in mind during the design process:

(1) increased stability (a more forward CG) requires more twist

(2) a larger C_{mroot} requires more twist

(3) decreased sweep angle requires more twist

(4) a larger design C_L requires more twist

Dr. Walter Panknin presented a set of equations at the 1989 MARCS Symposium which covers both the location of the center of gravity and the required wing twist for any tailless planform.

Note the four basic rules regarding center of gravity, pitching moment, sweep angle, and design lift coefficient outlined previously are all included in

PARAMETER	DIMENSION
span, b	100"
semispan, b/2	50"
root chord, cr	12"
tip chord, ct	8"
average chord, $\bar{c}$	10"
taper ratio, t	8/12 = 0.67
stability factor, sf, or static margin, SM	0.035
design lift coefficient, C_L	0.6
leading edge sweep	variable, in increments of five degrees, from -20 degrees to + 20 degrees
quarter chord line sweep	variable, from - 21 degrees to +18.98 degrees

Table 1

LE	-20	-15	-10	-5	0	5	10	15	20
1/4 chord	-21.00	-16.06	-11.11	-6.13	-1.15	3.86	8.88	13.93	18.98

Table 2

REF	DESIGNATION	C_m	α_0	SECTION PROFILE
1	E 205	-0.046	-2.37	
2	E 205.Inv	+0.046	+2.37	
3	Symmetrical	0.000	0.00	
4	EH 2/10	+0.00165	-0.74	
5	E 228	+0.0143	+0.34	
6	E 230.Eppler/MTB 1/2	+0.053	+1.73	
7	E 230.Panknin	+0.025	+1.73	

Table 3

Dr. Panknin's formula within Equation 2. This equation also takes into account taper ratio and aspect ratio, but we will not be discussing these two variables here. This formula has proven to be very accurate. Other than the dimensions of your creation, you need only know the zero lift angle and moment coefficient of the root and tip airfoil sections you will be using. Computer programs which utilize Dr. Panknin's formula have been available for some time. Once the necessary information is input, the computer will provide all of the additional data you need to build a longitudinally stable tailless sailplane. The necessary computations can also be accomplished on a scientific calculator.

Despite basic knowledge of model aircraft design and very good mathematical formulae, however, it remains difficult for the modeler to visualize the complex relationships between center of gravity, moment coefficients, twist and sweep, and mentally formulate an effective tailless planform for a specific task.

In response, Bill Kubiak, our Minnesota friend, suggested we attempt to integrate the basic trends into graphical form. He recommended focusing on the required twist angle by maintaining a "generic" design with predefined dimensions which would remain constant. Each of a series of graphs would then depict a specific root and tip airfoil combination. With sweep angle being the only variable within each graph, readers would be able to see the relationships between planform and necessary twist in a pictorial fashion which would be easily comprehended and easily remembered.

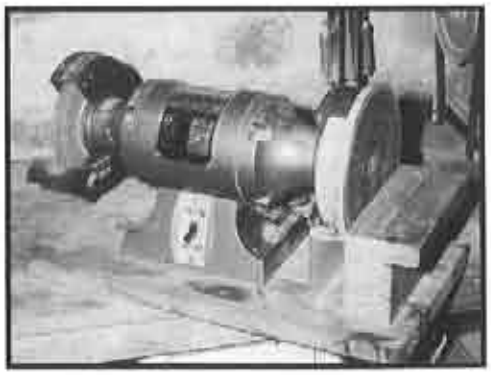
Following Bill's recommendation, we'll begin by defining those dimensions which remain constant. See Table 1 for this information. It should be noted that the chosen design C_L is relatively high. This was done for graphical purposes only. In practice, the design C_L would be significantly lower.

Figure 3 shows the nine planforms used to generate all of the graphical data included here.

Since this wing is tapered, the quarter chord line does not lie parallel to the leading edge. While it is easier for most people to relate to the leading edge angle, Dr. Panknin's formula uses the angle of the quarter chord line. Table 2 shows the relationship between these two variables. As you can see, the quarter chord angle is always about one degree forward of the leading edge angle.

The graphs, which will begin in next month's installment, are based on the leading edge angle. We did this so designs like Jim Marske's Pioneer planform, with its straight leading edge, could be easily evaluated. If you follow the examples by computing the Panknin equations you'll need to use the quarter chord line angle from Table 2.

Next month we will begin our graphical examination of the effects of sweep angle and chosen airfoils (See Table 3) on wing twist. ■



Make Your Own Bench Sander

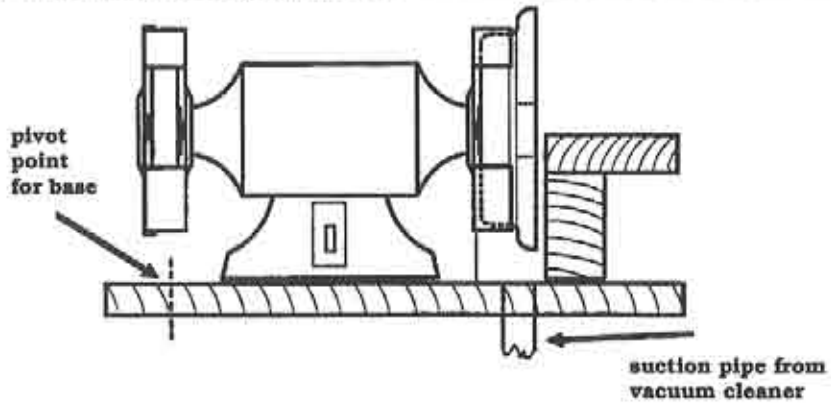
...by John Lightfoot
South Africa

Almost everyone who's seen my bench sander has commented on what a great yet simple idea it was, so I thought I'd share it...

The basis is a (not too) cheap double wheel bench grinder. I removed the one cover plate and the coarse wheel and mounted a double wooden disc on the shaft to make the sandpaper backing plate. I cut two discs from 12 mm thick "chipboard" so there would be no grain to warp and no variation of density to unbalance the final product. The one disc is the diameter of the grinding wheel and the other about 20 mm larger in diameter.

The discs should be cut as round as possible and a hole drilled through the centres to take the grinder shaft. The two discs are glued together with PVA glue and clamped until thoroughly dry. The hole on the side of the larger disc is then enlarged to countersink the retaining nut below the level of the sandpaper.

The grinder is then mounted firmly on the bench, with the remainder of the cover plate temporarily removed to clear the edges of the nearly circular rough assembly which is now mounted on the grinder shaft. This is where it's important that the discs be roughly true or the whole thing will jump around too much, because the next stage is to turn on the grinder and use a coarse file (or a rasp) and then a disc sander on an electric drill to shape the disc to a true and balanced circular plate onto which the sandpaper of your choice (I normally use 60 or 80 grit, resin bonded.) can be glued with contact adhesive.



I mounted the grinder body on a wooden base-plate which was pivoted on my workbench near the end away from the sander disc. There is thus the admirable situation where the grinding wheel can be used with the machine in the (stowed) position parallel to the bench but the base can be swung out at right angles to the bench to give access to the sanding disc. I screwed a wooden table to the base so that the top is just below the centre of the disc and as close as possible to the disc itself.

The final touch is to bend a small piece of acetate sheet to make a box behind the sanding disc in which the dust from the sanding will collect, sealing the edges with self-adhesive foam window-seal strip. Then I cut a hole in the base plate to take the tube from a vacuum cleaner - I was lucky enough to have been donated an old one by a friend who had invested in a newer model. Never throw anything away!

I went so far as to fit an electric socket on the back of the grinder, wired after the switch, so that when the vacuum cleaner is plugged in there, it only starts up when the grinder is turned on. The result may be a little noisy but it sure keeps the balsa dust under control! ■

Book Review

"Gliding with Radio Control" A Beginner's Guide to Building and Flying Model Sailplanes

...by Jim Gray
Payson, Arizona

There's probably no one in the world better qualified to write this book than its author, Martin Simons, whose experience with full-size and model sailplanes covers half a century. Almost every reader of *R/C Soaring Digest* has read Martin's articles over the past 10 years and has been enlightened thereby. However, many of you may not know that he has authored many other books in the field of gliding and soaring, as well. One of the first that I've had the privilege to read was "Model Aircraft Aerodynamics", and the second was "The World's Vintage Sailplanes 1908 - 1945".

Martin was also president of the Gliding Federation of Australia, and for ten years edited their magazine *Australian Gliding*. Martin holds the International Gold C soaring badge, and has designed, built and flown many, many RC sailplanes including a beautiful quarter-size Kirby Kite and the elegant PWS-102.

The publisher, B2 Streamlines, P.O. Box 976, Olalla, WA 98359-0976, has this book available for only US$18.00 which includes packaging and postage in the United States. (For airmail to Europe, please add US$10.00; for Asia and Pacific Rim, please add US$15.00.) The book is soft cover, 8 1/4" by 10 1/4" format, 110 pages which includes 18 chapters and four appendices with illustrations. I think the best description of this brand new work appears in the preface entitled "About This Book", quoted here in full.

About This Book

"This book is intended for the absolute beginner in the building and flying of radio control gliders. No previous knowledge or experience of the sport is assumed.

"The first important suggestion, repeated here, is that the beginner should seek advice before, rather than after, spending money on equipment or struggling with a model that may be unsuitable. Starting off is not quite as easy as it may seem. The help of an experienced in-

structor from a recognised model flying club, is desirable. Relatives or friends giving presents to young people should take special note of this.

"Yet there is enough in this text to enable anyone who is unable to find an instructor, to make a beginning without too many frustrating errors.

"The reader is taken slowly through all the important steps from an outline of the likely initial costs, the choice of a first model and the radio control gear, through launching methods and equipment onwards to the earliest flights, circuit planning and landing. The facts and ideas are explained simply but accurately. There is a glossary, giving the meaning of special words and phrases. Nothing is taken for granted.

"Finally there is some valuable advice about more advanced maneuvers and simple aerobatics, leading to the thrilling experience of hill and thermal soaring. A last short section outlines the possibilities for further enjoyment, including competition and task flying, scale sailplanes, and other kinds of radio controlled aviation.

"Martin Simons, the author, was born in England in 1930 and can hardly remember a time when he was not involved with model flying. He is also an experienced pilot of full sized sailplanes, with the International Gold C badge and two diamonds. He has written extensively about soaring flight in all its aspects and for ten years edited the magazine, *Australian Gliding*. He contributes articles to magazines in both the full sized and model flying areas, and is a regular columnist for the *Radio Control Soaring Digest*. One of his books, *Model Aircraft Aerodynamics*, is recognised as the standard English language text on the subject. It is also available in German translation. He designs, builds and flies his own model sailplanes regularly in South Australia, where he now lives.

"Martin Simons still recalls the feeling of total confusion that almost overwhelmed him when, as a boy, he opened his very first model aeroplane kit. There was an exciting picture on the box. Inside there were some little sticks of balsa wood, a couple of flimsy sheets of the same material marked with puzzling shapes, a bit of wire, a small chunk of hard wood and an incomprehensible plan.

"That model never was completed. Some kits offered on the market today are not much better, though they are bigger and cost more. They are capable of being made up into excellent models but inexperienced buyers, lacking guidance, tend to flounder. Many potentially good models are left unfinished. Mistakes of construction are often seen when beginners arrive hopefully at the flying field for their first lessons. Models are often seriously damaged on their very first outing.

"People attracted by the fascination of model soaring, may easily be discouraged by such sad experiences. In most cases, all they need is a few words of explanation at the start. This book contains these explanations."

In Summary

Whether you are an advanced RC soaring pilot, or a rank beginner with no previous experience, I think you should have "Gliding With Radio Control" in your library. As a respected editor and publisher of an international magazine once told me when a reader complained about the elementary nature of a previously published article in his magazine: "It's always worthwhile to re-publish a good basic article every three years or so because there will always be new subscribers who have not seen it before, and who need information." So, readers - beginner or experienced - read this book for enjoyment AND instruction because there's always something new to learn and/or refresh your memory in this wonderful and open-ended passion of ours! ■

Koorawatha Soaring Challenge 1994

...by John Donaldson
Australia

The third annual Koorawatha Soaring Challenge was held on the May Day weekend. The organizers brought the event forward from June as in previous years to try to escape the cold winter westerlies. The decision proved popular as 30 entrants arrived at the central Queensland motel on Saturday, 30th April.

To those readers that are unfamiliar with this event, Koorawatha is the name of a motel situated on the Bruce highway near the tiny town of Bororen. The event organizer, Garry Jordan, saw the site some years ago while driving past. Then he and his co-organizer, Evan Bengtson, approached the owner and secured what must be one of the best soaring competition sites in the country. The flying field is adjacent to the motel and entrants need only walk from their motel rooms to the flight line.

This year, the event attracted entrants from all over central and southern Queensland flying an assortment of models from 2 metre to F3B. The winch line up was an impressive sight with 25 winches spread right across the mown landing strip. Despite the organizers best intentions, the weather was still against us with intermittent showers disrupting the first day's flying to allow only 4 rounds to be flown. In these conditions, the 3 metre slippery full house (i.e., ailerons, flaps, rudder, elevator) type gliders reveled, being able to dash from one pocket of lift to the next and then be able to maximize landing bonus points.

On the Saturday night, the motel owners, Rhon and Angie Janssen, prepared a great BBQ and the good times rolled until late that night.

On Sunday morning we were woken by constant rain resulting in a 10 AM fliers (prayer) meeting, and decided to wait one more hour before calling the event off. Our prayers were answered and by 11 AM, the first round was underway during which David Vels scored a perfect ace-8 minutes and bonus spot landing points. Another two rounds completed the day's flying before retiring to the bar and dining room for a sumptuous smorgasbord feast.

The highlight of the weekend was the lucky draw for an ARF "Australis" fully moulded thermal glider worth $800 built and donated by Garry Jordan and Evan Bengtson. The lucky winner was Doug Williams of B.M.S.C. who coincidentally had folded the wing of his 2 metre glider that morning during launch.

On Monday, we were to fly the last 3 rounds being seeded according to the results up to that time. Only a few points separated the top 3 competitors, so an exciting finish loomed. However, in the end, the placings went to Siggi Schleid (third) from Toowoomba, Klaus Mittendorf (second) from Toowoomba, and Garry Jordan (first).

At the presentation ceremony, Garry was given custody of the Koorawatha Challenge trophy named this year in memory of Jeff Gibson, a fellow glider guider from Gladstone who died tragically in a work accident earlier this year. The success of the event can be gauged by the fact that the motel has already been fully booked for next year. ■

The Wave or Hand-Launch Topics

...by Scott Smith
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(714) 651-8488
evenings after 7:00 PST

World Handlaunch Jamboree this Month!!!

Don't forget: the 1st Annual World Handlaunch Jamboree will be on October 29-30, 1994 in Poway, California near San Diego. Pilot meeting at 8:00; first round at 8:30 (remember that California switches back to standard time before the contest). You handlaunch fanatics in Bangor, Maine, may want to charter a plane to come out.

Call CD Steve Strickland at (619) 741-1037 for more information.

Hand-Launch Wave Flying?

Last week, Dr. Norm and I went fun-flying at our local field. It was about noon, and the sea breeze had kicked in. I launched and noticed my plane fly through a sharp uplift about 10 feet off the ground that ended just as quickly. Intrigued, I immediately turned my plane around and found the same sharp lift again in the same place. After several more figure-8 turns, I had mapped out a corridor of lift about 15 feet long that was sufficient to soar in. I flew back and forth for about a minute before the "wave" dissipated.

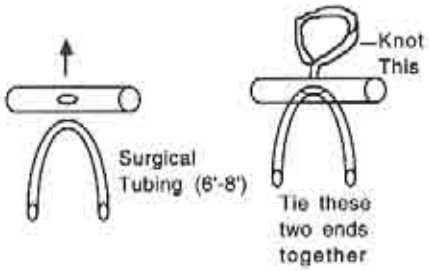
The area I found the "wave" in was not immediately behind any major obstructions. I don't think that it was "thermic" because the sea breeze would have been moving the lift downwind; this lift "stayed put". It just goes to show you that the "river of air" works in many wondrous variations.

Shoulder Exercise Tool

As promised several months ago, here is the shoulder exercise tool developed by Marc Gellart of the DARTS club. Thanks to Pete Young for letting me know about this. I quote directly from Marc:

"This "high tech" item only requires about six to eight feet of surgical tubing and a piece of one inch dowel. All you need to do is to drill about a 3/8" hole in a six inch piece of dowel and run the tubing (halved) through it. You then need to tie a knot into this end and put some CA on it to set the knot. At the two loose ends you also need to put a knot in each of these too and you are then complete.

"What this tool allows you to do is put your shoulder and arm under a working load much like your throwing arm is exposed to by throwing your hand launch sailplane. Not only can you work on the throwing muscles of your arm but by working through different rotations of the shoulder joint you can strengthen the shoulder joint and the rotator cuff as well.

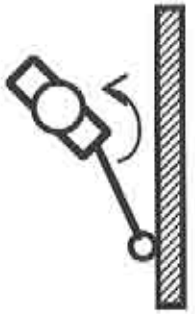


"First, I will look at stretches for your shoulder. (This is not to de-emphasize the fact that it is a good idea to stretch your whole body: legs, back, etc.) In any stretch it should be remembered to do them slowly and let your muscles and ligaments have time to relax and stretch. Do not expect your body to fold and contort like some gymnast the first time you do these, it will take you some time to get truly supple. Do them to a point where you can feel things stretching but not being torn apart, you do not want to destroy yourself right off the bat. The three stretches are as follows:

1. The first stretch I do is to grasp an elbow with my hand and draw your arm across the front of your body. The picture shows the right arm being stretched.

2. The second stretch is a modification of the first, again you grasp your elbow with your opposite hand, but this time you are working in the vertical. You will draw your elbow toward the other shoulder this time. I have also found that when doing this stretch that you need to, as you have drawn your arm as far as it will go, to begin to rotate your upper body over in the direction you started with your arm. By doing this you get a more complete stretch of not just your shoulder but of your body as well.

3. The last stretch of the series is done with the aid of a wall. You start by facing the wall with your arm out stretched to your side. With your hand flat against the wall (your palm), you begin to rotate your body away from your arm on the wall (you leave your hand on the wall).

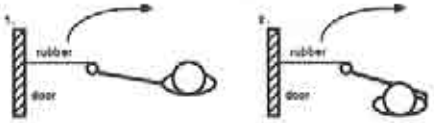


"Now that you are stretched, on to the real workout. There are eight exercises that I do with my exercise tool, and three I do with free weights. The free weight movements can be done with the tool, but I have found them to be more effective with the weights (I use five pound pieces of lead for this). Because the amount of pull produced is variable dependent on how short you make the rubber or if you use both pieces of tubing in a given movement (I only do curls with both ends involved in the work), do what you can do comfortably. Above all, do not do too much. When I started I would usually do a set of twenty reps and a second set of half that number. I am now up to doing forty and twenty on most of the exercises. I do these with both arms myself; this is not required, but I feel I get a better result. When you do these exercises, do them slowly and with purpose as it will give you a more complete workout. All of these exercises are designed to work primarily your shoulder and secondarily your arm. If you stick with this you may fatigue your arm and shoulder while throwing your model, but you will not hurt it. So a Jackie Gleason used to say, "On with the Show."

"All the exercises involve shutting the end of the tool (knotted end) in a door; I use the top of the door. In two cases, you

need to put it under your foot. This is the beauty of this system because no expensive equipment is required. In the diagrams the rubber ends of the tool is depicted by thin lines.

1-2. "These exercises involve the same basic position. You are standing with your right or left side to the door and with a strand of rubber hung over the top of the door and the door closed. Holding the tool handle, start with your arm out straight and across your body to the opposite side. The pull here will be from this same direction that your arm is pointed, and you will work your arm from the start position across its full range of motion to the other side of your body. When done, return to the start position. The second one starts with your arm extended out to its side and with the pull from that side, you work your arm across your body and return. Reverse sides and go again.



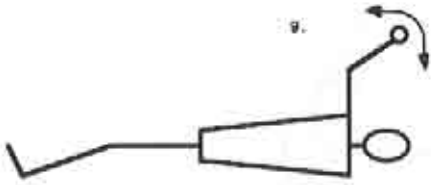
3-4. "This time you are facing away from the door and you are working in the vertical plane instead of the horizontal. The first exercise is the throwing motion. With your arm extended up and toward the door just as if you were about to throw your plane. The pull is from the rear just like throwing. The second involves your arm hanging down and you pulling forward as far as you can reach.

5-6. "This set you turn around and face the door, and for all practical purposes do exercises 3 and 4 with the pull coming from in front of you.

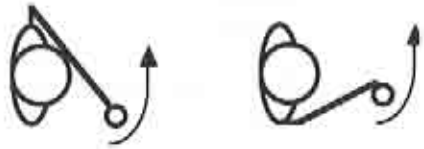
7. "This one requires you to stand on the strand of rubber of your choice and with the opposite hand grasp the handle of the tool. You need to have tension on the rubber at this point and hold the handle with your thumb pointing down and the top of your hand facing toward the opposite side of your body. Since your hand is being drawn down and away from its shoulder your direct your effort up and out from your body. do not go higher than your shoulder with your extension and have your arm finish about 30 degrees in front of you.

8. "This is your basic curl. Standing on both strands of rubber, with your arm hanging straight down, flex your elbow and work your bicep muscle.

9. "Now we are to the free weight part of the workout. All these exercises are done laying on the floor, the first on your back. With the weights in your hands (I use one in each hand), you will start with your arms pointed straight up, then you will flex your elbow and lower your hand to its shoulder, then return to the start position. This works the triceps muscle.



10. "The last two exercises are done on your sides. With a single weight in your top arm's hand, and with your upper arm laying along your body and your forearm hanging across your stomach, you rotate your upper arm around the shoulder joint and lift the weight up to where your forearm is level with your bodies topside, then lower the weight and go again. The second part of this is done with the arm against the floor and in the same position as before except this time the arm starts in the down position and rotates up across your stomach to your other side.



"In conclusion, I usually do my stretches again and call it a day. I am trying to work out three times a week right now and I try to walk on the treadmill every day. I will tell you now that when I am done I am wiped out (I do the entire routine), but when you think about it, you have done about six hundred reps and to say the least this is a few more throws than you will make at your average hand launch contest. It is my feeling that this type work out can only improve your stamina and power and protect your throwing arm from possible damage. To me that sounds like a good outcome to me. If you have any questions, just give me a call at (419) 648-2438, usually after 9:00 pm."

Thanks, Marc, for an "exhaustive" description of your conditioning technique. I plan to do it. ■

F.Y.I. - Controlled Airspace Considerations for RC Aircraft

...by Jim Gell
26048 Pillsbury
Farmington Hills, Michigan 48334-4344
(810) 476-3506 (Eve.)

If your club is looking for a new flying site, there are many restrictions that will influence the number and location of possible flying sites. These restrictions are typically the location of other clubs flying RC aircraft, site access, cost of owning/maintaining a particular site, and neighboring land use. From recent experience it is a good idea to get hold of aircraft navigation charts of your area to see if there may be restrictions on the airspace above the site. AMA rules state that RC aircraft should be flown no higher than 400 feet above ground surface within 3 miles of an airport without notifying the airport operator. However, abiding by this rule alone may not be enough.

Earlier this year the club I fly with, the Michigan International Soaring Society (M.I.S.S.), lost its primary flying site. M.I.S.S. is one of two sailplane clubs in the greater Detroit area. We began our search for favorable locations in areas where we knew radio interference from other clubs was not going to be a problem. Several prospective sites were located. Almost as an afterthought, I decided to check out these locations relative to airports on a Detroit sectional chart (full-size aircraft navigation chart). Three of the sites, as well as the M.I.S.S. secondary flying site, were located within the area designated as Class B airspace (formerly known as TCA).

One of the prospective flying sites was within the inner area of the Detroit Metro Class B airspace, where the Class B airspace starts at the surface. The other prospective sites and the club's secondary field were in the area where the Class B airspace began at 2500 ft.

The shape of Class B airspace has been described as an upside-down wedding cake. Within 10 miles of the airport it extends from the surface up to, say 8000 feet. From 10 miles to 20 miles it extends from 2500 feet to 8000 feet. From 20 to 30 miles from the airport it extends from 4000 feet to 8000 feet. The actual shape and size varies from airport to airport.

Class B airspace is typically found around large airports such as Detroit Metro and Chicago O'Hare. According to the FAA regulations, any aircraft operating within Class B airspace must have a Mode C transponder and be in direct 2-way radio communication with the tower.

(Immediately, the debate raged as to how high can we fly our RC sailplanes and still see them? But that's another story...)

This prompted calls to the local offices of the FAA and Flight Standards; they develop the regulations that the FAA enforces. After an extensive search of the regulations, they informed me that there are no regulations that specifically apply to the operation of RC aircraft in controlled airspace. To date there have been no incidents between full size aircraft and RC aircraft, therefore no regulations have been promulgated. So for now, and hopefully for a long time to come, there are no specific regulations regarding the operation of RC aircraft in controlled airspace.

But it is a grey area. It is quite possible for one to comply with the AMA requirements of being 3 miles from an airport and still be operating within controlled airspace. The FAA can't make you stay out of controlled airspace, but they have made it quite clear that they don't want you there. And why go somewhere you're not wanted?

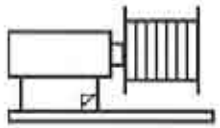
The FAA's chief concerns were that we do not know the altitude of our planes at any given moment and therefore can't tell when we are inside controlled airspace. More importantly, it is not possible for the RC pilot to be in direct contact with the tower. This means that the tower can't "shut us down" immediately if they need to route planes through the area we are flying. In other words, they won't have control over an RC aircraft in airspace where they have control over all other aircraft.

It is not difficult to imagine that problems could occur if a pilot on approach or departure sees something they don't expect to see (like a 1/4 scale glider circling upwards). This might result in the pilot taking some sort of action, such as aborting the landing. This would definitely get the attention of the FAA as well as the airline and could result in costs and publicity nobody wants.

Other controlled airspace such as Class C (formerly ARSA), Class D (formerly Control Zone), and Military Operations Areas (MOA) also need to be considered. The requirements for operating in Class C airspace are similar to Class B. For Class D airspace, authorization can be provided by the tower on a case by case basis. MOA's may only be active during certain hours of the day. Be sure when you refer to a sectional chart, that it is the current edition. These charts are updated periodically and the shapes and hours of operation of controlled airspace can change.

Another consideration offered by the folks at Flight Standards, was the sensitivity to local radio interference of full-size aircraft navigation equipment, such as omnidirectional and ILS beacons. When they are being inspected or serviced, the crews have be sure that their car/truck radios are turned off as they approach the beacons. No one seemed to know if RC radios would cause interference, but it would be best to steer clear and avoid any problems.

The people I spoke with at the FAA and Flight Standards were very helpful. They really bent over backwards to track down the answers to my questions. They even provided suggestions for some potential flying sites. If you think airspace restrictions may be a problem with a current or prospective site, you should call them. ■



Winch Line

Gordon Jones, 214 Sunflower Drive, Garland, Texas 75041; (214) 271-5334 After 5:00 P.M. CST

Bits and Pieces

UIUC Wind Tunnel Test Update

As an update on the wind tunnel testing at UIUC, the next run of tests are scheduled for October to be followed by a series of tests in November. Most of the initial setup and trial testing has been completed and they are set to start in earnest.

As the tests are conducted they plan to put out a quarterly bulletin to update the contributors of progress and calls for any additional help. Each of **you** can help this effort with contributions to the tests, whether it be monetary or with airfoil sections for testing. This set of tests will also be published in semi-annual (it is hoped) issues of SoarTech with the findings and results as they progress in the testing process. This will allow the publication of the results in a smoother form than waiting for the entire testing schedule to be completed prior to publication. We get it in bits and pieces to digest over time.

Contributions can be sent to the project to Michael Selig c/o Jim Guglielmo at the following address: Dept. of Aero. and Astro Eng., University of Illinois at Urbana-Champaign, 306 Talbot Laboratory, 104 S. Wright Street, Urbana, IL 61801.

Winch Line

We have had several requests for the location of manufacturers and sellers of winch line over the past month, so I will pass along some good places to get quality line and retriever line as well.

The Soaring League of North Texas (SLNT) has located a great source for both winch and retriever line: Brownell & Company, 429 E Haddam-Moodus Road, P.O. Box 362, Moodus, CT 06469, (203) 873-8625. They offer a 230 lb (#24), and a 320 lb (#36) braided line that really holds up well. In addition, they have a 90 lb (#9) twisted line for retrievers.

One note about setting up a winch which the SLNT started last year, the club now uses 320 lb test on the bottom half (the line that has the most contact with the ground) and the 230 lb test on the top half of the drum. The number of line breaks has been reduced by quite a margin and it seems to prolong the life of the entire drum.

Slegers International has 240 lb test braided line available in three different lengths. Ed has also found a local source for 50 lb braided nylon line that he uses on his retriever that has really worked out well. Slegers International can be contacted at Route 15, Wharton, NJ 07885, (201) 366-0880.

Soaring Stuff has 126 and 200 lb test braided line available. They also carry 200 lb test swivels and a good supply of split rings as well. In addition, Soaring Stuff has monofiliment line available in 150 lb test in 600 yard and 200 lb test in 400 yard lengths. Soaring Stuff can be contacted at 9140 Guadalupe Trail N.W., Albuquerque, NM 87114, (505) 898-8281.

A friend of mine has been using monofiliment for over a year with only one line break (the line got wrapped around the turn-around). Monofiliment has a couple of nice characteristics; it does not pick up moisture from a wet field and then rot on the drum. It also doesn't get caught in weeds and tall grass as it is smoother than braided line. These are a couple of real pluses.

Template Warning

For those of you who are using your local copy machine to size and print the paper patterns for airfoil templates, be sure to check the sizing on the copier before you

start pasting and cutting the templates. Some copiers, even in this age of technological advances, shoot the copy down a little bit when doing the reproduction. This means that 10 inches isn't always 10 inches. It may not be much but every bit of accuracy we can get is worth the effort.

A simple check to ensure that the sizing is correct is to take a 12 inch ruler and one small (4 inch), then make a copy of the rulers on the same page. When the copy is compete place the rules along the copied ruler and verify that the sizing is correct. If it is not you can either find another copier that works right or figure the compensation factor if you use that copier all the time.

At any rate, I have talked to a couple of people who have copied the airfoil, cut templates and built their wings only to find out they were a little short in the chord and thin on the thickness. Just a thought. ■

The 1994 Spring Fling

...Narrative by "Weeds" Rinkleib
...Photo by Ron Kucera

Sixty-eight flyers braved the wind to participate in the Sacramento Valley Soaring Society's (SVSS) third annual Spring Fling. This contest was held May 14 and 15, 1994 in Davis, California. The Spring Fling is an AMA sanctioned soaring contest which consists of various timed flights plus a bonus landing event. The flying site is located approximately 15 miles west of Sacramento and 5 miles south of the city of Davis. Native grasses (weeds which covered the field) were mowed for flying purposes. Some say that it is one of the best thermal sites in California.

The weather was windy, but warm on Saturday, yet the flyers braved the elements with 90 planes. By mid afternoon, the wind had increased to gusts between 20 and 25 miles per hour. CD Joan Nolte canceled the fourth round and postponed all remaining flights until the next day. Needless to say, the wind took its toll in gliders. Before the contest was over, 20 unlimited pilots had scratched for various reasons along with 8 - 2 meter pilots. The high drop out rate was primarily due to wind and plane damage caused by over exuberance in launches or flipping on landing. One plane was destroyed due to pilot and timer error. Both pilot and timer somehow ended up visually flying the wrong plane (one of three other planes remaining in the sky). When told that the remnants of his plane had been placed in the trunk of his car, the pilot was heard to respond, "Leave me alone. I've almost got my 8 minutes." He still didn't believe his plane was not one of the three in the air. The rude awakening came shortly thereafter.

Saturday evening, the SVSS hosted a BYOM (bring your own meat) barbecue at the flying site. The club furnished bread, salad, paper plates, etc. This was the time to sit around swapping stories, getting re-acquainted with old friends and inspecting the full size PIK 20 on display at the field. The PIK 20, along with a 2.5 meter R/C version were displayed by their proud owner, Dean Aldinger, a past president of SVSS. Dean is an active licensed glider pilot and an enthusiastic R/C modeler.

By Sunday, the wind had diminished to 10 miles per hour. The sky was overcast and showers were predicted for later in the day. It looked like great flying weather, and it was. The four remaining rounds were flown and the contest ended around 3:00 PM to clearing skies. A raffle and drawing for a variety of donated gifts, kits, accessories, etc., along with a grab bag of money, followed the contest. Carl Vega, one of the SVSS members, did quite well at the raffle. The way he was winning, one would swear he purchased half of the tickets sold. There were many winners who walked away with a prize

or two and a smile on their face. By the time the raffle was completed, the scores had been tabulated.

Contest winners were David Burwell (Expert), Peter Dannenfelser Sr. (Sportsman), Jerry Mensch (Novice), and Scott Meader (2 meter). The team event was won by the Mustang Ranch Soaring Society team comprised of Steve Clasen, Dave Lane, and Shawn Lenci.

Seven northern California soaring clubs sent teams to the contest. They included: South Bay Soaring Society (SBSS) - San Francisco, Sierra Silent Soarers (SSS) - Minden/Gardnerville area of Nevada, Mustang Ranch Soaring Society - Modesto/Stockton/Galt, Fresno Soaring Society - Fresno, Silverado Soaring Society - Napa, Tracy Skyliners - Tracy, and the host club, Sacramento Valley Soaring Society (SVSS) - Sacramento. In addition, many pilots came just on their own just to have fun. James DeRubeis and Roger Hebner traveled all the way from Klamath Falls, Oregon, to participate. We love that enthusiasm!

From my observation, fun was had by all. Many will go home to repair planes, but that's part of the hobby, isn't it? Thanks to all SVSS members in making this a great event. Thanks to all who attended. Without your participation the Spring Fling would not have been the success it turned out to be. We are looking forward to another fantastic Fling next year. You are all welcome! For more details, contact Doug Lent, the current President of SVSS, at (916) 966-4038.

(Bill Rinkleib is an SVSS Vice-President. He has been nicknamed "Weeds" because he spends a lot of time retrieving planes from downwind (weed infested) locations. Ron Kucera is the Editor of the SVSS Newsletter, "The Eagle's Nest", and is also the official Club Photographer.) ■

Easy Obeche Finishing Recipe

...by Rob Glover
3621 Conger Rd.
Huntsville, Alabama 35805
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I have read several articles and tips lately about how to finish Obeche wood skinned surfaces, and feel the need to add some more verbiage to the pile. The following techniques can make your life easier, and your plane lighter and prettier. Thanks go to David Godfrey for his help and inspiration to make better looking planes.

The first thing to do with your skinned wing is to lightly sand with 220 grit open coat aluminum oxide paper. All dry sanding will be done with varying grits of this kind of paper. All you need to do at this point is remove any "stick-ups" in the grain.

Next, obtain a plastic tub of super light vinyl spackling compound. This is a water based, white filler that is very light and sands about like Styrofoam. It is sold by various companies, I've found it labeled by Red Devil, Ace, and others. You can tell that it's the right stuff if the new tub feels empty when you pick it up on the store shelf.

Wipe this filler into the Obeche, working it into the grain with a plastic squeegee. The filler can be thinned with water if necessary, but keep it as dry as you can. The wood will soak up any excess water and swell up. After the filler has dried, sand it all back off with 220 grit dry paper. Sand until the dust starts changing from the white color of the filler to the tan color of the wood.

If you want to add color to your surface, now is the time. I like a couple of methods.

For a solid, opaque color I use acrylic lacquer, spray cans work fine. Mask any areas that you don't want painted and spray on light, dry coats. This paint will attack the foam, so don't build up a wet coat that soaks through the skin. Sand lightly with 400 grit dry paper, if needed, to knock down any raised grain. The object is to get a good opaque color at this point, we will add the shine later.

Another way to color your wing is with inks and textile dyes. You can have a lot of fun with magic markers and "T" shirt pigments. These pigments are available in a variety of colors including metal flakes, and are water soluble for ease of use. They can be found at arts and crafts stores. I like to wipe them on with a cheap foam sponge type paint brush. These brushes cost about 29 cents at the hardware store and will last through several planes if you are careful. Wipe off the excess pigment with paper towels before it dries to get a stained type appearance. Many of these pigments are "set" with heat. Read the instructions and go over your wing with a heat gun if that's the case.

The next step is to wipe on a thin coat of clear water-based Varathane with the foam brush. Paint an area no larger than the upper or lower surface of one wing, blot out your brush with paper towels, and try to wipe off all the paint that you just put on. Being stingy with the Varathane is the key to this paint job, particularly if you hate to sand. I find that if I work quickly the first wing is about dry by the time that I have finished the stabs.

After the first coat has dried, wipe it down lightly with 320 grit dry paper. If you got most of the excess paint off you won't need to sand very much. Continue adding thin coats of Varathane in this manner until the grain starts to fill and brush strokes start to show up. Sand the next to last coat lightly with 400 grit wet-or-dry slightly wet. The last coat gets sanded lightly with 600 grit slightly wet.

The wing will be looking pretty good by now, and it can be flown just like it is. A coat of wax will make it look quite presentable. If you want to make it look even better read on.

Get a can of clear gloss spray Varathane and put on a very light mist coat. Let this dry and wet sand it lightly with 600 grit. Keep doing this until you get tired of it. Two coats is enough for me. Don't sand the final coat. Rub the wing out with rubbing compound and wax it. This should be shiny enough for anybody.

The surface of this finish will be hard and quite durable, and as light as anything I've yet tried. ■

ZIKA

Servo Current Drain - A Fuller Investigation

...by John Lightfoot
South Africa

Many flyers have asked at one time or another just how long a given flight pack will last and answers have all been no more than guesses - often not very educated ones! I recently found mention of currents of the order of 25 or 50 mA drawn by servos, which I was quite sure were way too low. Some twelve years ago I did a lot of research on current drain and battery capacity, preparing for an attempt on our National slope endurance record (We eventually raised it from 11 1/2 to 14 hours! It was a terribly long day!), in the course of which I arrived at a figure of 150 mA for the working current of a servo.

We flew a model on the slope for 2 1/2 hours, starting with a fully charged battery, and then discharged it at 200 mA for another 1 1/2 hours. This means 300 mA.h left after the flight, which must therefore have taken 200 mA.h out of the battery which, over 2 1/2 hours, means the equivalent of a steady 80 mA.

But perhaps modern servos were more economical, so I dug out a selection of servos from the cupboard and set about some serious research.

Initial attempts at reading currents gave unstable readings, since a digital meter takes a measurable time to obtain a reading and the servo had reached full travel and stopped long before the reading had stabilized. I didn't have enough hands to hold all the wires and pins in place as well as wiggle the Tx stick, so a proper lead was assembled - a male and female plug connected as a short extension lead but without the signal lead, with the one wire snipped, bent out and soldered so the ends wouldn't fray, to take the ammeter clips. Used to connect the battery to the receiver, it gave the current drawn by the whole setup. The receiver on its own took 15 mA, so that had to be subracted from all readings to give what the servo was drawing. The stick had to be moved from side to side to keep the servo moving but after about ten cycles a pretty good reading could be obtained. The digital readout fluctuated wildly, but that's why the designers of the Fluke meter added a linear "rough readout" under the digital display - it reads almost instantaneously but less precisely.

The readings pretty well confirmed what I remembered but just to give a more definite idea, I opened each servo and took a reading with the motor running full out but disconnected from the gear train, so there was no load whatever.

The Futaba S-9101 is the only coreless motor servo I could test (courtesy of RC World) and it is also a very powerful beast, rated at 5 kg.cm torque, hence its unusually high current. It was in the shop and still brand new, so I couldn't open it to get a "free-running" current.

There is another way of getting an approximate value for the current drawn by a working servo. It is rated at a bit over 2 kg.cm which, taking a little licence with rounding off figures, means it can exert a force of 20 Newtons 1 cm from the fulcrum, moving it a distance of 1 cm in about 0,2 seconds. Thus the work done is force X distance = 20 X 0,01 = 0,2 joules which over 0,2 seconds means 1,0 watt.

Electric power is V X I so the current drawn = power ÷ V = 1 ÷ 4,8 = 0,208 A or

very close to 200 mA!

So one thing you may be sure of is that your servo is probably drawing close to 200 mA when it's working against a possibly stiff linkage as well as the airflow!

The good news however, is that it doesn't do it for very long! A servo usually takes about 0,2 seconds to move from centre to full travel but most of the time it doesn't go all the way and while you hold the Tx

Currents drawn by various servos under various conditions — (all in mA)

	Futaba						JR			
	S-120	S-128	S-133	S-148	S-3001	S-9101	3001	L-401	511	L-8001
quiescent	10	10	10	10	10	10	10	10	10	10
running free	70	95	85	105	100	-	85	130	130	70
normal operation	160	160	180	200	180	250	150	200	200	140

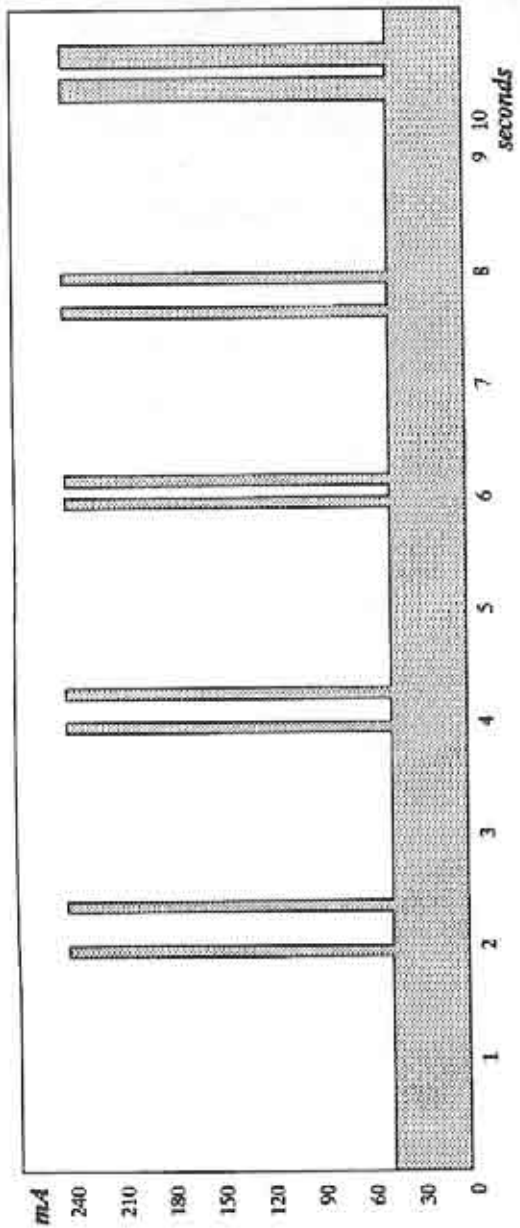


Diagram 1

stick steady there's only the 15 mA of receiver and 10 mA drain for each quiescent servo.

How often do you move the sticks? Everyone has his own style of flying - there will be times when there is no change at all for maybe a minute, while the servos will be working just about the whole time when landing in windy conditions. I would think that on average one puts in one small correction every two seconds and a major one every ten seconds.

To test this "armchair guesstimate" I counted the number of control movements I made in a couple of flights - you needn't laugh... the guys on the Common did it all for you. You should try flying a glider, counting inputs and carrying on a (sort of a) conversation all at the same time! To keep in line with my differentiation between half and full movements, I counted a full movement as two and a half deflection as one.

In one flight of 6 minutes 43 seconds there were 176 inputs and in a second flight which lasted 16 minutes and 52 seconds I counted 420 inputs. (There was a suggestion that I was flying better when I was concentrating on counting!) The first works out at one control input every 2,28 seconds and the second gives one every 2,41 seconds. These were thermal flights and I'm sure that on the slope, control movements will come more often and probably be more violent, so I think my guesstimate was pretty close.

Assume a receiver and three servos, drawing a steady current of 45 mA (15 +10+10+10). A "half movement" will draw 235 mA (15 + 10 + 10 + 200) for 1/10 second and then 235 mA for 1/10 second to return to neutral, a full movement taking 2/10 second out and another back. What will this look like from the battery's point of view? (Diagram 1)

If the stick was moved slowly, the spikes would be lower but wider (a lower current for a longer time) - giving the same area - the laws of Physics declare that a given job requires the same amount of energy, regardless of how long it may take!

The consumption will be equal to the shaded area (the base + the spikes) - current X time — which comes to (45 X 10) + (12 X 190 X 1/10) = 450 + 230 = 680 mA.s (that's milli-amp seconds!) or 680 ÷ 60 ÷ 60 = 0,19 mAh in the ten seconds illustrated. In one minute that would be 6 X 0,19 = 1,13 mAh which means that one would use about 70 mAh in one hour of normal flying.

This is confirmed by an observation made when we set a new flat field Club Duration record with a time of 2 hours and 10 minutes with a hand-launch glider fitted with a 250 mAh battery pack. The model was landed because we weren't too sure of the remaining capacity and we wouldn't have appreciated a flyaway at that stage in the procedings! On a discharger, the flight pack gave 150 mA for a further 50 minutes (= 125 mAh), so the flight had used 125 mAh in 21/6 hours which is a rate of about 60 mAh per hour. It was a small plane and it had been deliberately flown economically, so 70 mAh per hour would seem reasonable.

This is equivalent to a steady drain of 70 mA and would appear to indicate that one can expect about 7 hours of flying from a 500 mAh flight pack, leaving a very small safety margin. But now I come to the point around which I'd already started planning an article! It was going to be titled --

"Is Progress always Forwards?"

with a subtitle of ***"Beware the Modern Servo!"***

It started when one of our members investigated a buzzing servo. How often have you heard one of your servos buzzing quietly but everything worked fine so you launched and forgot about it? Why does a servo buzz? It's because the amplifier is turning the motor on and off

as it forces the servo towards the neutral position but the linkage physically prevents it quite getting there — and it's drawing current to do so! A gentle buzz probably means a current of about 60 mA although it could vary considerably.

Drawing 60 mA while doing nothing useful, instead of the 10 mA it should be when not working, means an extra 50 mA, and the earlier table will now look like Diagram 2. The different peaks depend on whether a buzzing or a quiet servo moved.

The arithmetic reveals approximately 115 mAh per hour and if two servos are buzzing, about 160 mAh per hour, and in the latter case there is a maximum of three hours capacity — with about a six minute safety margin!

Now how about an extreme case... a hot F3B model or a big scale soarer, with six servos, all buzzing! For this situation the figures reveal a drain of about 380 mAh per hour, in which case a 500 mAh flight pack will last only an hour and a quarter! And to make the picture worse, these figures assume no control inputs... only the six buzzing servos. With any sort of normal control usage it would last a lot less and in addition, the problem of a voltage drop will add to the drama as the receiver is being asked to operate on a fair bit less than the 4,8 volts it was designed to get. (For a model using more than four servos there is a case for the idea gaining hold in some quarters, of adding an extra cell to make a pack of five, so the flight pack is closer to the six volts (5 x 1,2 V) for which most receivers are designed.)

The best answer is probably to use a 1200 mAh flight pack, as many F3B flyers do.

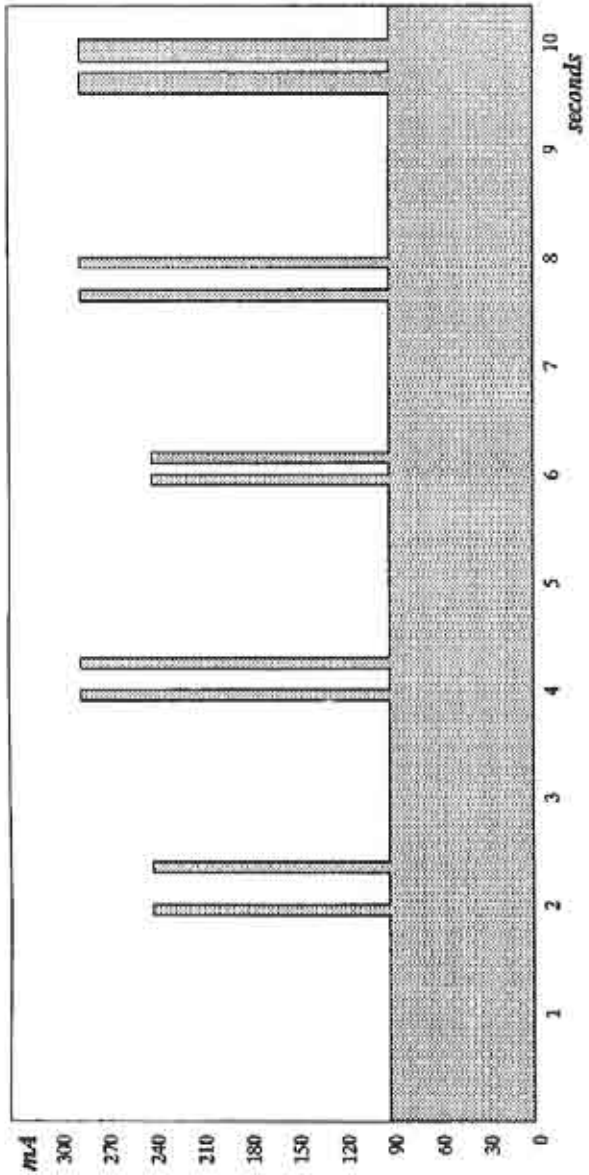


Diagram 2

But I have had reports of one of them being flattened in a day's cross-country flying — it's all too easy with a steady drain of a couple of hundred mA!

But why should servos buzz? Firstly, I understand that coreless motor servos almost always buzz — very gently. That is probably OK, provided the buzz remains very slight. There are two main reasons for a servo to buzz. The first is built in and may or may not be curable (luckily it doesn't happen too often). It is caused by too narrow a "dead band" at the neutral position. This is probably the reason for the buzz in the coreless motor, but because the armature, being coreless, is so light, the drain is very small. I'm talking about standard servos with ordinary motors. On some servos it can be cured by using a slightly higher value capacitor for the dead band width control. It's usually about 22 nF (needing to be about 23 or 24nF) and you need a capacitance bridge to find which of your stock of 22 nF capacitors are in the high range of the specifications! The next standard value — 27 nF — is much too big a jump.

The other reason is that the servo is under load, and this is where the newer breed of servos can be deadly! Recent trends have seen the advent of metal gears, ball-races and coreless motors, all of which help the servo to move more freely — everyone feels that lovely free movement and says — "Wow! What a great servo!" Bad news! Any force on the servo arm will tend to turn the motor, since the gear train is so free and the motor turns easily — the motor responds by applying power to move back. This means that the servo is holding position electrically — draining current — buzzing — where an older generation of servo would stay in position, under most reasonable forces, because the physical resistance to movement in the gear train and motor kept it there!

If you have one or more servos which buzz, don't ignore them — first off, find out what the buzz is doing to your flight pack. Then set about freeing your linkage so that there is no (or less) load on the servo.

There's some good (well — reasonably good) news —

Most situations won't be as bad as I've calculated and unless you indulge in a real flying marathon, you're unlikely to reach a dangerous battery level, although long slope sessions should be watched. The important thing is to be aware of the possible dangers of the modern very free-moving servos.

The most sensible approach would be to make up a simple adaptor lead as I did and measure what your setup draws. If you know what's happening you're less likely to get caught short! ■

John Lightfoot is a Science Teacher and the Editor of *Southeaster*, the newsletter of the Southern Soaring Club in South Africa. ■

The pilot's meeting on Saturday morning.

A variety of types of models seen in the pit area. The flying field was a WW II fighter base.

Interglide F3J Walsall Staffordshire, Great Britain

...by Iain Glithero
Mesa, Arizona U.S.A.

I went to Interglide this year as I happened to be in Europe in late July on business, and arranged to be in England for that weekend. I wish I had been able to plan ahead so that I could have flown in the contest. The contest was held very near the geographical center of England, just outside Birmingham, on the 23rd and 24th of July.

Interglide, as the name suggests, is an international sailplane event held every year now. (It used to be held alternate years with 'Radioglide' held in between.) Because of the volume of interest in sailplane flying in Europe, there is room for both.

This year, there were teams from all over Europe, including Holland, Germany, Great Britain, and this year for the first time, the U.S.A.. Ben Clerx, Roger Lackey and Mike Aguire from the Harbor Soaring Society in California represented the colonies very well.

The format of the contest is very different from a normal U.S. contest. The C.D. does not need to be concerned with launch equipment, as each pilot is responsible for providing their own. However, the C.D. does need to provide an AUDIBLE warning system to keep the contestants appraised of the time in the slot. The time signals are: 1) Start of the slot, 2) 2 minutes remaining, 3) 30 seconds remaining, 4) End of slot.

The system used was completely automatic, only requiring the C.D. to make sure all pilots, towmen and timers were ready before hitting the "START" button. The only other task for the C.D. to perform during the 'slot', was to ensure that everyone was on the ground at the end of the final tone.

At the first tone you may launch, or you can wait until some one else marks the lift and then launch. If the launch was not good, or the lift non-existent, you may relaunch once, but your last flight counts.

There were 94 entries for this year's event, with some very well known European names in soaring, including Stefan Eder, Patric Tax, Les Sparks, Dick Edmonds, Sean Walbank and the eventual winner, Martyn Johnson.

The first Slot of 12 pilots launched at once at about 10 AM; this was the first of 11 slots with varying numbers of pilots between 8 and 12. The flying field was large enough so that even with so many flyers there were very few mid-airs. The popular technique for launch seems to be to go up to about 70 degrees on the line as fast as possible, and then zoom from there. The medium to brisk breeze helped here, but when the wind died the pulley tows came into their own and the launch speed, even for the F3B style models, was more than adequate. Those who were really out for speed were using 'two-man' pulley launches —scary!! Faster than a runaway winch!!!

Ben Clerx of TEAM U.S.A. was in slot 2 of the first round, and although he did not have a great flight, he thought he was in a reasonable position as he could only see Wolfgang Pellkofer still in the air for a few seconds after he landed. BUT when he was walking back to the pit area he and his team discovered that Simon Jackson, a junior, was still in the air and so Simon won the slot and Ben got 627 for 3rd in the slot, with Wolfgang 2nd with 629. This is part and parcel of F3J. You must be aware of what everyone else in the slot is doing, and that is why it is necessary to have a spotter and a timer. Both Mike Aguire and Roger Lackey were more fortunate in their first slots, as they both made 1000 with Ben coaching and spotting.

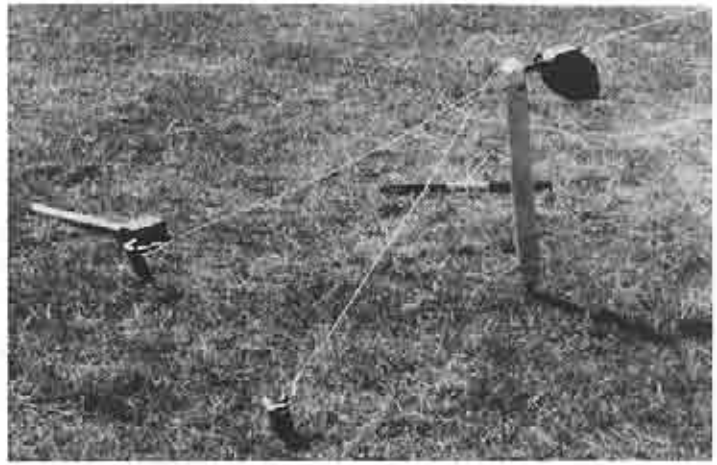
There were a total of five slots flown, three on Saturday and two plus the flyoff on Sunday. At the end of Saturday, Les Sparkes was leading with a perfect 3000 and Dick Edmonds was second with 2989. The U.S.A. team were still in contention as they had all won at least one slot and Mike Aguire had a very close second place in his second slot.

On Sunday, Mike, Ben and Roger all won both the slots flown but only Mike made the top ten for the fly-off. Ben was just outside at 13th and Roger was at 16th.

The fly-off was flown in two rounds, the two scores were added together and

Wind speed indicator used by ben Clerx. Very accurate but expensive. About $80 at your local sailplane store.

Pulley used by one German team. For reverse pulley tows - using two towmen.



the winner, with a total of 1890, was Martyn Johnson. Mike Aguire finished a very credible 3rd with 1735, only missing second place by 36 points.

I talked to the U.S.A. team and they told me they were looking toward the F3J world championships with some excitement, now that they have tasted the international F3J scene.

The models flown in this year's InterGlide were of several different styles. The U.K. flyers seem to prefer the large polyhedral floater types, although the wing must be incredibly strong to stand the zoom launches, The other Europeans seemed to favor the F3B influenced models but with 10-12 oz wing loadings. The U.S.A. team were using the MAKO designed by Ben Clerx. There were a couple of those models with strange shaped wings designed by the old Buzzard himself....Yes, the good old B.O.T. is still competitive.

The C.D., Steve Holmes, ran a well organized event and for once the weather in England was good, although the locals were complaining because it was too hot! That does not happen in England too often.

Many thanks to Ex-Patriot American, Jack Sile, for directions and hospitality and to all those who put up with the questions and the camera in their face. ■

Where Have All The Sniffers Gone?

...by Steve Pasierb
Baltimore, Maryland

It finally struck me the other day. As I looked out on a sea of pilots competing in an ESL (Eastern Soaring League) event, no one was wearing headphones. I couldn't find a single person with an antenna jutting out his side. I strained my ears to hear a faint growl or screech coming from the flight line. Where had all the thermal sniffers gone?

Had society's crime wave finally penetrated the basement workshops of sailplane pilots? Were sticky-handed theftuous types snatching sniffers from field boxes so they could be shipped off to third-world countries and sold at an insane profit like a new Jeep Grand Cherokee that disappears from the mall parking lot? How had this happened?

I began to piece together the clues. I remembered seeing sniffers for sale, many brand new, for ridiculously low prices. I recalled seeing them at swap meets, or neatly boxed with "for sale" signs tacked on them at contests, or in the soaring classified ads. They hadn't been stolen. No, they were forsaken. But why?

I flashed back to my first, and last, opportunity to CD a soaring contest. I had a perfect plan in my head. It would be the fairest of the fair contests. Focus on lots of flying and landing skill, try to eliminate luck. I thought it through time and again, planned every step. I was committed to making the last contest of the year, the very best. Every detail, including no sniffers.

Now you see, I didn't have anything against sniffers. In fact, I had one on order. However, I felt, and still feel, that contest flying should rely on piloting skill, not lift telemetry being transmitted back to the pilot's ears. I am a purist. Design a better plane. Hone your skills. But don't un-level the playing field with a electronic doohickey. This was going to be a pure contest. Launch, thermal, land on your own.

Weeks went by and contest day arrived. A spectacular fall day that screamed lift. The kind of air that you could easily thermal a cord of firewood in. I went through the prep, had the winch and retriever ready, called the pilots meeting. As the group came together I detailed the tasks and that sniffers would not be used. One pilot in the crowd simply took the headphones from around his neck and unhoked the receiver from his belt. One said, "Ok, you're the boss." Then "it" happened.

The stragglers had finally joined the pilot's meeting. As I concluded and everyone walked off to fly, someone said to one of the late-comers that sniffers would not be used. Now I'm not sure, but I imagine the sound that followed resembled a freight train about to derail. The screech of the brakes, the painful whine of steel on steel. The thunderous crash. "What!" "Who the hell...?" "He's doing this to get at *me*!"

By the time I realized what was unfolding, it was too late. I spun around to see a pilot coming toward me at light speed. Picture the headphones and antenna flailing in the breeze. What followed was an attack on everything from my heritage to a one-man debate on the value of my continued existence on the planet. Angry, viscous stuff. The kind of thing that you'd expect from Congress.

So the CD stood his ground. Exercised authority. The pilots rallied around me. Yet the attack continued unabated. On and on, growing in volume and malevolence. By now, we were fifteen minutes behind schedule. I gave in. Said, "OK, sniff away." Big mistake. The guy just kept raving. Wrecked the contest. Wrecked me for future CDing. Lost a sniffer sale for Ace. Fortunately, he also lost the contest.

So again, I question how did we go from sniffers being worthy of an impassioned attack, to being the rare exception. Heck, I had a guy ready to kill me. Now, it seems that people won't admit to even owning one. Sniffers became the toupees of flying. Yeah guys want them, like them, but they won't admit to it.

Just a passing thing? Or, did flyers finally wake up to the fact that the beauty of sailplanes and soaring is **silent** flight, not headphones and noise. Most would rather listen to an intolerable sound, say Rush Limbaugh, than a growling, screaming sniffer. Purity won out. Peer pressure prevailed. The sniffers were silenced. Now, at least on the East Coast, sniffers have gone the way of the pet rock. Still acceptable at fun flys, but seriously frowned on at a contest. Hallelujah!

Maybe I'll get back in the CD biz?

(Steve Pasierb is editor of *BASS NEWS*, the Baltimore Area Soaring Society Newsletter, and is a decent, stand-up kind of guy. But, he usually manages to tick someone off with his writing.)

■

Well, Steve, thanks for the "tongue-in-cheek" article. And, congratulations to you and all the other BASS members for being recognized by the Academy of Model Aeronautics as "A Gold Level Leader Club"! ED. ■

Wilfried Klinger in oils - a painting of the Luftwaffe FW-190 pilot who never fought against the Allied forces in World War II, but turned to model making and had a successful career in that field. All photos by Dale Willoughby.

Wilfried Klinger From FW-190 Pilot to Model Manufacturing

...by Dale Willoughby
Investigative Reporter

Many of the readers of this publication who were into soaring gliders and sailplanes in the late 1960s fondly remember the true scale sailplanes on the market or at the soaring site bearing the distinctive red WIK emblem.

Those sailplanes were manufactured more than 25 years ago in the small German town of Knittlingen, using the fiberglass and white gelcoat methods akin to the full size sailplanes of that era. Each model was meticulously laid up in the mold taking the entire work day for just one model sailplane.

This writer visited Klinger's modest factory in 1969 on my return from Pellestova, Norway, just after I set my second World's Record in FAI F3B - Class 33 - Speed in a Straight Line.

Wilfried Klinger's command of English was better than my German. He took me to his flying field where he demonstrated his newest glider which he named SUZIE after his youngest daughter. It was powered by a Cox engine on a pylon. The first flight lasted about 5 minutes after a 3 minute engine run. He turned the transmitter over to me and I caught a booming July thermal. He repeated this several times during a 14 minute flight, "Mister Villobee, NO LOOPINGS BITTE."

Herr Klinger was into mostly powered airplanes and small hand launched gliders plus model accessories at that point in time.

Prior to the ride back, he showed me his German pilot's license for the FW-190. When questioned if he had shot down any allied enemy aircraft, he replied that he had just received his wings in the LUFTWAFFE the same month as VE Day and that petrol and flyable aircraft were very scarce.

After the war ended, he married and returned to Knittlingen and founded the manufacturing business, prospered and finally moved into a new two story building - a combination home, office, and workshop. It was there that I once again visited him (1979), and watched the construction of the 1/4th and 1/5th Grob scale sailplanes. By that time, I had sold out to Peter Bechtel of Windspiel Models, lock, stock and barrel, and then founded Model Helicopters and later, Scale Model Research; the former sold to Lloyd Wheeler and the latter to Bob Banka (1983).

Volker Hahnle's 1994 design - GIN FIZ - electric for 10 to 12 cells, 2700mm wingspan, FG fuselage, aluminum tailboom. Imprinted star covering is called ORA DESIGN and available with violet, blue, yellow and red background.

Volker Hahnle holding the WINGS 190 flying wing which he designed and produced. Wingspan is 1900mm (74.8"), controlled by 2 or 3 channel radio. Wing area is 36 sq. dm. FG fuselage. Retail cost is $150.

PICCOLO held by the designer - comes in 3 versions - 1500mm (59"), 2100mm (82.7"), and electric powered. 2 channel R/C or 3 channel for electric. Model 150 is competing and winning in Europe. Retail is $95 for either version.

SUMMER WIND, electric powered, 10 to 14 cells, 2500mm (98.4") span, Eppler 205 airfoil, FG fuselage & fin. Retail is $265.

Jim Martin of Hobby Lobby was then marketing the WIK scale sailplanes as well as the Graupner line.

Herr Klinger died in 1985 and Frau Klinger in 1991, and the children decided to sell out. When I returned last month (July), I questioned Hellgard (one of the daughters) regarding the molds of the Grob models and she replied, "They were mislaid and are no longer available." They were the Grob CS-77, Speed Astir, Twin Astir, and the G-109.

Now she and her husband Volker are operating under the name of "extron-Modellbau", marketing many all new designs and accessories. They do not retail their merchandise in Germany, but only sell to dealers. Volker told me that he is looking for an American firm for exporting his wares and can be contacted at: Postfach 1123, D-75434 Knittlinger, Germany for a slick 70 page catalog (in German) with a surprising number of kits, mufflers, hand tools, props, etc. ■

Lee Murray's Lil' Scorpion which was reviewed.

Mike Fox, designer, with his winning Lil' Scorpion. He received 1st place honors at the LSF Nats.

Lil' Scorpion Kit and Flight Performance Evaluation

...by Dale Uecker and Lee Murray
Of the Valley Aero Modelers
Appleton, Wisconsin

The Lil' Scorpion is a complete high performance two meter version of a standard class Scorpion which was positively reviewed by Sherman Knight in the Nov '91 issue of *RCSD*. The model is produced by Fox Models. The kit has undergone several changes since the one being evaluated was received about 20 months ago. (Sorry! But we're slow builders.) At the recent LSF Nats, I was able to talk to Mike Fox about changes to the kit and see several other builder options which all seem to produce acceptable results. Some of these included modified wing platforms (two tapers vs three), two flap servos vs one, obechi sheeting vs balsa, and a mid fin stabilizer vs "T" tail. Using Lil' Scorpions, the designer, Mike Fox, won the 1994 LSF Two Meter Nats while Rusty Shaw finished 3rd with his modified wing platform version. This verifies my conclusion based on theory and experience about the excellent flying performance of this model. There were 10 Lil' Scorpions at the contest including the one being discussed here.

General Features:

The model includes a balsa sheeted SD7037 six panel white foam core wing & tips, light fiberglass fuselage with slip on nose cone, and partially sheeted foam core stab. The instructions included helpful photographs, several illustrations and a blueprint. It is designed for a computer radio to control flaps, ailerons, elevator and rudder using appropriate coupling. The vertical tail volume coefficient (VTVC) and longitudinal stability factors which deal with surface areas and moment arms are lower than the older sailplanes, but may aid the modeler in detecting thermals. However, it suggests that this is not a beginner's model and you had better keep your eyes on your model. The theoretical flight performance curves from PC-Soar are shown in Figure 1. Table 1 shows the comparison with four other two meter ships using PC-Soar and airfoil polars from Princeton wind tunnel data. Besides showing the Lil' Scorpion to be a superior model in theory, the table also indicates how the technology (airfoils, model designs and building methods) has developed over the years to produce better models for us.

The original design went through some radical measures to insure that the minimal weight of the model is achieved. Being somewhat skeptical, we opted for some more conventional methods, while others were done as instructed in a step of faith.

Items accepted:

- Sheer webs made from tooth picks.

The changes were made in the kit to eliminate the toothpicks, strengthen the wing spar, and simplify the construction.

- 1/32" sheeting on the stab was only

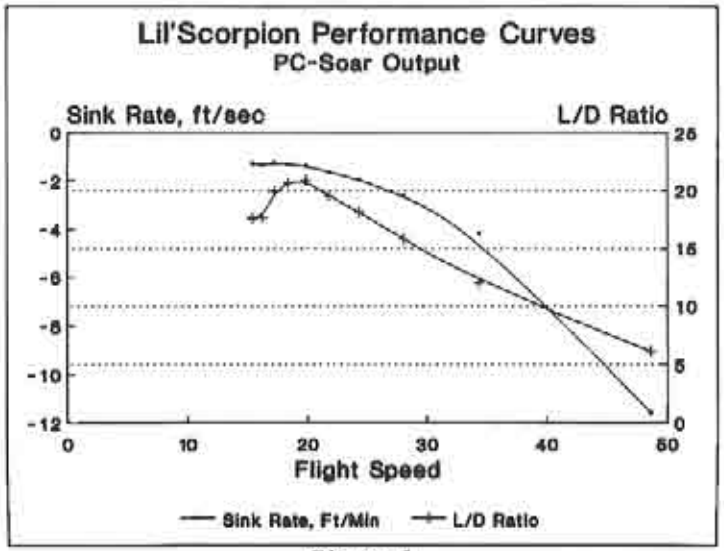


Figure 1

Table 1
Comparison of Model Attributes, Performance, and Stability

NAME:	Lil' Scorp.	Falcon 600	Mariah	Prodigy	Sagitta
AIRFOIL:	SD7037	S3021	S4061	S4061	E205
WEIGHT:	37	43	38	30	33
WING LOADING:	9.7	11.2	9.5	8.49	7.7
WING AREA:	551	552	574	509	616
WING A/R:	10.8	10.6	10.1	11.4	9.6
STAB. AREA:	58	66	74	68	91
LONG. S.F.:	0.38	0.43	0.37	0.44	0.46
FIN/RUD. AREA:	37	33	53	43	40
VTVC:	0.021	0.020	0.025	0.024	0.019
Min Sink Rate:	1.27	1.44	1.36	1.23	1.34
Max L/D:	20.9	18.2	17.8	17.3	16.2
Best Speed:	19.8	19.8	18.2	18.6	16.4

Notes:

VTVC: The Vertical Tail Volume Coefficient which traditionally falls between 0.13 and 0.023. This considers the length of the tail boom, the size of the fin and rudder relative to the size of the wing.

LONG. S.F.: The Longitudinal Stability Factor typically falls between 0.34 and 0.70. Theoretically this number should increase with higher negative pitching moments for the wing. This parameter considers the length of the tail boom and sizes of the horizontal stabilizer and wing.

for the forward half of the H. Stab. The latter half was done with 1/32" cap strips.

- Pull-pull dial cord system for activating the rudder. This does save weight and has low friction. The control horn in the rudder is a brass tube which constrains the cord from moving via tooth pick.

Items Modified:

- Horizontal stab connecting wires mounted permanently into one side of the stab. We felt that sooner or later there would have to be something straightened, so we opted to add the carrier tubes on both sides of the wing.
- The wingtips were to be mounted using tape and no rods or blades to hold them on. We wanted more security so that the tips wouldn't blow off during a hard launch or at some inappropriate time. We put a 1/16" balsa face on the tip section and epoxied it to the main panel without fiberglass tape to save weight. Even this didn't seem very secure, but we are trying to save weight. (After seeing Mike Fox's model, I see that the tape can be a satisfactory way of attaching the tips.)
- The single 1/4" nylon wing hold down screw was to be mounted in a recessed tube at the rear of the wing. The forward part of the wing is held by two steel pins into plywood. The screw mounting was changed to make the top of the bolt head flush with the surface, lowering drag. The thickness of the plywood that the bolt screws into was increased to make us feel better about the security of the connection. This was probably not justified based on the launches I witnessed at the LSF Nats.

The weight of the fuselage is low. We found resin starved glass at the joining line. Mike indicates that his joining method has been changed to eliminate this condition. These joints and pinholes in the surface were easily filled using PPG Red Cap DFL 17 spot putty (best one we've tried). The total weight was 36.3 oz which is less than the 37 oz claimed. I found Lil' Scorpions as light at 35 oz and as heavy as 40 oz. In comparison with a friend's 2M Shadow, it is about a pound lighter.

Radio installation was a little tight around where the receiver goes. I don't know what receiver Mike was using, but my 8 channel DAD Interceptor 2000 fit so snugly that the wing was about sitting on the receiver. The servo wires were tucked around the sides of the receiver. The pull-pull rudder cables were routed through a different tube than the Teflon one supplied. Getting adhesion to Teflon isn't easy and there was a curvature that I didn't want to work with. I used 1/8" nylon tubes glued into a balsa mount up front and fixed with silicon RTV adhesive about half way back. It seemed to work well. The flap horns were limited in reflex by the wing hold down plywood in the fuselage. I used a Dremel tool to relieve the plywood until I could get a little reflex of the flap. Perhaps a different angle on the flap actuator wire would have worked better. Using two flap servos with direct links to the flaps solves all those problems and doesn't add that much weight.

Flight Performance:

I flew the model for the first time one day before the Appleton Sailplane contest of August 7th. After a meticulous set-up with my Vision radio (two evenings) and adjustments to the specifications in the instructions, the first flight was over 5 minutes long and the subsequent "on field" adjustments were minimal. The elevator throw was excessive in my estimation, so I used a 60% dual rate setting. The CG was set up as recommended and then a half oz more lead was added for security on those first few flights. The second day of flying was in a contest where I took 3rd place in a field of 11 good Midwest flyers. Due to the lightness and small tail, the model is very responsive to air flow turbulence around it so it is a good thermal sensor. You need to keep your eyes on the model. The speed range is quite amazing and with crow, it can safely be dived at a 50 deg or more angle which is what I did in the contest to land it almost on the nail holding the center of the landing circle line.

Nest of 9 Lil' Scorpions at the LSF Nats. (It could be a gaggle since these things fly.)

Along with the lightness, I did have a couple of flights in wind gusts where I wished I was carrying some ballast. Turning was smooth with no tendency to tip stall.

In conclusion, I would recommend this affordable, high quality, high tech model to anyone with good building and flying skills. Based on our experience, the authors have ordered two more Lil' Scorpions. ■

On The Air With Cornfed

Fred Rettig
1778 S. Beltline Highway
Mobile, Alabama 36609
(205) 471-2507 (days)

Thanks, ya'll!

Summer has come and gone. My, it sure seemed to have gone by quickly. Looking back, I can't believe it went so fast. Here I sit counting my wins and losses. I hope that each and everyone of ya'll were able to add something to your trophy case, whether it be some gold or just a good memory. Whatever the wins are, big or small, count your blessings. You have your health and your friends and you can do it all over again next year. May we learn from our mistakes and add to our talents of R/C soaring. My biggest victory this season was overcoming a seventh in a row of losing a good contest in the last round. I guess that through the losses, I have learned that winning is not everything. For with the losses has come a great deal of soul searching. You know... What am I doing wrong? Many questions went through my head and through it all I came to

realize that my reasoning for winning is not worth what the sport should mean to me. You say, "What are you trying to say, Cornfed?"

Well, I'll tell you. If we always succeeded in life at everything we do, after awhile there would be no challenge, for in our losses come strength. Mistakes seem to stick in our minds greater than successes. Why? I don't know. Maybe, because mistakes bring pain. I sure know that through my losses, one after another, much pain came, until I started to realize that it was only a contest, a hobby, and that the reason for being at the contest was for fun and friendship.

Well, I finally overcame my seventh in a row, and got a victory. A victory in my mind which is far greater than a trophy in hand. I hope that each and everyone of ya'll overcame life's trials and troubles and have learned from your mistakes. Just hold on, as tomorrow will come and things do change.

Through my travels this summer, I sure met some nice folks, too many to name, from coast to coast and even in the north. I don't think I met anyone I didn't like. Oh, yea, there was one or two. Them winch masters who were always calling me when the time didn't seem right. Just kidding!

In closing, I want to give thanks to all who helped run the contests this past summer, from the C.D. to the winch operators, score keepers, and everyone else that had something to do or just volunteered to help. Thanks! We all enjoy ya'lls efforts. It is sure a labor of love.

To the kit builders, may you continue to work for excellence and perfect your ideas. Most of all, be professional at what you do. Honor your words. Tell the truth to us, your customers, for without us you have nothing but a plan. We also know that without you guys, we have no future in our hobby, for ya'll are what makes our tomorrow exciting and progress this hobby with your new ideas and dreams. Dream big, for tomorrow we play!

Thanks to all the folks that make our hobby a great hobby, from the press to hardware to electronics to glues, and all it takes to make it work.

May next season be even greater.

Signing Off,
Cornfed

P.S. Pray more than before and shine your shoes.

ATTENTION: Jerry Slates of Wylie, Texas. When serving that new box of grits to your friends, don't insult them by offering them sugar for seasoning. ■

ATTENTION: Fred Rettig of Mobile, Alabama. Grits are OK, but how do you tell the difference between grits and sawdust? Jer ■

ZIKA

SPECIAL NOTICE TO ALL THIRD CLASS SUBSCRIBERS IN THE U.S.A.
EFFECTIVE OCTOBER 1, 1994

We will no longer offer 3rd class bulk mail delivery in the U.S.A. All subscriptions and renewals will be by 1st class service, only.

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BUT, NO, WE STILL HAVEN'T FIGURED OUT HOW TO GET IT TO YOU "YESTERDAY"! Sorry!!

Jerry & Judy Slates

Schedule of Special Events

Date	Event	Location	Contact
Oct. 8-9	TPG Flaa Speed Festival	Torrey Pines, CA	Erik Larson, (619) 793-7640
Oct. 8-9	2m - Unl	W. Palm Beach, FL	J. Wilson
Oct. 9	SASS Novice Classic	Seattle, WA	Sherman Knight, (206) 455-2345
Oct. 9	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 8-9	S.O.A.R. Fun Fly	Plainfield, IL	Stan Watson, (708) 448-6371
Oct. 15	1.5M Hi-Start Contest	Washington, MI	Ray Hayes, (810) 781-7018
Oct. 15-16	Last Fling of Summer	Tulsa, OK	Perry Gilstrap, (918) 455-1203
Oct. 22-23	2m - Unl	Morriston, FL	Bob Wargo, (813) 938-6582
Oct. 23	S.O.A.R. Contest	Illinois	Wayne Fredette, (708) 532-3904
Oct. 29-30	World HL Jamboree	Poway, CA	Steve Strickland, (619) 741-1037
Nov. 6	S.O.A.R. Turkey Shoot	Illinois	Tom Blood, (708) 377-8641
Nov. 25-27	Tangerine	Orlando, FL	Ed White, (407) 321-1863
Dec. 3	Hand Launch	Poway, CA	Bill West, (619) 222-5296
Dec. 10-11	Winter Soaring Festival	Indio, CA	Buzz Waltz, (619) 327-1775
Feb. 5-6	Southwest Winter Soaring	Gilbert, AZ	Iain Glithero, (602) 839-1733

If there are contests missing from this schedule, that you feel should be added, please ask the CD or a spokesman to let us know via phone, FAX, or a quick note.

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Perry Gilstrap, Contest Director
14701 E 111th St. So.
Broken Arrow, OK 74011
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An Orlando Buzzards Thanksgiving Holiday R/C Soaring Spectacle!

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FIRST ANNUAL Winter Soaring Festival
DECEMBER 10TH and 11TH, 1994

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Public Invited!

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PLEASE CALL OR WRITE FOR ENTRY FORMS AND ACCOMADATION INFORMATION TO:
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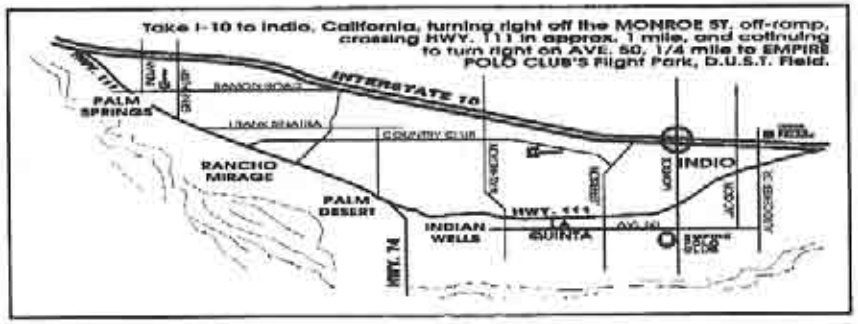

LIFT OFF!

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9:30 AM - 5:00 PM (Closed Sun. & Mon.)

FX 35D

With the many phone calls I get every day, one of the most asked questions I get about electric sailplanes is, "What speed controller should I use?" I have tried just about all of the available controllers on the market and have found most to be very good if used properly, but I could not find all the features I wanted in one unit until now. The new FX35D by AI/Robotics has about any combination of features that I can think of all in one unit. The FX35D is the new improved version of the already popular FX35. Martin Euredjian, the designer of the FX35D and owner has given me permission to reprint some of the features of the FX35D that are in the super large (20 page) manual that comes with every FX35D.

"SPECIFICATIONS: Digital Signal Processor, 6 to 20 cells, 50 Amp, 1.3x1.8x0.5 in, 1.8 oz. BEC, Motor noise filtering, BEC disable jumper, In-Flight-Charger™, MOTOR CUTOFF, Power Management Shutdown™, Soft BRAKE, Timed Brake™, Brake disable jumper, High Rate THROTTLE, Soft Start, Quick Start™, Opto-Coupling, Throttle-Lock™, LED, Adaptive Frame Tracking™, Throttle mode jumper, Auto-Cal™, No adjustments needed, Sequential Arming System™, Power-On Safety Delay™, Thermal Protection, Active Overload Protection™, Output Short Circuit Protection, Stalled Motor Protection, 14 gauge silicon/rubber wire, 20 page manual."

If you are looking for a speed controller for your next model or want to get a speed controller that you can use as you upgrade to a larger motor and cells, try the FX35D. The suggested retail is $120.00, but most are being sold for $90.00. It's a very good buy, no matter what.

Good Flying!! ■

Additional specification information was provided, however the FAX copies of the "System Reference: Standard Configuration" did not come through well. Will see what we can do next month. ED. ■

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*.

1.5 Meter Sagitta R/C Hand Launch

...from Sky Bench Aerotech

Sky Bench Aerotech, with Airtronics permission, is proud to announce the availability of a 1.5 meter version of the original Sagitta. This miniature Sagitta should be an instant winner due to its clean drag free lines, just as with the original. This kit is easy to build and has hand picked balsa sheeting and other wood parts that will equal the quality of the original kit.

In today's world of shrinking flying fields, this model will allow you to fly in school yards. Launch heights of approximately 150 feet are available with our Mini Hi Start. We suggest ordering the 3021 airfoil if the builder plans to cover the wing with heat shrink plastic.

The Sagitta has a 59" wing span, choice of SD7032 or SD3021 airfoil, and can be built flat wing with ailerons or polyhedral. Flying weight, depending upon choice of equipment, ranges from 10 to 16 oz. The construction is a bolt-on one piece foam wing sheeted with 1/32 balsa wood, fuse sides are balsa wood and 1/64 plywood, and the stab is built up.

The price is $49.95 plus $6.00 shipping for the kit and $23.95 for the Mini Hi Start if ordered with the kit from Sky Bench Aerotech, 58030 Cyrenus Lane, Washington, MI 48094. ■

The MAKO

....from Clerx Aeronautics

The Mako is an Open Class competition sailplane designed by Ben Clerx, winner of the prestigious 1992 Visalia Fall Soaring Festival and the 1993 Masters of Soaring. It features state of the art design with epoxy/fiberglass/kevelar fuselage, triple tapered obechi over foam flying surfaces and a slip on nose cone. A generous tail moment allows for excellent tracking for any wing size from 100" to 124", allowing for custom retrofitting.

Two kit options are currently available. A pre-sheeted version incorporates the SD7037 airfoil and features a half inch T6106 aluminum joiner rod that can be replaced by a steel rod for ballast. For those looking for the lightest and strongest, a carbon fiber rod is also available. A Semi-kit version is also available and includes all hardware and composite material. All you provide is the wood. This semi kit also utilizes the SD7037 airfoil and a Squires case hardened 5/16" joiner rod.

The specifications are: 114" wing span, 950 sq. in. wing area, 70 - 74 oz. flying weight, 11 oz. wing loading, SD7037 airfoil, obechi over foam construction with carbon fiber and fiberglass reinforcement and a built up rudder.

This is a fantastic high performance sailplane that has been found to be perfectly suited for the intermediate as well as the advanced competition pilot. Handling characteristics are crisp yet smooth. Slow controllable landings, tight thermal performance and exceptional launching characteristics has made the Mako a resounding success in Southern California over the past year.

The prices for the Mako are: $375.00 presheeted, or $185.00 for semi-kit. To place your order for the Mako or for more information, send a SASE to Clerx Aeronautics, 39 Seabrook, Newport Beach, CA 92660. ■

Starling & Starship

...from Performance Composites

These efficient, high aspect ratio 60" and 2 Meter gliders excel at the slope and in thermals. Don't let the wing loading surprise you, both planes have an incredible L/D, and perform well both in light air and in howling storm winds. Lots of Kevlar and S-glass make these planes very durable, the RG-15 airfoil provides them with awesome speed and the ability to work light air, but the best part is their level of completion.

The wings of both planes are made with 4" of carbon fiber, glass top and bottom in the flight control surfaces and at the servo openings, obechi over blue foam, and a spruce leading edge. The wings are joined at the center section with S-glass. The 2 meter Starship has a shear web spar that makes the thin wing incredibly stiff. The Starling comes set up for two servos in the wing, but can be adapted to torque rod activated ailerons. The Starship comes set up for four servos in the wing.

The Kevlar and S-glass fuse has multiple layers and is *strong!* The Starship fuse has a long nose moment to offset the weight of the 25% tail moment, keeping the amount of lead needed in the nose to a minimum.

Gliders come with the wing sheeted, joined, L.E. shaped, ailerons (and flaps on the Starship) cut out and beveled, tips installed, and the wing is mounted to the fuse with 8-32 bolts. Balsa stabs are jig mounted to the fuse and S-glass reinforced. Canopy is mounted, servo tray is installed, lead is poured in the nose, and other required hardware is included.

Plane requires finish sanding, covering or Varathane, and installion of radio. A completely assembled airplane for the price of some kits!

Includes computer generated performance charts and six pages of finishing and flying instructions.

Specifications:	Starling	Starship
Airfoil	RG-15	RG-15
Span	60"	2 meter
Area (sq. in.)	360	511
Aspect Ratio	10	12
Flying weight	30	39
Wing loading	12	11
Price	$179.95	$249.95

Options:

Torque rod kit (you install) for single servo ailerons on Starling	$12.00
Finished plane	Call
Shipping Charges	Call

Ca. residents add 7.25% sales tax.

Performance Composites, P.O. Box 6843, Napa, CA 94581; (707) 253-8029 ■

Likes & Dislikes

In August, we asked those of you that feel strongly about anything in *RCSD* to jot down your thoughts and send them in to us. We want to know what you like and dislike and are pleased that several of you have done just that. We also received an abnormal number of phone calls this month, which are not included here, where many of you said to keep up the good work! We really appreciate those phone calls! They made our day!

We also want to share a quick analysis that was done to determine the cost per page going all the way back to the first issue of *RCSD*. The chart speaks for itself! However, we ran out of room this month, so we'll include it next month.

"Thanks also for your hard work in putting together the *RCSD*. It is the only magazine that I read from cover to cover. Well done and keep up the good work." Don Richmond, California

"You guys have the best soaring publication going!!!" Steve Loudon, Nebraska

"Thanks for a great publication. Hope to see you at Los Banos 2nd Annual Scale Fun Fly." Ron Widel, California

"Keep up the good work! I like the slick paper and better graphics that come with them. I also like the segregated advertising. If your advertisers think I won't read their ads because they are separated, they are incorrect. I don't always read all the articles, I have little interest in slope soaring or flying wings or scale. My interest is pretty much straight thermal duration at this point, but that is subject to change. The other stuff is not without merit, and I skim it all for applicable tips. The contest reports sometimes seem a little long, but are perhaps a necessary thing. Flying contests is more fun than reading about them." Rob Glover, Alabama

"Great 'publication'. My favorite. Don't let Martin quit his great writing!!" Pat Hart, California

"I'll renew this year, and probably not next year. I don't care for the new "slick" pages. It doesn't feel right." Richard Byrne, Texas

"In response to your 'anything' inquiry, I'd like to share a few thoughts of my own. Regarding the cost of your publication, I don't mind paying the cost as long as you provide soaring specific articles and pictures that I could not find elsewhere. Also, some of your articles seem a little esoteric for even the avid builder (for example, the article on the center of pressure of wings. A mention of the information and a P.O. box would have sufficed. Ultimately, after building our planes most of us want to fly and not necessarily in contests. I would like to see planes in flight flown by "normal" people accompanied by text that describe the plane or the site. (You know, the human interest stuff.) Of course these kinds of stories need to be solicited. (I wouldn't make a suggestion like this without a contribution. So forthcoming I will send you pictures of my stomping grounds, Big Sur, California, with my high performance homebuilt in flight.) To sum it up, I like to fly! That's not to say I don't appreciate "high tech" techniques or F3B or F3Z. I do and I utilize as much as I can in my designs. But we build to fly or so I assume by your publication's title - Soaring. All in all, you have an interesting publication, but a little more won't hurt." Chuck Kim, California

"Keep the glossy stock for the reasons you stated plus it enhances the look of the pub. From my perspective, what little it increases the rates to subscribers, it's worth it. No problem here at all with the subscription rates. I would not be opposed at all to see more advertising in *RCSD*. I don't know if you actively solicit advertising, but more ads certainly would not hurt my feelings. I think it would enhance the value of the publication to A) the readers, B) to the advertisers, and C) to *RCSD*." Bob Sowder, Tennessee

"You have asked for input. *RCSD* is super. Price is not too bad. Gloss paper?? So what! As long as I get a copy, I am happy. I know that this is the computer age but some of the stuff gets pretty heavy (airfoil plotting, elementary stressing, etc.). Most of the models are $150.00 on up to $300.00 or $400.00 or $600.00. What ever happened to the little guy trying to fly a Wanderer or Gentle Lady at 2 or 3 channels?? No computer radio at 5 - 6 - or $700.00. If you have to invest big bucks to fly, you can always sit and watch. Whatever you do, don't forget the little guy!! I don't want to compete with the likes of Mark Allen or Brian Agnew. I'll build a little plane and I'll have fun flying. When it takes a dive, I can rebuild it or drop it in the burn barrel. I had fun and it didn't cost an arm and a leg. A simple good reading (publication) is OK for me. You can't please everybody all the time... Keep up the good work. Thanks." Mike McQuisten, California

"I like the balanced nature of *RCSD* (i.e., not too much of any one area of interest), plus the odd article on something unusual. My particular interest is PSS. Keep up the good work." Craig Foreman, Australia

A Long One from California

"I received my August issue of *RCSD* a few weeks back. It was another good issue. In the front section you asked for feedback on what your readership feels strongly about. I feel strongly that you should continue to publish each month. I look for *RCSD* each month and enjoy it a lot. Keep up the good work. Here's some specific likes and dislikes...

"1. Paper - Who gives a shit. The old paper was fine, the new paper is fine. If it makes your job easier, use glossy. Don't go to color if it adds much cost. I also like the present, physical size of the publication. It would be nice to have more each month, but what would it cost? Is that the business you want to be in?

"2. Advertisements - You changed the format a while back. I rather liked to be surprised and have the ads sprinkled throughout the issues. Again, not a big deal. I do look at all the *RCSD* ads. This is my principal source for sailplane vendors and materials. The more the better. I spend time looking over the classified section. I also like the R/C BBS section. (Jerry, put in occasional pictures of your kits. The prices look right, but what do they look like?)

"3. Regular Contributors - I really like Martin Simons. His last article on aerodynamic center and Cm was well done and easy to understand. The Ridge Writer was my second favorite. Slope soaring is my life. I'm sorry you must discontinue this section! (I enjoyed the interview with Joe Wurts that ran in that column some time ago.) Jerry's Workbench is also a favorite. I also enjoy Hand launch Topics with Scott Smith. International Slope Racing, Gavin Botha.

"4. Content - More construction articles. Composite construction. Model trim and balance. Molding. Race competition. Electric F3E. New product announcements. I also enjoy hearing from Herk Stokley. Kit reviews. Also any new stuff from "Soartech", or UIU Low Reynolds Number Airfoil testing. I very much like to hear about any new developments in airfoil design or theory. The more detailed or technical the better. Sailplane performance calculations, computer programs. Visits to slope sites throughout the country. I really enjoyed that 6 part vacuum bagging series. Composite materials performance - weight vs cost vs strength.

"5. Dislikes - Inaccurate technical info and low tech construction articles (George Siposs). George's May '94 article had quite a few simple technical errors. Articles that are meant to be funny, but aren't. The guy who is always talking to someone called "Bunky". ***BIG DISLIKE - Breaking up articles, so one page is up front with the remainder in the back. Please don't adopt this practice.***" Tim Stover, California

And from Kansas

"I want to thank you for all of the work that you do for the *R/C Soaring Digest (RCSD)*. *RCSD* Staff!!! The monthly book (magazine), is full of information. All of it is interesting, most of it is on a level that the average kinda' guy level, and some of it is on a plateau that fills the real science void that some people need. *RCSD* fills in all of the areas of soaring, so that I can get an idea of what other types of soaring groups look for, and fly. I am primarily into flatland thermaling with 2-3 meter ships. There are so many different ships/airfoils on the market... so many decisions, and to have a limited income... All different types of ships and different styles of flying. What to do? Read about them! Just look in *RCSD*, and when you get the bug, call the manufacturer. These guys love to talk and tell you all about their hobby. On the rare occasion your ship is grounded, because of rain, or snow (or whatever...), you can always find an article that you really wanted to re-read, or try something different in building/flying techniques, and if for some reason you are really in the blues, and not really "up" in the blues, look up your old buddy Cornfed.

"I want to say, "Thank you, and keep up all of the great work," to all of the columnists, and of course to Jerry and Judy Slates!" Lindsey Angell, Kansas ■

Advertiser Index

R/C Soaring Resources

The contacts listed here have volunteered to answer questions on soaring sites or contests in their area.

Contacts & Soaring Groups

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

Arizona - Southern Arizona Glider Enthusiasts, Bill Melcher (contact), 14260 N. Silwind Way, Tucson, AZ 85737; (602) 325-2729. SAGE welcomes all level of flyers!

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

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

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

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

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

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

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

Illinois (South & Southwest) - Silent Order of Aeromodeling by Radio (S.O.A.R.), Jim McIntyre (contact), 23546 W. Fern St., Plainfield, IL 60544-2324; (815) 436-2744.

Illinois (North & Northwest) - S.O.A.R., Bill Christian (contact), 1604 N. Chestnut Ave., Arlington Heights, IL 60004; (708) 259-4617.

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

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

Maine - DownEast Soaring Club (Northern New England area), Steve Savoie (Contact), RR#3 Box 569, Gorham, ME 04038; (207) 929-6639.

Maryland - Baltimore Area Soaring Society, Bill Cavanaugh (President), 1428 Park Ave., Baltimore, MD 21217; (410) 523-0778.

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

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

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

Nebraska - S.W.I.F.T., Christopher Knowles (contact), 12821 Jackson St., Omaha, NE 68154-2934; (402) 330-5335.

Nevada - Las Vegas Soaring Club, Jeff Burg (President), 853 Shrubbery Lane, Las Vegas, NV 89110; (702) 459-8100.

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

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

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

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

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

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

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 $7.00, 1984 for $7.00, 1985 for $8.00, 1986 for $8.00, 1987 for $9.00, 1988 for $9.00, 1989 for $10.00, 1992 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, outside U.S.A. for $80.00. Last 4 (1987-1992) in U.S.A. is $45.00, outside is $50.00. Allan Scidmore, 5013 Dorsett Dr., Madison, WI 53711.

BBS

BBS: SLOPETECH, Southern California; (714) 525-7932, 2400 - 8-N-1

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

Seminars & Workshops

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

NASSA
NORTH AMERICAN SCALE SOARING ASSOCIATION

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

F3B/USA • F3F/USA
RC Sailplane Technical Journal

F3B/USA is a bi-monthly publication dedicated to the sports of F3B and F3F. The journal is intended for the beginning as well as experienced multi-task soaring enthusiast. Articles cover a wide variety of areas including: technical data issues, description of techniques, and articles written by and about the top people in the sports.

Subscription Rates: $14 per year (6 issues)
For More Info Write: F3B/USA,
87 1/2 N. Catalina, Pasadena, CA 91106

LSF

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

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

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

The Vintage Sailplane Association

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

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

T.W.I.T.T.

(The Wing Is The Thing)

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

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

You are invited to join the
NATIONAL SOARING SOCIETY

• OFFICIAL AMA SOARING "SPECIAL INTEREST GROUP" • YEARLY NSS "SOAR-IN" TOURNAMENTS • NATION'WIDE "EXCELLENCE AWARDS PROGRAM" • EXCELLENT BI-MONTHLY NEWSLETTER • NSS FULLY SUPPORTS THE F3B SOARING TEAM & LSF SOARING PROGRAM • NSS IS INVOLVED IN THE ORGANIZATION AND OVERSEEING OF THE SOARING PORTION OF AMA NATS (INCLUDING AWARDS BANQUET) • YEARLY DUES ARE $15 U.S.A. AND $20 OVERSEAS (SPECIAL FAMILY RATES) • NSS OFFICERS ARE FROM ALL 11 DISTRICTS

For Info., Contact NSS Secretary/Treasurer
Robert Massmann
282 Jodie Lane
Wilmington, OH 45177
(513) 382-4612

Classified Advertising Policy

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

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

For Sale - Business

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

"Jet, tearing the skies apart!." One of over 670 quotes and stories by Frank Zaic in **FRANKLY SPEAKING**. $6.95 plus $1.25 postage. Model Aeronautic Publications, Box 135, Northridge, CA 91328.

OVERSIZE PUSHRODS - 47 inch long 0.052 dia. music wire with 40" polypropylene 0.125 O.D. tube. Perfect for elevator and rudder actuation. $2.00 each, plus $4.75 UPS per order. Shipped in PVC tube. BB Sailplanes, 3134 Winnebago Dr., Sedalia, CO 80135.

SILENT FLIGHT CLASSIFIEDS, the newsletter for sailplane and electric builders and pilots. Our classifieds sell your "experienced" planes and equipment. Latest info. for the sportsman and contest pilot. Yearly for $10.00, 12 issues, sample $1.50. SFC, 329 Little Ave., Ridgway, PA 15853.

1.5 METER HAND LAUNCH R/C SAILPLANE KITS - Sagitta, Aquila & Jouster, SD7032 or 3021, foam wings sheeted with 1/32 balsa. $49.95 + $6.00 S&H. Lil Bird (minature BOT), all balsa construction. $29.95 + $6.00 S&H. Mini Hi Start is $23.95 w/kit order. Sky Bench Aerotech, 58030 Cyrenus Lane, Washington, MI 48094; (810) 781-7018.

CANNON R/C SYSTEMS, world's smallest radio systems and ACE R/C, both in business since 1953, are your best choice for small sailplanes & electric models. Cannon servo weighs .35 oz., 4 ch receiver weighs .54 oz. Send for free price discount catalog. Sky Bench Aerotech, 58030 Cyrenus Lane, Washington, MI 48094; (810) 781-7018.

Wanted

Aquilla Grande. Nick @ (415) 728-7709, Northern Calif.

For Sale - Personal

FALCON 550E complete with Astroflight 05 cobalt FAI motor, all servos are JR micros. Futaba FP-77UAF radio and Astroflight 110 quick charger. Fuselage painted with white Emron, wings natural obechi, absolutely beautiful, never been flown or used... $725.00. Call Dr. Tim McCullough (713) 930-9354 (H), 451-6722 (W), Texas.

FALCON 880/SD 7037, ready to fly, 2 Air. 102's, 4 JR 341's, 7 ch RCD platinum Rx (ch 57), 57 Vision module, wingbag. Program your radio & fly today... $500.00 plus shipping. Curt (909) 592-2105 eve., Southern Calif.

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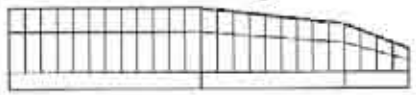

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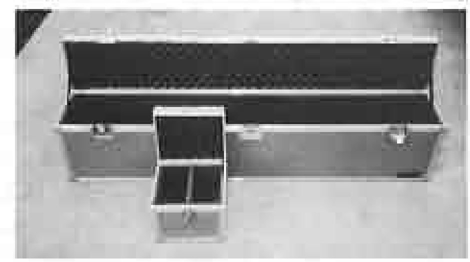

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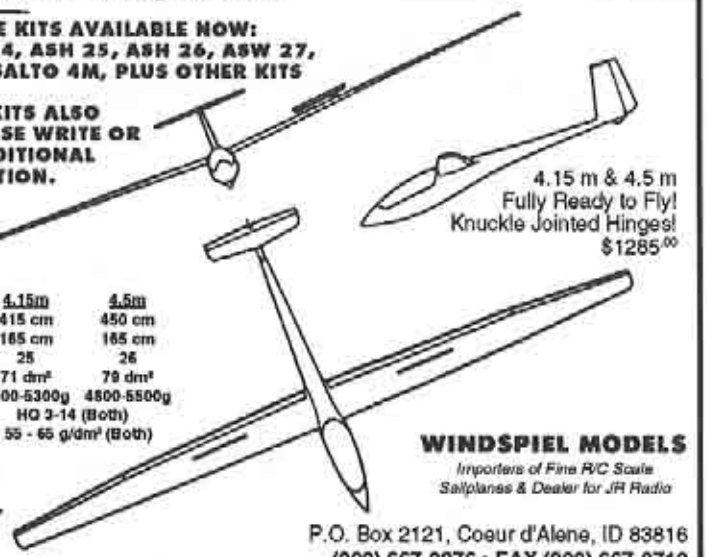

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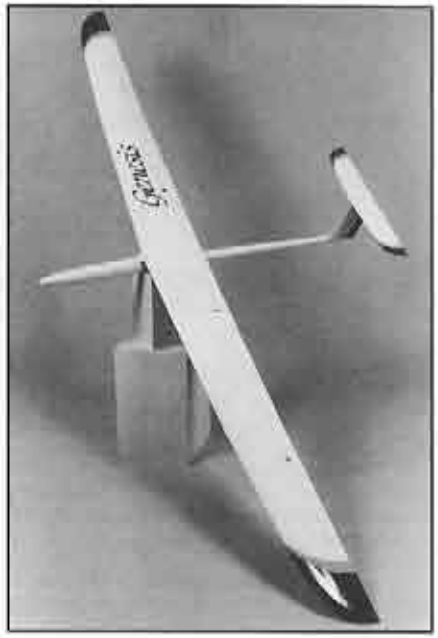

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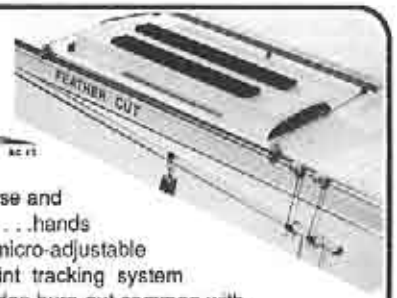

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→ Epoxy Fiberglass Fuselages for the Scratch Builder

The epoxy fiberglass fuselages listed here include suggested specifications (Wing Span/Airfoil/Radio Channels). All requests are done on a custom basis. We do not carry a large inventory, but rather custom make each fuselage as the orders are received. Please allow 6-8 weeks for delivery on partial kits and canopies.

→ Canopies & Accessories

An in-house vacuum form machine allows us to produce our own canopies. If you are looking for a canopy or other vacuum formed accessories (including sailplane, power, etc.), please let us know. We have a large inventory of canopies and do short production runs. Manufacturer inquiries are welcome.

→ Custom Mold Making

Please call.

→ Check or money order only, U.S. funds, please. C.O.D. $4.50 additional. Prices subject to change without notice. Texas residents, please add 7.25 % sales tax. S&H costs are for continental U.S.A., only.

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1/5 Scale Ornith
142" wing span
1/5 Scale Orlice
135" wing span
1/5 Scale ASW-17
135" wing span
Stiletto RG-15

Epoxy Fiberglass Fuselages	Price	S&H
1/6 Scale DPS Reiher V2 (120"/Scale/4)		
46" fuse, canopy, plans	$75.00	$10.00
1/5 Scale ASW-19/20 (132"/RITZ III/4)		
54" fuse, canopy, plans	$75.00	$10.00
1/5 Scale Nimbus (159"/Wortman/4 - 5)		
54" fuse, canopy, plans	$75.00	$10.00
1/5 Scale Rhoenbussard (112.5"/Scale/4)		
40" fuse, plans	$75.00	$10.00
1/5 Scale ASW-17 (135"/Mod. Eppler/4-5)		
49" fuse, canopy, tray, dwg.	$85.00	$10.00
1/5 Scale Orlice (135"/E392/3-4)		
49" fuse, canopy, tray, dwg.	$75.00	$10.00
1/5 Scale Ornith (142"/E392/3-4)		
49" fuse, canopy, tray, dwg.	$85.00	$10.00
1/4 Scale DG-100/200 (147.5"/Wortman/4 - 5)		
64" kevlar reinf. fuse, canopy, tray, docu.	$175.00	$20.00
1/4 Scale Libelle (154"/RITZ I/ 3-4)		
58.5" fuse, canopy, frame, docu. pkg.	$135.00	$20.00
1/4 Scale Jantar (187" or 202"/Wortman/4)		
67" fuse, canopy, plans	$145.00	$20.00
1/4 Scale HP-18 (147"/RITZ III/4)		
69" fuse, canopy, plans	$135.00	$20.00
1/4 + 10% Scale Salto (142.5"/RITZ I/ 3-4)		
61" fuse, canopy, frame, docu. pkg.	$135.00	$20.00
1/4 Scale SZD - 30 Pirat (147"/Clark Y/4)		
62" fuse, canopy, plans	$135.00	$20.00
1/4 Scale Kestrel (167" or 187"/RITZ/4-5)		
63" kevlar reinf. fuse, canopy, frame, docu.	$175.00	$20.00
1/3 Scale ASW-19/20 (16.5'/Wortman/4-5)		
89" fuse, canopy	$250.00	Call
Semi-Scale ASK-14 (90" or 110"/flat bottom/4)		
(motor glider .15 cube in. or electric)		
40" fuse, canopy, plans	$75.00	$10.00
Condor 3m (bolt-on wing mount/up to 10" chord)		
52 1/4" kevlar reinf. fuse, nose cone	$80.00	$10.00
Contestant (148"/E205/3-4/10.5" chord)		
60" fuse, canopy, tray	$75.00	$10.00
Elf 2m (bolt-on wing mount/up to 10" chord)		
44 3/8" fuse, nose cone	$65.00	$10.00
44 3/8" kevlar reinf. fuse, nose cone	$70.00	$10.00
Facetor (83"/E193/3)		
41" fuse, hatch, plans	$75.00	$10.00
Oden (100-130"/S3021/As Req./10.25" chord)		
51" fuse, canopy	$65.00	$10.00
51" kevlar reinf. fuse, canopy	$75.00	$10.00
Raven 3m (119"/Mod. E193/As Req./10.75" chord)		
51" fuse, plans	$70.00	$10.00
51" kevlar reinf. fuse, plans	$80.00	$10.00
Smoothie (100"+/None/Var.)		
49" fuse, hatch	$65.00	$10.00
Special Edition (100-130"/Any/As Req/9.625" chord/bolt-on wing)		
54" kevlar reinf. fuse, nose cone	$80.00	$10.00
Stiletto I (100-136"/Any/As Req./10" max. chord/plug-in wing)		
49" epoxy fiberglass fuselage	$65.00	$10.00
49" kevlar reinf. fuse	$75.00	$10.00
Stiletto II (100-136"/Any/As Req./10" max. chord/bolt-on wing)		
49" epoxy fiberglass fuselage	$65.00	$10.00
49" kevlar reinf. fuse	$75.00	$10.00
Stiletto RG-15 (100-136"/RG-15/As Req./plug-in wing)		
49" kevlar reinf. fiberglass fuse	$75.00	$10.00
Zen (100"+/None/Var.)		
51" fuse, hatch	$75.00	$10.00

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So — you've built and become proficient flying a series of starter gliders. Now, you have the choice of spending big bucks and getting a smallish pre-built glider from the glider design pool-of-clones or for a fraction of the cost and some of your own recreational building time you can fly a true original. You can fly an Anthem!

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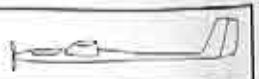

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VERTIGO
VULCAN 2M

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GENESIS
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★ Saturn HL ★

Saturn HL is simple -- it's a great flying Hand Launch that won't empty your wallet for exotic micro radio gear, with an extra measure of durability built in to keep you flying.

Specifications:

Airfoil:	E387
Planform:	Triple taper
Wing:	Foam/Obeche
Fuselage:	Glass/Kevlar
Wing Loading:	5.5 oz sq in

Standard or V tail

★ Saturn 2.0 ★

Saturn 2.0 is our exciting new two meter that shares a lot of the design and flying characteristics of our sucessful, contest winning Saturn 2.9T - with one small twist. It can also be built as a V tail. This is a really exciting two meter ship to fly; either for thermal duration ,or try it on the slope for some neat aerobatics.

Specifications:

Airfoil:	HQ 3/10 - 3/9
Planform:	Triple taper
Wing Area:	585 sq in
Wing:	Foam/Obeche
Fuselage:	Glass/Kevlar
Wing Loading:	9 - 10 oz sq ft

Standard or V tail

FOR PERFORMANCE OUT OF THIS WORLD

QUIET FLIGHT INTERNATIONAL

QFI

We are pleased to announce our brand new glossy monthly publication for the Soaring and Electric Enthusiast

Who is the editor? Well I'm Dave Jones and you probably know me from my editing work on Silent Flight. QFI is an independent magazine from an entirely new publishing house.

So what can the new magazine offer?

- International Contributors
- World News • Quality articles
- New techniques • New ideas
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- Good graphics & photography

Issue 1 kicks off with a good mix of articles on slope, flat field, scale and electric models and special features on Selig Donovan Aerofoils, Lost Foam modelling, The Aerodynamics of Flaps, plus the European shows and a super PSS plan of the Mig 3 WW2 Russian Fighter

Available - late May

QFI is available on subscription from QFI, P.O. Box 3000, Denville, New Jersey 07834

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ESTEEM 110 & 122

A NEW OPEN CLASS SAILPLANE
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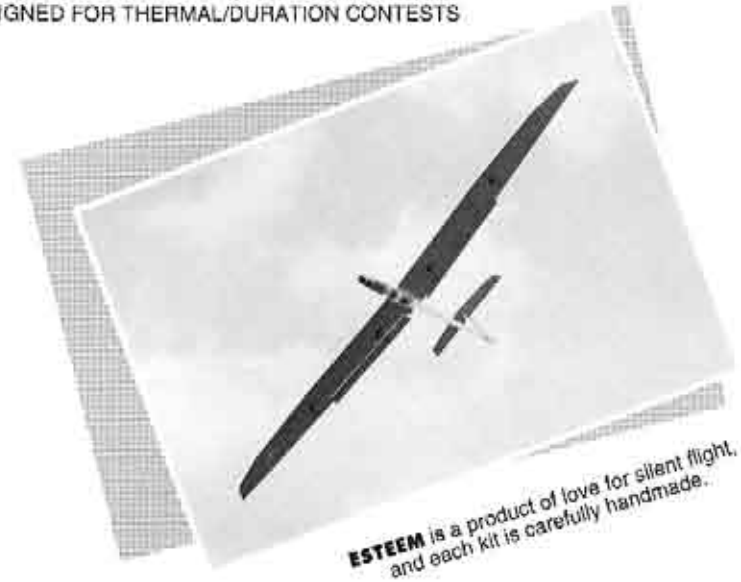

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- ✔ Spar is 1/2" diameter carbon tube installed into most of the wing panel length.
- ✔ Wing panels are swept slightly back.
- ✔ Long, narrow fuselage, is flexible and not too rigid.
- ✔ Strong stab & rudder control combination.

SPECIFICATIONS:

Airfoil:	SD7080 Modified	
Fuselage Length:	57 in.	
Wing:	Foam & Obeche	
Wing Planform:	Triple tapered at leading edges Double tapered at trailing edges	
Flying Weight:	56 - 58 oz.	
	ESTEEM 110	**ESTEEM 122**
Wing Span:	110 in.	122 in.
Wing Loading:	9.8 oz./sq. ft.	9.2 oz./sq. ft.
Dealer & Catalog Price:	$375.00	$400.00
ARF Available:	$630.00	

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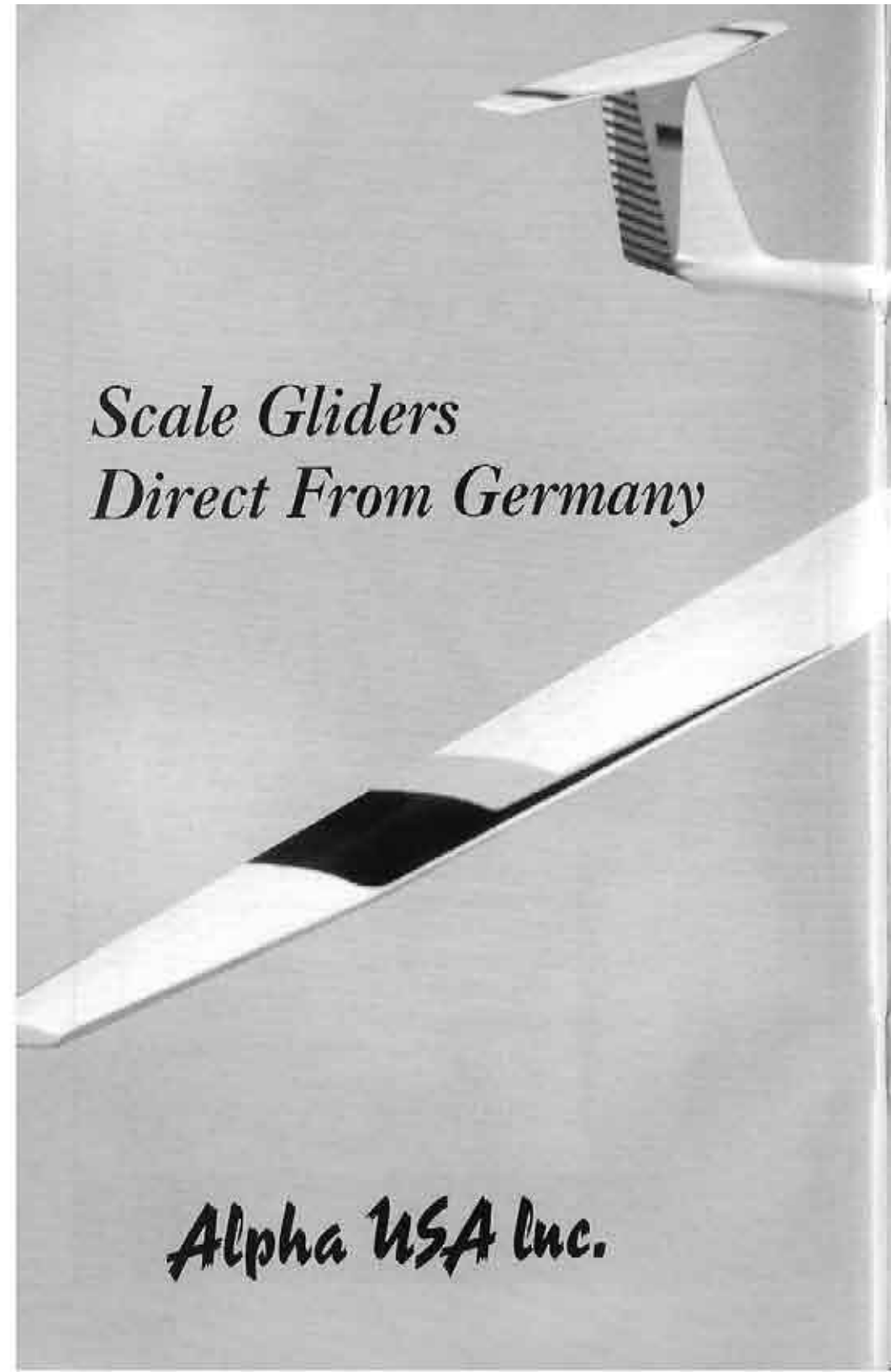

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Also Winner:
•Southern Electric Fly-In
•Memphis-in-May Electric Fly-In

SPECS:
√ Wingspan: 92"
√ Airfoil: Eppler 387
√ Wing Area: 650 sq. in.
√ Ready-to-Fly Weight: 50 oz.
√ Wing-Loading: 11 oz./sq. ft.

KIT FEATURES:
√ Presheeted Obeche Wings
√ Epoxy glass and Kevlar-reinforced fuselage
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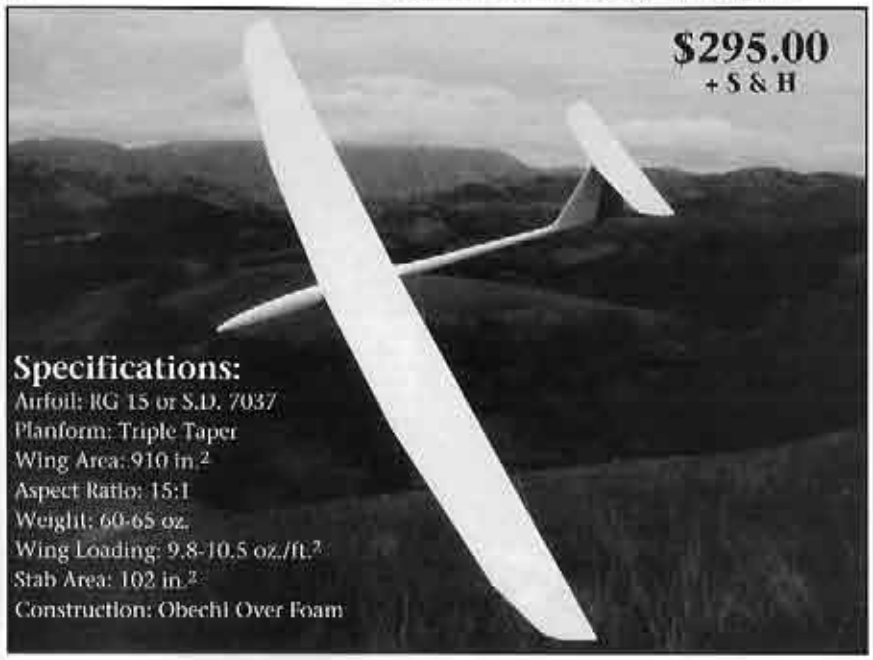
NEW From Spectrum Enterprises

The Prism
Unlimited Thermal Duration Sailplane



The New Prism

The latest in unlimited thermal duration design from Spectrum Enterprises. **The Prism** is an Obechi Over Foam version of our New **Spectrum** F3B moulded plane. It has new fuselage dimensions, a new 9.25" root, 15:1 aspect ratio, 117" span triple taper wing planform, and a stab with a generous area of 102 sq. In. In thermal duration, with the RG15 airfoil, you have the greatest flexibility for covering ground and penetration into the wind. With the proven S.D. 7037 Airfoil and its light empty weight of 60 to 65 oz. it will work the lightest of lift and with its large 2.25 chord flaps, it will slow down beautifully for precision spot landings.

Kit Features:

- Wing & Stab will be pre-sheeted and have routed hingline with plywood root rib pre-installed (comes finish sanded)
- Servo bays are routed and wire channels cut
- 3/8 titanium wing rod
- Fuse will have slip on nosecone and construction will be fiberglass with carbon fiber and Kevlar reinforcement.
- Optional nosecone with moulded landing skid will be available (extra cost)
- Complete instructions and hardware included

New kit price only $295.00 plus shipping and handling.

*The Prism available from Ron at **Spectrum** (707) 838-1427 or **Slegers International** at (201) 366-0880.*
Call for info (P.S.T. 8 a.m. to 4 p.m.)

The Turbo has been redesigned for better performance, durability, and faster building. The kit now comes with a Fiberglass fuselage and full wing sheeting which makes kit building faster. The Turbo's trademark high performance capabilities have been further improved with increased speed and energy retention. An exciting new option offers a fully symetrical SD-8020 wing which gives you the same performance inverted as rightside up opening up new aerobatic possibilities.

Composite ARF

- Ultra Strong Carbon/Glass RG-15 Wings Vacuum Bagged On Blue Foam Cores
- Bolt-On Tail Surfaces - Fits In 2"x7"x 36" Case For Traveling
- Push Rods Installed
- Optional SD-8020 Symetrical Wing
- Optional Radio Installation
- Optional 600mah Battery Pack

Pre-Fab Features

- Vacuum Bagged Balsa Skinned Wings
- Removable Pre-Built Tail
- Push Rods Installed
- Optional SD-8020 Symetrical Wing
- Assembled Wingeron Linkages

Kit Features

- High Quality Wood And Hardware
- Epoxy/Glass Fuselage
- Feather Edge Foam Cores
- Optional SD-8020 Symetrical Wing
- Assembled Wingeron Linkages

Specs Span: 60"

Airfoil: RG-15 or SD8020 Symetrical
Wing Area: 320 sq.in.
Kit Wt. 18-22 oz. Comp. 23-29 oz.
Wing Loading: 10-15oz.sqft.
Control: Wingeron/Elevator
Standard or Micro Radio Gear

CLIMMAX
High Performance 60" Span Hand Launch Thermal Glider
Climmax Takes 1st & 3rd At World Soaring Jamboree Hand Launch Contest

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RAIDER Takes 1,2,3,4, At World Soaring Jamboree Unlimited Sloap Race

Specifications

- Airfoil: SD-7037
- Wing Area: 100 sq. in.
- Wing Loading 5.0-6.0 oz. per sq.ft.
- Two Channel: Rudder, Elevator
- Flying Weight 12-14.5 oz. (FG)
- Machine Cut Balsa, Spruce, And Plywood
- Quality Feather-Edge Foam Wing Cores
- Flying Weight 14-15 oz (all wood kit)
- Bolt-On Wing
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- Standard or Micro Compatible
- Optional 150, 270, or 400 mah Battery Pack

Highly Prefabricated Plane Requiring Little Assembly

Raider Racer	F3B Raider
Span: 90"	Span: 110"
Airfoil: RG-15	Airfoil: RG-15
Aspect Ratio: 11.3	Aspect Ratio: 13.0
Proj. Surface Area: 950 sq. in.	Proj. Surface Area: 1050 sq. in.
Wing Loading: 14 oz/sq.ft Max	Wing Loading: 14 oz/sq.ft Max
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ARF Kit $269.95

60" Span Glass Slope Racer **RENEGADE**

The Renegade is the new "Bad Boy" on the Slopes of California, winning everything in the new 60" span racing class. The RG-15 airfoil gives the Renegade a blistering speed range and the ability to carry a massive ballast load if needed. Its flaperon system cranks the plane through high-G pylon turns with little energy loss. Don't let Renegade's bad attitude scare you off because it is very stable at all speeds and has remarkable light lift and thermaling ability. This rugged plane gives you big plane speed at a small plane price.

Highly Prefabricated Requiring Little Assembly

- High Quality Molded Epoxy/Fiberglass/Kevlar Fuselage With Slip On Nose Cone - Installed Elevator Cable
- Vacuum-Bagged RG-15 Composite Wings Featuring Blue Foam Cores Skinned With Carbon Fiber And Glass
- Pre-cut And Hinged Aileons
- Bolt-On Wing And Tail Surfaces - Optional Ballast Kit

The Contender is designed for those who desire the ultimate in speed and aerobatics, featuring three channel control with wingerons, elevator, and full flying rudder. Contender's long tail moment and stabilizer design give it hands-off stability even at extreme speeds. The airfoil and wing design allows for an incredible speed range with the ability to turn or climb sharply with unmatched energy retention. Wings are constructed with blue foam cores, Carbon Fiber, and plywood wing skins and spars. The fuselage is designed with a large ballast compartment over the C.G. where up to 20 ounces of ballast can be placed for high lift conditions or slope racing. At the standard flying weight of 50 ounces, the Contender is very fast and will fly great in winds averaging as low as 5-7 m.p.h.

Specifications

- High Speed 2 Meter Aerobatic Slope Plane
- Transition Modified S3016 Airfoil
- Wing Area 420 Sq. inches
- Flying Weight (unballasted) 50 ounces
- Wing Loading 17.0 to 24.0 oz. per sq. ft.
- Three Channel: Wingeron, Rudder, Elevator

Composite ARF Features

- High Quality Kevlar/Glass Fuselage
- Sapped Blue Foam Cores And Carbon Fiber & Glass
- Wingeron Linkages And Control Cables Installed
- Bolt On Tail Surfaces
- Highly Prefabricated - Needs Little Assembly

The Ultimate Aerobatic Speed Machine

FiberGlass/Kevlar Body Now Available !

CONTENDER

Glass Body Kit $149.95 • Composite ARF $289.95

Contender takes Novice Slope Racing Class at World Soaring Jamboree

The Renegade kit has all of the high performance flying ability of the composite version but at a lower price. Each kit features precision cut foam cores, full hardware kit, full size plans, and can fit any type of radio gear. The Renegade is one of the most versatile slope planes anywhere and can be built very light to accomodate those small slopes or thermal flying areas.

Features

- Airfoil: S-3014
- Wing Area: 396 sq. in.
- Flying Weight 25-32 oz. (unballasted)
- Two Channel: Aileron / Flaperon-Elevator
- Bolt On Wing - Foam Wing Cores
- Pre-cut Wood Parts
- Hardware Kit - Full Size Plans
- Standard Or Micro RC Compatible

Wood Kit $65.95
Pre-Fab $159.95

RENEGADE THE KIT

High Performance C.R. Aircraft Sailplanes

- California Residents Tax 7.75%
- Shipping & Handling $5.00

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* Prices Subject to Change Without Notice Orders Shipped U.P.S.

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