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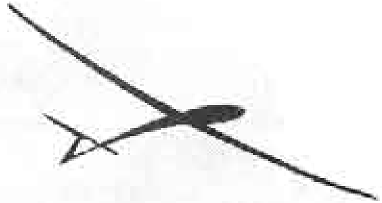
R/C Soaring Digest

A publication for the R/C sailplane enthusiast!



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

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The Soaring Site

About the Cover

The cover photo recently appeared in the May/June 1992 newsletter of the Cincinnati Soaring Society in Ohio and was sent to us by Chuck Lohre (editor). Dick Pratt is holding his scale Bald Eagle for Joe Ruh to photograph. According to the newsletter, "The wing is built up but the fuselage/body is fiberglass inside a plaster female mold from a foam carving. Dick's ready to make a flock. Seriously, Dick is going to make a test bed body to prove out the flight characteristics. Good luck!"

M.A.R.C.S. Symposium

The Madison Area Radio Control Society (M.A.R.C.S.) is holding a National Sailplane Symposium on October 24 - 25 in Wisconsin. While final arrangements are not available as of this issue, we have received calls over the last year by several of you who wanted to know when the next Symposium would be held. Well, its coming, soon. We are trying to coordinate Martin Simons stay in the U.S.A. with the Symposium and, at this writing, expect him to be a speaker at the event.

Yes, Martin will be in Wylie, Texas during October. Should any of you find the time to come over for a visit, just give us a call around the end of September, and we'll let you know what kind of schedule has been set up. There will be some (lots?) of flying, barbecue(s), an informal talk on the subject of aerodynamics, and all sorts of things we should be able to dream up on the subject of sailplanes what with all the *"elves"* around.

The New Club in Alabama

Charles Roberts of the Central Alabama Soaring Society has written to say that their first contest is over and, "The deed is done! ...The task was cumulative duration. Five attempts to get thirty minutes with a seven minute max per round. There was a one point per second penalty for everything over seven minutes and thirty minutes cumulative. The landings were L-6s. I had only seen L-6 before in Memphis and like them as a means to combat awkward looking, destructive, dork landings - AKA, yard darting. Everyone seemed to like L-6 better. There were 24 entrants... (Florida, Alabama, Tennessee) Low tech was the order of the day taking 3 out of 5 places. A Sailaire flown by Kendal McDonald of Tullahoma, TN was first; a Bird of Time flown by yours truly was third, and Charles Waller came in fourth. High tech was represented by Rusty Rood of Pensacola, FL who came in second with a Falcon 880. Of course, Rusty could thermal a Boeing 747, so it's not a test of plane. Sam Fara of Huntsville, TN came in fifth with a Constellation." We're glad your first contest was a success!

Across the Pond

Michael Shellim, a new subscriber in London, England, has written to say, "I have just taken delivery of a new F3B kit by Stuart Blanchard who is, as you know, a stalwart of the F3B scene and ex-member of the UK team. The kit is of his well-known Calypso, and features fuselage mouldings of superb quality, plus machine-made epoxy/glass/obechi skinned blue foam wings and tailplane. The wings have carbon fiber spars. The RG15 section wings also are of excellent quality; in fact, the best I have ever seen in a kit, with a razor sharp and dead straight trailing edge.

"Models of this kind are beginning to find their way on the slopes round here, in spite of the relatively high cost. But you only have to see the quantum leap in both penetration and thermal ability from these F3B machines to realise that it's the only way to go if you can afford it. This particular machine is excellent value at £236.00 for the two-piece wing version.

Another hi-tech model seen on my local slope at Ivinghoe Beacon is Dave Woods' Ellipse, a spectacular F3B-style soarer of Czech manufacturer. If this style of soarer gets really popular, there is bound to be a traffic problem soon as these machines fly fast and eat up an awful lot of sky."

Interglide 92

Jack Sile, editor of *Soarer* in England has sent a copy of the report on Interglide 92, the European F3J Cup Event, organised and run by the Fairlop Model Flying Club, which was held on July 25th & 26th. Since the write-up will appear in *Soarer*, we won't print it in its entirety.

"Rob Ashley, from the Wessex Soaring Association, has won the Southern Area dominated 1992 Interglide Fly Off. Bob is a newcomer and was flying a "modified" Fendon. The 1992 version was flown to F3J rules as provided by the BMFA and did not contain the latest CIAM changes.

"The powerful German team demonstrated a new technique of hand-towing with 2 towmen and a pulley. Their F3B models were an experience to behold with launches that were nothing short of spectacular!

"J.V. Valenta from Czechoslovakia caused more of a stir on the ground with his "Thermik", which enabled him to go home with a full order book. I would guess that within a short amount of time there will probably be enough Thermiks around to start a new class. Plenty of Grifters were about, as well (flown by Kai Erdmann and Mr. F3J Germany,

Mark Foster's Libelle
Pasadena, California

Rheinhard Werner)."

Jack says in the report, "Interglide 92 was a world class event." Congratulations certainly are in order for all the people who worked hard to make it a success! (The Top Winners: 2nd place - M. Johnson, 3rd place - K. Hinch, 4th place - M. Neal, 5th place - D. Charles)

The Great Race

The Great Race was held on June 13-14 in Osewego, Illinois. Glen Poole, Sr. sent us the photograph and a copy of the results showing that Joe Wurts took first place, Pat Flynn, 2nd, and Ken Bates, 3rd. The photograph (L-R) is Rich Burnowski (flier), Jerry Bannister (timer), Glen Poole Sr. (flier) and Al Zolecki (driver). ■

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A Means of Achieving Maximum Differential with a Rigid Control System

Some swept wing tailless designs require two rudders, one on each wing tip. The idea is to have the rudder on the inside of the turn deflect outward while the opposite rudder remains motionless. A challenge is presented, however, when the rudders are connected to the same servo wheel.

In a previous column, "Some Notes on the Construction of a Storch IV", we described a system analogous to a commonly used method of deploying spoilers for accomplishing this function. Bill Kubiak, our Minnesota friend, described an alternative linkage in a recent letter to us. As Bill's suggestion is explained in terms of aileron differential, as for a conventional aircraft, we thought we'd pass on the text of the letter to *RCSD* readers.

"I've been reading your February 1992 column (Construction notes for the Storch IV) and I think I have to disagree with your Figure 2. I don't like the idea of the loose string through the control horn.

"I think the loose string will allow the rudders to flap (or flutter). I think that all control surfaces should be controlled with rigid linkages. I think that a simple modification of the linkage used for 2:1 differential aileron movement would work OK.

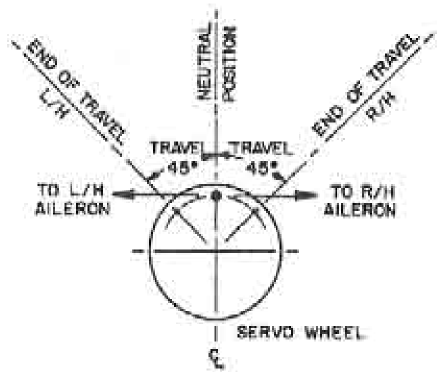

FIGURE 1

"Figure 1 shows the usual setup for equal aileron deflection. Both push rods come off a common point on the servo wheel.

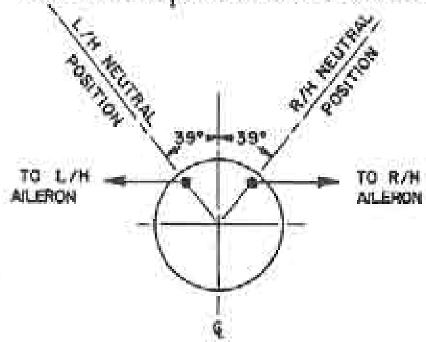

FIGURE 2

"For a 2:1 differential movement the servo wheel has two pivot points, one for each aileron, as shown in Figure 2. Each is located 39° off the common center.

"When the servo wheel turns counterclockwise the down left hand aileron movement is equal to

$$\sin 84° - 39° = .3652$$

"For clockwise motion the up L/H aileron movement is equal to

$$\sin 39° + \sin 6° = .7338$$

as shown in Figure 3.

"So the ratio between up aileron movement and down aileron movement is

$$\frac{.7338}{.3652} = 2.0094$$

or 2:1.

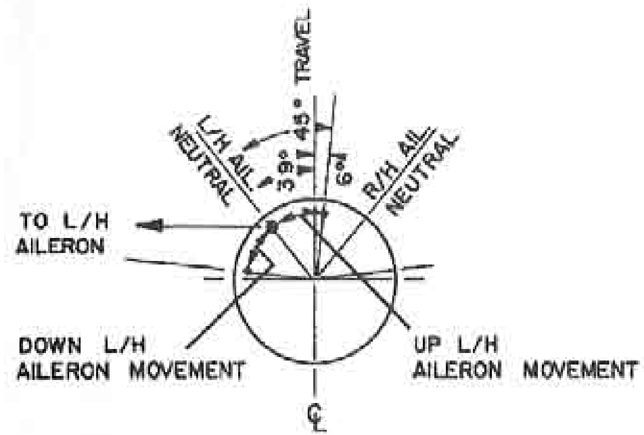

FIGURE 3

"If this method is carried to an extreme the pivot point for the L/H aileron would be moved around to 67.5° off the servo center line. (See Figure 4.) When the servo wheel is turned counterclockwise the down L/H aileron movement is equal to

$$\sin 90° - 67.5° = .0761$$

"When the servo wheel is turned clockwise the up L/H aileron movement is equal to

$$\sin 67.5° - 22.5° = .5412$$

"And

$$\frac{.5412}{.0761} = 7.11$$

"This is the maximum aileron differential obtainable through servo wheel geometry alone.

"The down going aileron would not remain motionless while the other aileron moved up. The down going aileron would wave back and forth a little but this would be acceptable to me because the linkage would be rigid.

"Only the position of the left hand aileron linkage pivot is shown in Figures 3 and 4. The right hand aileron pivot position is symmetrically opposite to the left hand, just as for the two pivot points in the 2:1 linkage shown in Figure 2."

As stated at the beginning, the mechanics of aileron differential as described here translate equally to rudder differential as used in our applications. Bill's information is therefore helpful to designers/builders of conventional tailed aircraft, as well as to enthusiasts of tailless configurations. Thanks, Bill! ■

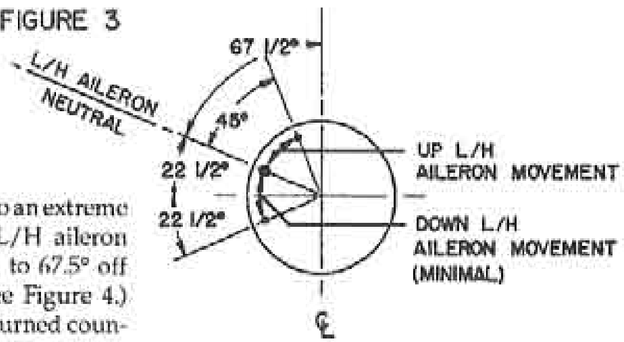

FIGURE 4

Flying in Wind and Weather

...By Martin Simons

13 Loch Street, Stepney,
South Australia 5069

Air moving up and down

So far we have dealt with flying in the wind, which is the more or less horizontal general motion of large air masses. Sailplane pilots, however, seek out air which is moving upwards and try to avoid that which is coming down. If the air where we are flying is moving only horizontally, we tend to pack up and go home. But there are some confused ideas about vertical motions in the air and the way our models behave in them.

It is well understood by every model flier that wings such as those on our sailplanes, will stall if the angle of attack of the airflow exceeds the stalling angle. There is no escape from this. The actual value of the angle of attack at which the stall occurs differs from one wing to another, but typically it is about 15 degrees. A model with a stalled wing will not fly properly, so, except for aerobatic purposes, we control the model, especially in turns near the ground, so that this angle is not reached.

The flow of air when the wind is blowing over a steep slope, is more or less as shown in Figure 18. The air cannot go through the hill, so it must go up and over the top. The entire flow 'field' is inclined. If the slope is steep, the angle at which the airflow goes up might be 30 degrees, more if the slope is a cliff, less over a gentler declivity, but anyway, angled up. It is this upward angling of the airflow that creates the upcurrent in front of the hill, and it is in this slanting flow that a model (or full scale) hill soaring sailplane must fly if it is to soar.

The wing of the slope soaring sailplane, trimmed for its best rate of sink, takes up (give or take a degree or two), a roughly horizontal angle to the ground. The flow over the hill is at an angle to the horizontal considerably greater than the stalling angle of the wing.

Some model fliers have tied themselves in extraordinary intellectual knots because, putting the two ideas together stalling angle and angle of inclined flow up the hill, it seems to them that when the sailplane is flying in slope lift, it ought to be constantly stalled. Yet it isn't. The wing does not stall. If it did, hill soaring would be totally impossible. The model would fall out of the sky as soon as it was launched.

If this line of confused thought is applied to thermal soaring, it is obviously even more mistaken (Figure 19). The air in thermals goes pretty well straight up. Granted, this is not a perfectly vertical ascent, but give or take a few degrees, it is closer to perpendicular than the slope wind, which is merely tilted somewhat. (The internal structure and formation of thermals, and how to use them, will be discussed later.) Yet a model in a thermal, trimmed to soar efficiently, once again has its wing more or less at a horizontal angle to the ground (ignoring the bank and the up elevator trim which is necessary to cause the model to circle, as described in detail in the previous article- this hardly affects the present argument). Yet some pilots believe that in a thermal, the air strikes the sailplane from directly underneath, and it is even said sometimes that for climbing in such an upcurrent, the turn should be as flat as possible to present the greatest possible wing area to the rising air. If this were even half true, thermal soaring would be quite impossible. Indeed, any aircraft at all that ran into an upcurrent would instantly be in a profound stall. Obviously it does not happen.

When a model enters a downcurrent, these same confusions appear in reverse.

Aircraft carriers do not often climb hills or soar in thermals, but the same general kind of argument applies to flying in any current of air. Not many people think of flying gliders inside moving vehicles, but we do.

Entirely in the interests of science, we are going in a very large cable car up a mountain (Figure 20). The air in the car ascends at an angle matching the slope of the mountain. The wind outside happens to be blowing up the slope, at exactly the same speed as the car. Launching the glider from the end of the car nearest to the slope, we see it fly steadily, without stalling, to the other end, where it hits the end wall. We have made our point.

The glider has a certain sinking speed through the air. The air in the cable car ascends faster than the glider's sink rate. At the moment of touch down, it is actually higher, relative to the mountain, than when it was launched, so it has made a brief soaring flight in a mass of air that is moving up an inclined path up the slope. As it happens, the airspeed of the glider, in its present trim, is exactly the same as the speed of the cable car, so the glider rises vertically above its launching point. To the people standing on the

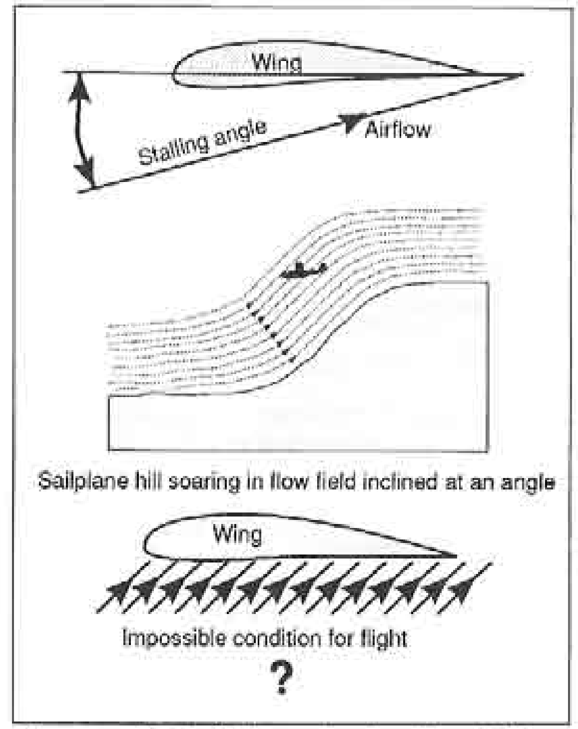

Figure 18 Sailplane in inclined flow

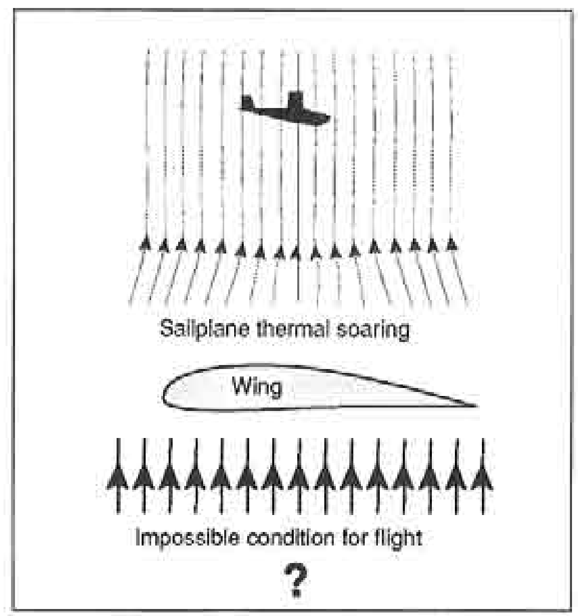

Figure 19 Sailplane in thermal

slope watching the cable car go by (like Crusoe watching the ship), the glider does not move forward at all, but hovers, and rises. The air in the cable car moves past them with the wind they feel on their faces. The people in the car feel no wind because they are moving with the air.

The angle of attack of the glider wing to the air, is exactly the same as it would have been if launched in a dead calm over level ground. The air moving up the slope moves as a whole, a package, and within such a mass the glider will fly just as it will in any other moving mass of air. What counts is the flow relative to the sailplane and this is the same however the air mass as a whole is moving.

Imagine that the cable car window at the far end is open and that the glider flies out of it. The air outside moves up at the same speed and angle as the air inside the car, so the glider notices no difference at all and flies on and up above the slope without the slightest change of trim being required.

When the cable car gets to the top we shall find scores aeromodellers flinging sailplanes off the mountain and soaring in air moving up the slope at an angle greater than the stalling angle of any sailplane. Very likely there will be hang gliders and contest sailplanes all following the same principles.

By the time we decide to go down the mountain, as often happens in such regions the wind has reversed and is now blowing down the slope at the same speed and angle as the car descends. The glider still flies perfectly, but of course since the mass of air it is in is sinking, it comes down instead of rising relative to the ground. Because it is now flying in the downwind direction, the outside watchers, who feel the wind blowing down the slope, see the glider moving by at a ground speed faster than the cable car, and of course it is losing height rapidly too. But because the glider is trimmed for a particular airspeed, it flies no differently from when the car was going up the hill. If launched in the same way from the same position inside the moving car, it hits the wall in the same place as before.

A related confusion was apparent in the pages of many, if not all, model flying magazines about fifty years ago. Lacking radio control, free flight slope soaring sailplanes at that time were often built but their flights were usually brief. After launching from a hill top into wind, they would fly out and climb in the slope lift for some distance but soon would be upset slightly by a gust, or begin to deviate to one side or the other because of a slight asymmetry in their construction. Once heading out of the wind they were quickly swept away to leeward, usually falling into the turbulent 'white water' downcurrent on the lee side of the hill, and crashing. Occasionally better success would come when a model lingered longer in the lift, but the final result was almost always the same - a long walk to leeward to find the model.

Practically every slope soaring model was designed with a huge vertical fin. This, it was claimed, again and again and again, was to keep the model heading into wind for as long as possible.

It did not work. The models with huge fins, like the rest, head out over the slope for a distance, then would begin to veer off and sweep away to the lee side. Once the turn out of wind began, they made not the slightest attempt to correct the deviation. They were neither better nor worse than the others in this respect.

Cable cars are usually rather narrow, but imagine a very wide one, inside which it would be possible to launch a small model sailplane from side to side instead of from the rear towards the front. Give it an enormous fin. The package of air in the car is moving straight up the slope. If the large fin theory was correct, the model launched crosswise would quickly turn to head along the car from back to front.

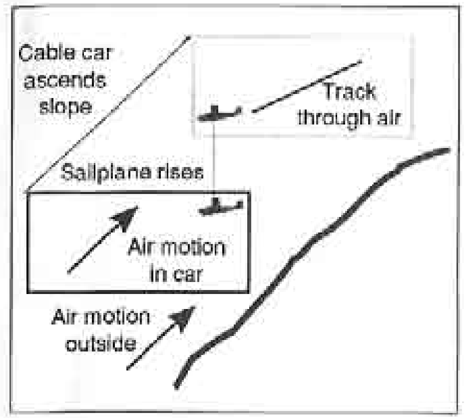

Figure 20 Glider flying in ascending cable car

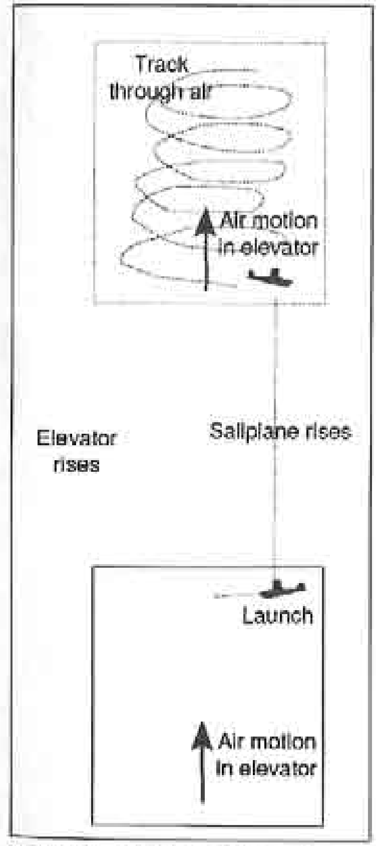

Figure 21 Soaring in an elevator

In fact it would show not even the slightest inclination to turn so. Why should it? The air flows directly from nose to tail of a correctly trimmed model and will flow from nose to tail whatever direction the model is flying, providing it is trimmed correctly. There is no sideways flow to push the fin and turn the model. Cut the fin down, launch again, and the same result appears.

Whole generations of free flight slope soaring sailplanes were built on this mistaken notion. Even today, I still hear people at slope soaring sites claiming that a slope soarer needs a large fin. Yet models with perfectly ordinary fins are commonly flown successfully at such sites and those with large fins do no better.

What about the thermal soarer? No need for a mountain. Go to any tall building where there are elevators (Figure 21). If possible, find one of those transparent ones that go up and down the walls, so that you may observe the ground as you go up, and so that outside observers can be imagined, like the mountain climbers on the slope or Crusoe on the island. Suppose the elevator to be exceptionally large, though its size really makes no difference. Make a small sailplane, trim it for circling, get into the elevator and, as it ascends, launch the glider from as high a position as possible. The air in the elevator is going vertically upwards like the air in a thermal. The glider circles round and round perfectly normally in this rapidly rising package of air, and, if it has a suitably low rate of sink, it will be higher when it hits the floor of the elevator than it was when it was launched. To the watchers outside, the glider has soared upwards by circling round and round in a rising package of air. To the people in the elevator, it has spiralled down to the floor. If the air in the elevator is imagined as a similar package rising within a a thermal, the problem of stalling in vertical air currents disappears. ■

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Surprise II

A friend of mine recently returned from a trip to Europe, and knowing that I am always interested in new planes and accessories, brought back with him the new Aeronaut catalog. Although the catalog is in German, which I can't read, it is still interesting to look at all the items not available in this country. The first thing I noticed was the Surprise II on the cover, held by Rudolf Freudenthaler. For those who may not know, Mr. Freudenthaler has been the world champion in F3E in 1986, 1988 and 1990, most recently using the Surprise II. Knowing of Mr. Freudenthaler's fine reputation as a flyer, manufacturer and builder, I tried to get a Surprise II. After many phone calls and letters to just about anyone I could think of who might handle the Surprise II, and not getting any positive results, I called Rudolf directly, which is what I should have done in the first place.

As it turned out, Rudolf was extremely helpful in helping me acquire a Surprise II. He faxed me a catalog of the products he manufactures and other items that he handles. I didn't know it at the time, but Rudolf also owns a hobby shop in Austria. Some of the items that Rudolf handles that so far have not been imported into this country, are his custom props and spinners and a fine line of speed controllers and HP motors.

After seeing all these neat, new items, I let my friend Ed Hinkle in North Carolina know. Both of us thought it would take many months to get our order back from Austria, so we placed a large order which included four Surprise IIs. As it turned out, Rudolf had everything in stock and we had the order in ten days. As I had mentioned in an earlier *RCSD* article, dealing with foreign countries is not as bad as you might think.

The Surprise II turned out to be every bit as good, if not better than I had thought. There is not much to getting one flying as most of the work has already been done for you. The wing is one piece. It is a white foam core that is first fiber-glassed, has been reinforced at the center section with carbon fiber and then completely sheeted with balsa. The leading edge has been installed and sanded to shape. As a matter of fact, the whole wing has been sanded and only needs a slight touch-up. The servo wires are already installed and the servo mounting area is marked for you. All you have to do is add tip blocks, cut out the ailerons, install servos and cover. As you can see by the construction methods, this is a very strong yet light wing. Remember this wing was designed to handle from 7-27 cells.

The fuselage is Kevlar with a white gelcoat. The fin already has the T-nuts installed for the bolt-on T-tail stab. The stab is also a Kevlar composite that is very light. The fuselage needs a firewall installed to mount the motor, wing hold down plate installed, and a servo installed in the fin area. The stab needs the elevator cut out and this unit then bolted to the fin. The holes are already drilled in the stab which line up perfectly with the fin. The last thing to do is to install the motor, prop, spinner, batteries, speed controller and the receiver.

The flight performance, as you would expect from a world class plane, designed by the world champion, is excellent. I have flown the Surprise II with 7-20 cells and found all of the combinations to work very well. But personally I prefer 7-10 cells. Because the Surprise II is designed for F3E, it flies very fast, is very stable, yet still thermals well. By using 7-10 cells to keep the wing loading down it lands very nicely. If you are looking for something like this with a world championship record, the Surprise II may be for you.

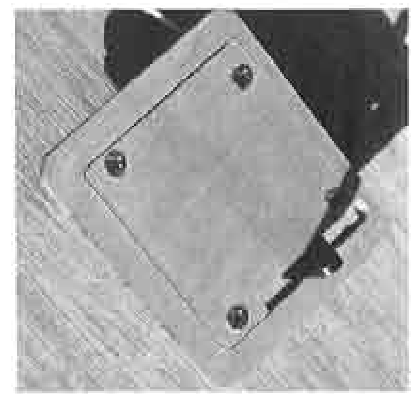
Besides the four I got from Rudolf, I know of only one other in the United States. I was so impressed with this plane and the equipment that Rudolf handles, that I have become his United States agent. If you are looking for a Surprise II, give me a call as I have a limited supply available. I take credit cards and my FAX number is shown above.

My most recent project is electrifying a Falcon 880. At this time everything seems to be working well. I hope to report on this project next month.

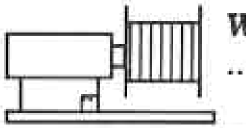
New Products

My good friend and fellow *RCSD* writer, Gordon Jones, better known in the wing sheeting business as Elf #12, told me of a man in his area that has started a wing building and sheeting business. Needing a wing for one of my fuselages, I thought I would give him a try. Dale King, owner of Elf Engineering, is located at 1111 Highridge Road, Wylie, TX 75098; (214) 475-8093. Dale cuts the cores, installs the brass wing rod tube, makes a spar reinforced with fiberglass and Kevlar, puts the root rib on and sheets the whole wing with Obechi at a very reasonable price. The quality of the wing is excellent, straight, true and light. Dale will also do custom cutting and sheeting for those who do not have the skill or time to sheet a wing.

Servo Mounts



Another new item that falls into the "I wish I had tried this sooner" category is the servo mounts by Soarcraft 615 N. Farr Road, Spokane, WA 99206; (509) 926-4803. They are light at 10.2 grams per pair. The parts are cut from birch aircraft plywood with a jeweler's saw using computer generated templates and adhesive (CA) bonded together. If you want a mount that lets you remove the servo easily for servicing or replacing, or for sharing servos with another wing, this would be an excellent item to have. I have tried them and like them. ■



Winch Line
...by Gordon Jones

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

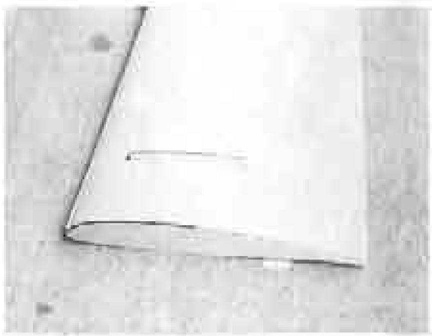
Composite Wings - Part 2

A little about the project...I decided that I could provide the construction techniques for building a composite wing and do some other things at the same time. I will cover both plug-in and bolt-on wing composite construction with a couple of building options. I also selected materials from each of the *RCSD* advertisers so that I could compare the various product lines, and to match similar structures for weight and strength using different layups.

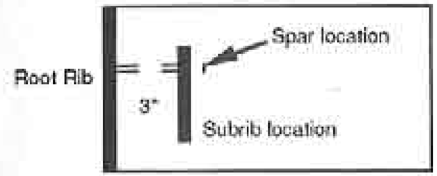
I built four wings with various layups to obtain a comparison of products, strength and weights. These were two plug-in wings with different spar systems, and two bolt-on wings with slightly different construction techniques. I must admit deciding on the wings, spar arrangements and layups was an interesting project in itself. The basic thought here was to show as many options to the builder as I could. In addition I wanted to show various possible layup schemes for different applications to provide an idea of the possibilities. As with the rest of this hobby the only limit is your imagination.

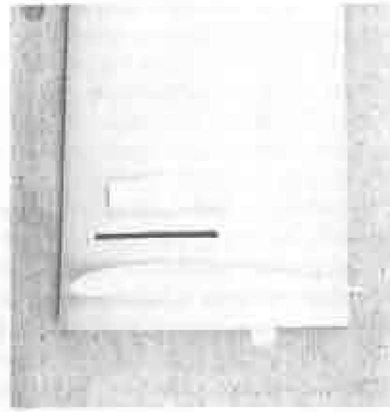
Now, let's look at the preparation phase of glass bagging a wing. The first step, other than deciding on the airfoil, planform, and cutting the cores is the spar system that will be used. There are several systems that will work quite well in a composite wing that have been around for years. The old reliable system that has been around for years made of balsa/spruce is one that is a favorite with many modelers because they are used to the construction technique and it is easy to build. This is shown in the picture below. Using 3/8" x 1" hard balsa cut out a slot of the dihedral that you want to use. Fit the brass tube and then epoxy it into the balsa spar with epoxy and microballons being sure not to let any get over the sides of the spar. Next, cap the spar front and back with 1/32" ply six inches on the front and 12 inches on the rear of the spar. Next, cut out a slot in the foam cores to allow for the spar assembly. Match the spar with the cores and cut the spar down to the graduation of the core as it get smaller farther out in the wing. Once this is fit you can glue the spar in place in the foam cores. Presto you are done.

As an alternative some folks have taken to wrapping the spar assembly with Kevlar prior to glueing it in the wing. Also you can use a hard wood for the spar as some of the Europeans are doing. There are many options here that can be used for the spar that will work nicely; the option is yours.

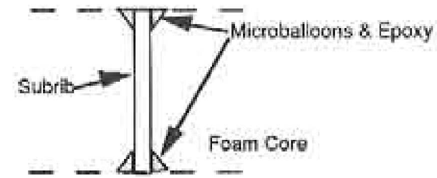


In addition to the above systems, a new option comes into play now with the composite structure. This is cutting a single 1/4 ply root rib and with a 1/4 ply sub rib about 3 inches into the wing core to support the wing rod. This option is a favorite mine as it takes very little time yet is strong and has been used in everything from cross-country to two meter ships. The root/subroot rib option also speeds the building process as it takes very little time to accomplish. The only thing that you will need for this option is a jig to drill the carry through tube holes, but this is easy to make and will be discussed later.





First, cut a root rib and then decide where the carry through will be located (roughly). With this spot in mind measure about two inches on either side of this point on the root rib. Using the root rib as a guide mark out a pattern for the sub rib on the plywood; then cut it out. Mark the location of the subrib on the foam core using the same technique measuring about three inches out into the core. Draw an outline of the subrib on the foam and then cut it out with an X-acto knife. Note that the subrib should fit snugly in the foam core. At this point trial fit the subrib and perform any trimming that may be necessary for a good fit. The final stage in this option is to epoxy the root and subrib on the cores. When this is dry, cut about a 45 degree trough around the sub rib on the top and bottom and then fill this cut with epoxy and microballons forming an "I" beam. That's all there is to installing the system.



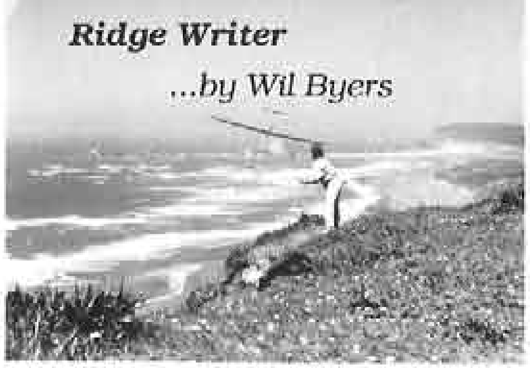
The next big item on the agenda was to decide the cloth needed for the outer skins. This is where many opinions come into play as there are many differing thoughts about glass layups. I am a believer that we have been over engineering our glass wings and have started backing of the amount of cloth used in the layups. The majority of the flyers today are Thermal type flyers and as such the 100 ounce airplane is a handicap. (There are exceptions I know!) With this project I decided that I would use no more than five ounces of cloth (a layer of 3.0 and a layer of 2 ounce, for example) on any wing. My idea was to obtain the required strength for the launch through the spar and skin structure, and to make the skin as ding resistant as possible at the same time. This can be accomplished in several ways by using different materials for the construction.

With four wings, I wanted four different layups that would provide a good comparison of strength and materials. I choose the following layups: 3 ounce crowfoot E glass with a layer of 1.4 ounce as an outer shell, 3.2 ounce Uni-Web carbon fiber with a 1.4 ounce outer shell, 2.2 ounce Kevlar with a 1.4 ounce outer shell, and a 2 Meter wing with multiple layers of 1.4 ounce E glass. Each glass layup contained a 4 ounce carbon fiber strip to act as either a spar or a spar cap for the balsa spar assembly. A second layer of light glass was used from the root out about 18 inches for additional strength in the root area for the launch. I have used similar layups with good success and come out with fairly light wing panels.

Next, we will begin the construction phase of the project. ■

Ridge Writer

...by Wil Byers



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

As discussed in the July issue of this great Digest, scale soaring is quite a unique form of the hobby. It is also greatly overlooked by the R/C soaring enthusiast in terms of models with an ability to soar. This is most likely due to the fact that scale models are usually quite a fair bit larger than their non-scale cousins. And, it is probably because most scale ships weigh a good fraction more than other models. Therefore, this month I would like to pass along some data that may put a different perspective on scale soaring and the fun to be had by participating in it.

Scale gliders and soaring machines are every bit as good soarers as other soaring models. However, they are definitely not thermal duration ships, which can be "SPOT" landed. In the hands of a good pilot though, they will certainly get good air times and their L/D will exceed most if not all non-scale gliders. A definite problem arises though when one wants to land a 13 pound model. It rarely or never stops like a 4 pound model (something to do with 1/2 mv2).

So, why are scale ships able to fly as well as they do? Probably because they are designed first as soaring machines rather than gliders. Notice that I am making a distinction between a soaring machine and a glider. You ask, "What is the difference?" Well let's take a few minutes to look as some design parameters for both scale models and their full-size counterparts. This data may give you an idea of just why scale soaring may be a facet of the hobby that you have unnecessarily or unintentionally overlooked.

That was kinda fun wasn't it? (I love looking at data tables. I hope you do, too.) Look at the size of these models. Scale models are bigger, heavier, have higher aspect ratios, carry heavier wing loading and are most often faster than non-scale **units**. So, they have the disadvantage of needing more room to land and will arrive at the ground with more velocity and inertia should something go wrong. Oh, yeah! They usually lighten your pocketbook at a disproportional rate, also.

Nonetheless, scale models of all types normally have a great deal of design advantage on their side. This design advantage is kinda a hidden thing because many would be scale pilots look at them and rule them out as performers because of things like: the size of the fuselage or the fact that the wing sections are normally quite a bit thicker than the typical thermal duration ship. Don't let that stop you though because these ships are carrying wing loadings that make up for any extra thickness in the wing. And, the drag that the fuselage presents is mostly profile drag and is minimized at low velocities, which is the speed the model will mostly be flying at. On the other hand, if you are looking for rocket ship speed you may be pleasantly surprised by a scale ship if it is outfitted with a thinned section and it has a high aspect ratio wing. It must also be built strong to survive those high speeds, but scale models will go very fast.

Now, let's look at the data to hopefully support what I have just said. The drag of an airfoil is composed of two elements. One element is known as profile drag D_0 and the other being induced drag D_i. Of course, profile drag is the shape of the airfoil and those things that

Model: Name	**Span Meters**	**Length Meters**	**Wing Area dm^2**	**A/R**	**Wt grams**
Astir CS77	3.75	1.68	72	19.53	3200
Janus	4.2	1.72	73	24.16	3300
ASW20L	4.5	1.75	79	26	4500
ASW22	6.25	2.025	106.4	36	5200
Salto	4.2	1.73	71	24.5	4400
Jantar	4.75	1.80	83.5	27	4700
KA-6	3.88	1.72	79	19.06	4500
DG-600	3.5	1.455	57	21.49	2900
DG-500	4.48	1.72	72.9	27.5	4700
DG-300	3.75	1.54	72	19.5	4200
Full scale model:	**Meters**	**Meters**	**M^2**		
D-30	20.1	6.62	12.02	33.6	N/A
Fafnir	19	7.760	18.6	19.4	
Austria	30	9	35	25.7	
PWS-101	18.99	7.27	18.9	19	
B. Albatross	18.896	7.112	19.1	18.72	
ASW-27	15	6.55	9	25	
ASH-26	18	7.55	11.7	27.69	
DG-600	17	6.83	11.59	24.94	
Ventus	17.6	6.56	10.15	30.2	
SZD-55-1	15	6.85	9.6	23.4	

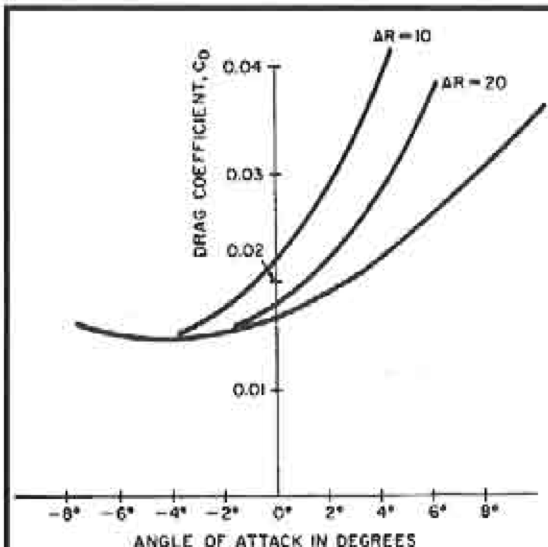
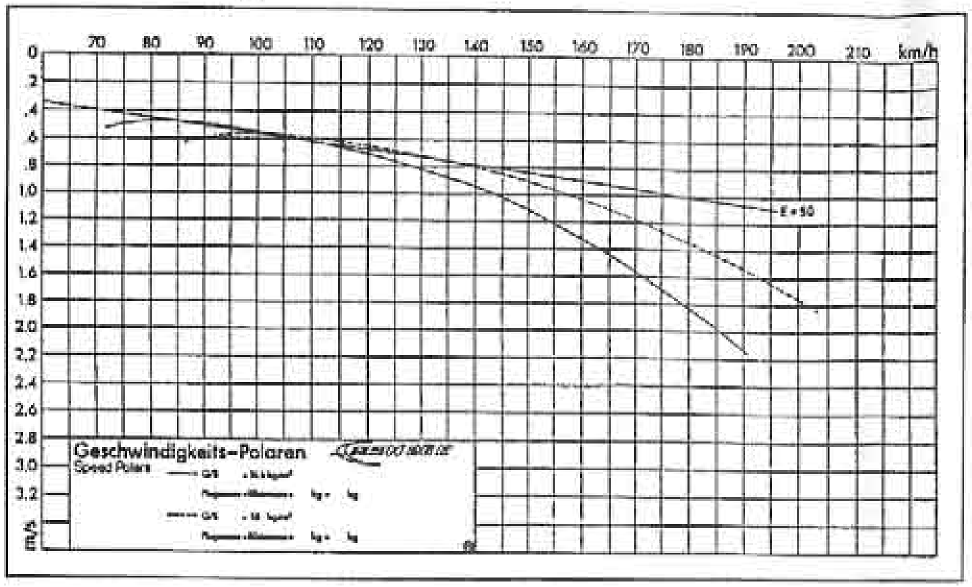


Figure 1

Variation of Drag Coefficients with Aspect Ratio

Figure 2



affect the flow around it such as its thickness. Induced drag is that which is a function of the lift characteristics and the aspect ratio of the wing of that particular airfoil. So, then:

$$C_D = C_{DO} + C_{Di}$$

Now, then, the induced drag coefficient can be found from the relationship of:

$$C_{Di} = C_L^2 / AR$$

In other words, the profile drag coefficient will remain constant for an airfoil. It is independent of the lift coefficient and of any change in aspect ratio. Notice, however, that C_L^2 is divided by the AR. So, as AR goes up the induced drag with be reduced fractionally. (See figure #1.) Thus, one can easily see why Nimbus IVs, ASW-22s, and ASH-25s are the high L/D machines. The point I am trying to make here is: scale soaring machines benefit from both weight and their higher aspect ratio.

The reason weight is an advantage is due mostly to increased Reynolds number. (See figure #2.) And, as I've said before, a higher Reynolds number will mean a decrease in drag. Look at the figure and see that for the same soaring machine a minimal change in overall sink rate occurs for a significant change in wing loading. In this example the wing loading is increased 44.5% and the sink rate only increases about .1 meters a second. The speed of the ship increased, however, from 85 km/h to about 105 km/h. Not a bad price to pay for the ability to cover the ground at 20 km/h faster I'd say. So, for the ability to cover a great deal more sky, the soarer doesn't increase its sink rate very much and its odds of finding lift increase substantially.

Look over the figures and the data and think about making your next high performance model a scale ship. Many flyers in countries other than the U.S. are now starting to aerotow these big models. You may also want to winch launch them. If you choose to use a winch, however, be sure to use the rise of ground (ROG) technique because it is quite hard to throw one of these big models fast enough to keep it away from a tip stall. Lastly, if you are like me and love sloping, just go throw it off a hill.

Ride the Ridge! ■

K&A MINI-1

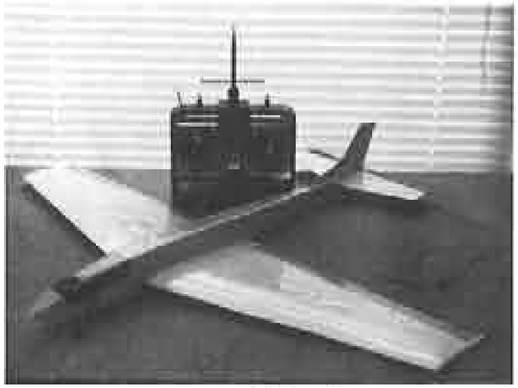
...Review by Gregory Vasgerdsian
Concord, California

For a few years now I have been aware of the Mini-1 but really never paid much attention to it. I thought, "For what reason would I want to build a glider that small?" This all changed rather quickly when a slope flying friend of mine brought his over. My first impression of seeing an actual Mini-1 was that this thing had to be fun! My overall impression of the Mini-1 is very favorable, but let's get into a good critical look at this micro sloper.

When you open the box you get a small set of white foam core wings, rolled plans, instructions, hardware bag, and a polybag filled with wood. The foam cores are quite a kick; I pulled them out and compared them to my Bird of Time's stabilizer, and found them to be very close in size! The cores were cut nicely, though not perfect, and required just a light sanding over. I covered my wings with the 1/16" balsa supplied, using 3M Brand two sided tape. This stuff works great on small wings; it's light, strong and very, very quick! To get rid of a bit of weight, I removed the foam between the cap strips. I've had a number of rough landings and have yet to break a wing, so this doesn't seem to weaken the structure much. The 1/8" dowel that holds the leading edge into the fuselage seemed a little small but has held up so far. My friend suggested extending the ailerons all the way to the tips, for a higher roll rate. The increase of just 2 1/2 inches on my Mini-1 made a big difference.

Because of the small size of the Mini-1, you have to plan out your radio in advance. I used a HiTec 4 channel radio with their micro receiver, 250Mah battery, and two Royal Titan Micro servos. To avoid the hassle of trying to stuff all my flight packs wiring into the little fuselage, I shortened and re-soldered my servo and battery leads. The servos mount in-line in the center of the wing; after covering I used a bit of silicone to hold them, quick and simple. Be sure to leave enough room so that you can mount your switch in the top of the fuselage over the leading edge of the wing. Since the fuselage is thin you want to make sure that you allow for the aileron torque rod ends to be able to fit within the back of the fuse. and not rub or bind. The hardware package included is complete, but a bit over-kill. It was nice to get the Du-Bro flat hinges, but on a model this small, unnecessary. I just used sticky backed mylar from my local plastics store. (3M has a strong transparent tape that works good, too.) The extra material trimmed from the brass torque tubes is used to bush the aileron horns. On my Mini-1 the elevator pushrod was too short, so I grabbed a longer piece of 1/16" music wire out of my "extra bits box".

Throughout building I used the instructions as a guide, as the plane is very easy to build. However, I did come across a few areas in the building of the model that were not mentioned, but nothing a reasonably experienced builder could not figure out. Getting into the fuselage I have one important suggestion: add a 1/64" ply doubler to the fuse. sides, from one inch back of the wing trailing edge all the way to the nose.



My Review Ratings (1-5, 5 = excellent)

Instructions:	4
Hardware:	5
Wood:	3
Plans:	5
Foam Cores:	4
Ease of Building:	5
Performance:	5

Specifications

Span:	28.5"
Area:	167.4 sq. in.
Flying Weight:	10 oz.
Manufacturer:	K&A Models Unlimited
Materials:	Balsa, Ply, Foam Core Wings
Radio Req'd:	2 Channel Micro (Ail., Elv.)
Airfoil:	Semi-Symetrical (Low Camber)
Flying Skill Level:	Expert
Kit Purchased for:	About $30.00

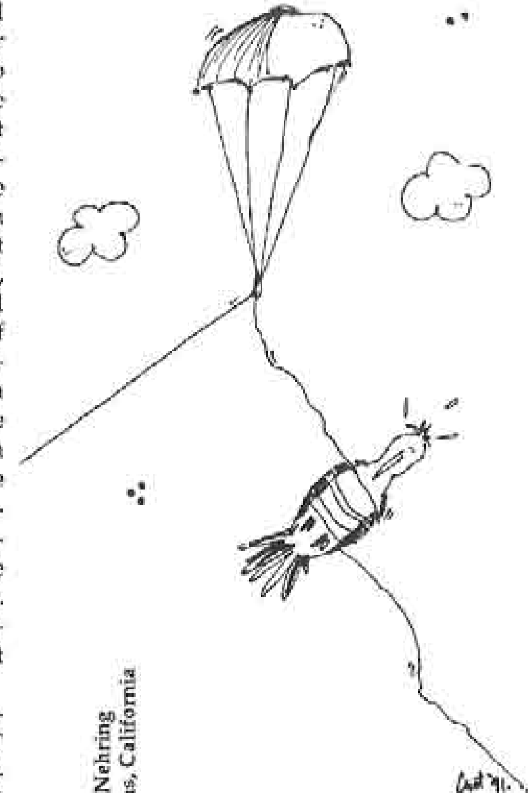
With just 1/16" balsa for the sides, the Mini-1's fuselage front is a little weak for my taste. Plus, with the doublers added you should not need to add any weight to the nose to balance out. The 3/32" sheeting for the top and bottom of the fuselage was pretty dense, so I used it in the nose area, but grabbed some nice light stuff for sheeting the rear. The tail feathers are supplied already to shape, but the stabilizor and elevator on my kit were extremely dense/heavy. I cut new ones out of lighter stock.

After sanding comes covering. In my opinion, the color scheme used on the Mini-1, and any other model for that matter, is very important, but perhaps more so for one that is under 3 feet in span. For the last few years I have gotten into the habit of covering all my model's wings with red undersides and white tops, with a little variation. Most importantly is that I've gotten used to seeing a dark bottom and light top. One flying friend of mine does it the opposite. The reason this is important is that when I'm flying my big model far away or my Mini-1 a bit closer I intuitively know what attitude the model is in. When I see the white wing it automatically registers as the top; in the case of a small and fast plane like the Mini-1, if I had to think, "Let's see. I made the top yellow and the bottom green...", it could be too late and the model could easily be history!

So, with the Mini-1 covered and radio installed (Heh, It fit!), it was time to hit the scale and balance the model out. My Mini-1 with the doublers added, needed no additional weight. It came in at 11.6 oz.; a little weight could still be shaved off with lighter servos. Total building time was 10 hours...No kidding! The balsa dust was flying! Okay! Let's head for the hills.

The nice thing about the Mini-1 is that you aren't throwing off the side of the hill a big investment, or a lot of building hours. With the wind doing 20 M.P.H. at one of my favorite slope sites, the Mini-1 was thrown off with a little apprehension. Out it climbed; I rolled left and, zing! Down the ridge! The Mini-1 handled the wind no problem, penetrating fine, and quite fast. With the ailerons extended the roll rate is very sensitive and very quick...in fact, almost everything this model does it does quickly. I was smiling! The model is marketed as a high performance slope glider and that it is. When flying you do have to pay attention, as it's agile and fast. The really nice thing about the Mini-1 is its low mass for landings; even on the face landings are easy. Just zip it along the top, turn into the wind, and mush it with a bit of up elevator. Even with low mass, the Mini-1 actually has very good energy retention, and it carries itself through maneuvers very nicely. Inverted performance is good with a little jab of elevator to hold it in. The one thing you do not want to do with the Mini-1 is stuff it into the hill nose first. (Which, as we all know, happens occasionally!) The Mini-1's fuselage does not take this type of abuse well, though the wing is very tough. A glass fuselage would be wonderful for the Mini-1, but for about $30.00, who's complaining?

In conclusion, I would highly recommend the Mini-1 to the EXPERT slope pilot. The Mini-1 will definitely quicken your reflexes, and I don't think you could ever get bored with it. Also don't be put of by its size; I found the Mini-1 to have no bad flight characteristics. It's inexpensive, small, fast and super fun to fly! ■



Curt Nehring
San Dimas, California

One Club's Winch Project

...by Mark Child
El Dorado Silent Fliers,
Long Beach, California

They say that necessity is the mother of invention. In our case this couldn't have been truer. Our story starts about four years ago. The club was new and the equipment we were using back then did just fine in keeping up with the demands we were placing on it. As we grew, we began to place more and more stress on our winches.

With 130 current members, the decision was made to launch (no pun intended) into a design and fabrication project that would equip the club with four powerful and, most importantly, bullet proof winches. With as many as 30 pilots showing up on any given contest day the winches had to meet the following criteria: They would have to be identical, powerful, reliable, and able to stand up to the abuse our members can heap on them.

The result is a winch that runs smooth, makes plenty of power (both torque and line speed), and will pull for quite awhile without melting its insides down or sucking a battery dry too quickly.

There were several members, each with his own area of expertise, who contributed to the project's success. It started when fellow member Gary Cooper and I got our heads together to determine just what one of these "super winches" should look like. We spent a few nights in Gary's garage scribbling ideas down on butcher paper and it wasn't long before we had an idea of what we wanted.

It was decided early on that the outboard end of the motor's shaft would have to be supported in some sort of bearing. We elected to do this in order to prolong motor life between yearly overhauls. The lateral stress that can be placed on an unsupported shaft is considerable and can lead to unnecessary wear on the motor's brass bushings.

Shot of #1 showing detail of pedal hook-up.

Winch #1 (prototype) on its first day at the field. Good looking ain't it?

The winch drum showing all of its parts. (L - R) Brake pulley, inside end plate, spool, outside end plate, shaft attachment hub. 6 bolts in front hold everything together.

Close up of pedal hook-up on #3.

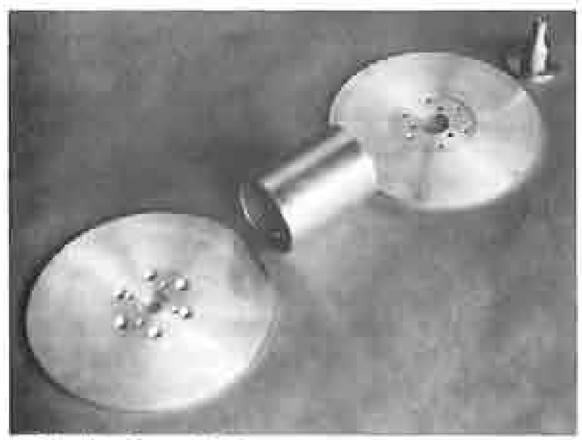
We initially considered having roller bearings installed in the motors, but this type of bearing requires almost constant maintenance in order to keep it properly lubricated. End result - bushings instead of bearings.

The motors we use are the late model Ford long shaft starters that seem to have become the standard for sailplane winches. We bought motor cores at $20.00 each from Alco Used Auto Parts in Carson and then took them to Barco Auto Electrical Service in Bellflower for a complete overhaul.

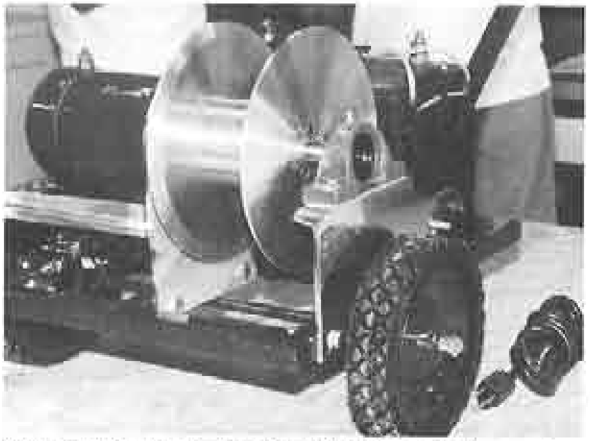
The rebuild included the following: A reconditioned armature and new commutator, four six volt high-torque field coils, new bushings, heavy duty brush springs, and heavy duty welded brushes. All parts are new and the motors seem to be running quite well. Winch number one had to have its brushes replaced in four months, but we think it was due to the fact that for the longest time it was the only winch on the field while numbers two and three were being built.

The bill for the overhaul was reasonable at $58.00 so the total for a powerful, six volt high-torque motor was just over $70.00. We run the winches on good 12 volt deep cycle marine batteries, and club treasurer

#3 almost ready to go. Brake arms are machined from solid aluminum stock and line guide is aluminum tent stake.



Exploded view of drum. Notice how the back of the inside end plate is machined to exactly center the brake pulley! You can also see how the inside of each end plate are machined to allow for centering the spool. The hub (far right) is the brain child of Pat Springs and myself. The shaft rides inside the hub. The "shaft" on the hub, in turn, rides in the bearing. Neat way of extending shaft length!



Outboard size #3 showing larger bearings. Bearing really helps prolong the life of the motor. Also, notice that bearing and pedal socket mounting plate is all one piece, now. Compare with earlier shots of the #1 winch. Super sanitary way of doing it. Don't you think?

Dennis Jenkins was responsible for getting batteries at incredibly good prices.

The winch drum was an area of major concern. More head scratching and rough sketches, this time at Pat Spring's house. Pat is another club member who contributed to the project in a big kind of way. A pattern maker by trade, Pat was responsible for machining the prototype drum. Keeping in mind that we wanted to support the outboard end of the motor shaft, we were faced with a small but perplexing problem.

The motor shafts were just under six inches long. A drum width of anything less than four inches would be unacceptable. After doing some rough measuring, it was determined that, with all the necessary clearances and the brake pulley installed, there would be less than one inch of shaft exposed on the outboard end. The bearings were at least an inch wide so we were faced with having to lengthen the shaft somehow.

Pat and I ran several ideas by one another and eventually settled on the nifty idea shown in some of the photos. A friend of Pat's machined a neat fitting out of stainless steel that would serve two purposes: 1. It would provide a way to attach the drum to the shaft, and 2. it would extend the shaft the necessary one inch. This special hub bolts to the outside end plate of the drum from inside the spool. A hole was then drilled and tapped to allow a small bolt to be threaded through the hub and shaft.

When the drum is assembled, the end of the shaft actually rides inside the hub giving us the needed extra shaft length. The drum's end plates are nine inches in diameter with a spool diameter of three and half inches. Three bolts hold the hub in place on the outside end plate while six stainless bolts hold the entire drum assembly together. The brake pulley was machined to center itself on the back of the inside end plate. It's attached to the drum with four hexhead bolts.

Pat machined the first drum and subsequent drums were fabricated by a friend of Gary's. The drums were made entirely of quality T-6 aluminum stock.

With a spool diameter of three and a half inches the winches make plenty of line speed while the high-torque motors give them plenty of pulling power.

Gary fabricated the frames and we wanted a compact winch that would allow us to carry the winch and battery in one nice neat package. The result is what you see in the photos. The entire package is on wheels allowing easy movement on or off the field. Dual solenoids take care of sending current to the motor and a set of Timbs Engineering safety switches are on the horizon.

The aluminum plate bolted to the left side of the frame serves as a mount for both the pillow bearing and the electrical socket for the foot pedal. Gary cut the mounting plates from aluminum channel stock then gave all four a good polishing.

Paul Gendarme, you guessed it — another club member, took care of equipping each winch with heavy .10 gauge battery cables. Paul's contribution to the project also makes a difference when it comes to reliable performance. Each cable has heavy, soldered lugs. The heavy cables and soldered connections offer the least amount of

resistance allowing the motors to operate even more efficiently. The cable ends were wrapped in speed tape and then sheathed in a good heat shrink tubing for added protection.

The turn arounds and winch pedals were fabricated by Gary and his dad Kenny. Both are active members and take a great deal of pride in their work (it shows). Jim Skinner fabricated the solid aluminum brake arms and the hardware that goes along with them.

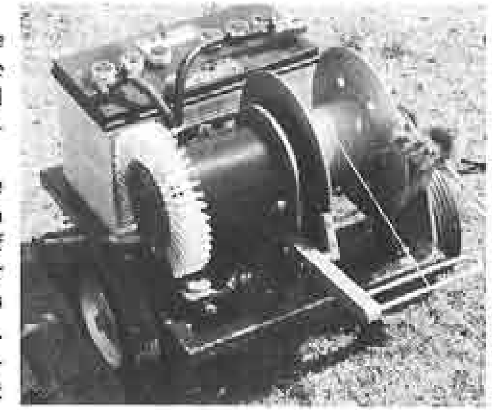
Jim, the ingenious fellow that he is, devised a clever line guide that can be seen at the end of the arm. The "line guide" is actually a "U" shaped tent stake that he found at a local outdoor outfitter (REI).

The guide is attached to the arm in such a way that when it wears on one side, you can simply turn it over to the other side. On an average, we have been getting about five to six months of wear on a side before the guide has to be turned. We have about 10 guides in stock so we will never be without line guides for the brake arms (at least not in the near future).

We use Rahm retrievers and have found them to be the most reliable commercially available retrievers. Cy is a club member and has placed his stamp of approval on the new winches. Do we plan on marketing our winches? NO! We'll leave mass production of sport winches up to Cy. We incorporated some of Cy's ideas into our winches and refined them just a little, but our winches are a little overkill for the average sport flier. (Cy makes a damn fine winch for the sport flier.)

We do, however, welcome any questions regarding material sources or clarification on how things were fabricated. If you have questions, write or call: Mark Child, 9530 E. Alondra Blvd. SP36, Bellflower, CA 90706; (310) 866-2257. Or Gary Cooper, 13020 E. Bahia Dr., Cerritos, CA 90701; (310) 860-7001.

If we had it to do all over again, we wouldn't change a thing. It only goes to show ya what can be done when a few guys who love to fly gliders get their heads together. ■



Notice the signs of wear. We have put some serious miles on #1 and it keeps on pulling like a freight train!!! Heat sinks after the fact. This is the prototype sink on our #1 winch. Tons of cooling area, and they really do a good job of cooling!

This is a side bar to our winch story. With all the power the motors were making, we began to notice a fair amount of heat build up. The motor on the number one winch would get downright toasty if it was worked to excess (as was the case most of the time). The solution? Heat sinks.

Club member Bill Duncan took the initiative and fabricated a prototype heat sink out of quality 6061 aluminum stock. He machined the fins at home and made it a point to leave their surfaces rough in an effort to increase the cooling surface area. We immediately noticed a difference in the amount of heat the motor was retaining. The sink was definitely doing its job as the motor was running cooler and would cool down quicker after periods of abusive extended use (one launch after another). The heat sinks for winches two, three and four will be made in two halves and clamp around the motor's midsections rather than replace the dust cover as on the first winch.

Again, we have no plans to market the sinks, but I'm sure Bill would be happy to share any information about how he made them for our winches. For info, write to: Bill Duncan, 5462 Cerulean Ave., Garden Grove, CA. 92645. ■

CG, Elevator Trim & Decalage Trimming Techniques

...by Frank Deis
2680 Fairway Dr.
Colorado Springs, Colorado 80909

I am flattered that Martin Simons put so much time and effort into testing and commenting on my pitch trimming techniques as recently published in his article in *RCSD*, July 1992, page 4. I, of course, differ with his assessment of my techniques and would like to hear from other members of the sailplane community regarding their experiences. I hope some of you will share those experiences, using my (or any other) trimming techniques, with myself and *RCSD*.

I always believed this was a cut and dried subject. Now, I learn that it is much more interesting and worthy of some additional discussion. First, I will recap on my techniques.

Summary Recap

The objective of my trimming techniques is to get the decalage set for maximum lift to drag flight which is typically between one and three degrees. The process is to set the decalage to a known angle, locate the CG (using the dive test, normally), note the performance, and then repeat the process for a new decalage. The process is iterated until the peak performance is located. Once this process is complete, the other five basic trim positions can be "ball parked" and then refined through flight testing. The emphasis throughout is on assuring that the decalage stays within and ends up in the proper range and that the pilot be comfortable with the resulting handling qualities.

Neutral Stability

Both Martin and I use the term "neutral stability" but we are referring to two different kinds of "neutrality". My use of the term is restricted to the case where the sailplane tends to continue in a straight line when put into a dive. (I.E., it has no tendency to pull out on its own.) In my experience this is not necessarily associated with dynamic instability, or neutrality in response to control inputs as Martin describes. Unfortunately, I do not know different names ("stick fixed neutral stability point" is clearly the name of one of them) for these two or perhaps three different "neutral stability" points. (Can anyone out there help me?) The kind of neutral stability I approach is similar to that used by our R/C pattern flying brothers which clearly does not result in the behavior Martin describes.

Key Points

Given the summary recap above, I will cover the key points raised by Martin.

• The tuck under trajectory associated with elevator reversal that Martin indicates should be added to my diagram is real. I have never experienced it using my trimming process, so I elected to leave it out.

• The process I use produces no signs of "dynamic instability" (pitch oscillations about the flight path). If the dive test is used to locate the CG on a sailplane with near zero decalage, signs of dynamic instability do appear but that is the only time I have ever experienced it. Hence, both my Falcon and a friend's would dive in a straight line with no perceptible oscillations. They both had a very solid feel while in the dive and pulled out gently and predictably when commanded to do so.

• Martin's description of the dive test, where any elevator trim setting can correspond to any one of several speeds is interesting, but does not correspond to what I have experienced. Clearly, if I had experienced what he described, I would not use this approach to trimming because it would, very simply, not work! The way Martin describes setting the elevator trim lever positions on the transmitter is NOT the method I suggest. My recommendation is to set the trim lever locations based upon specific angle variations above and below the reference position after the CG is set using the dive test. Once the ball park locations are set, I suggest a specific flight testing process to complete the tuning. Do not set any of the elevator trim positions using the dive test because, as Martin describes in detail, IT WILL NOT WORK!! Using my procedure, there is no noticeable "dynamic instability" and the model is not overly sensitive to elevator movement. (I have tuned a large number of sailplanes over the years; I have never had to reduce the total elevator throw. They are more sensitive to elevator trim changes than nose heavy models, but I find the increased sensitivity useful in finding lift.) My experience is consistent with Martin's observation that movement of the CG aft of the point resulting from the dive test results in increased touchiness, and that is why I do not recommend going there. His discussion of this region is consistent with my experience, but the trimming technique I use does not require experimenting in it. (On a personal note, I prefer sailplanes with larger horizontal stabilizers so I can venture a long way into that territory without catastrophic results. It is not a desirable place to be!)

What Martin described most certainly can happen; I helped a friend trim a Gentle Lady that performed exactly this way.

Originally, in preparing my articles for our newsletter (Pike's Peak Soaring Society), I did some broad ranging trim studies with my Olympic II and also produced the behavior he describes. In both cases the decalage angle was outside the one to three degree range I specified. The procedure must be followed as I described or Martin's version of events can occur. You must check the decalage as you go. For sailplanes with fixed horizontal stabs this is not much of a problem, because the wing must be shimmed to change the decalage. Special care, however, must be taken with stabilator ships. If the CG is set and then the elevator trim is moved around, it is pretty easy to get the decalage so low that undesirable handling qualities appear. The only protection I know of in this situation is frequent checking of the decalage with an incidence meter during each iteration of the procedure.

Martin's explanation of tailplane drag is excellent and, of course, consistent with theory. Unfortunately, it does not seem to agree with or explain what I think I see. I believe the theory is correct as far as it goes, but it does not appear to account for the flow separation that occurs at our Reynolds Numbers (i.e., Lister's Rule). Without exception, Pilots who's sailplanes were trimmed to pass the dive test notice a significant and often dramatic improvement in performance. They did not always like the feel (i.e., handling qualities), but there was no question about the performance improvement. I am open to theories that account for this and will gladly trade mine in on a better one.

I tell the people I instruct, "There are several different theoretical approaches to trimming and flying sailplanes. Different pilots prefer different approaches and they all achieve good results. The most important thing is to pick a theory you like and follow it. Mixing and matching between theories is a sure road to trouble and frustration." I have tried the approach recommended by Martin and, for some reason, I did not get either the performance or handling qualities I like. Hence, I use the theory and procedures I described in my series of articles.

Center of Pressure

By the way, I have gotten many comments about my use of the term "center of pressure". I am aware of the moment coefficient and how it is used in the various stability calculations. I just find it easier to visualize the center of pressure

(CP). The CP is pretty well behaved across the typical trim range and most intermediate skilled pilots do not wrestle with engineering issues such as, "Where is the center of pressure when there is no lift?" If you do, then use the moment coefficient because it neatly deals with such problems. Otherwise, I find it easier to visualize the center of pressure moving aft and producing a more nose heavy-like behavior than that of the force couple produced by the wing pressure distribution about the mean aerodynamic center... non-dementionalized into the moment coefficient is increasing in value by becoming less negative and producing a pitch down torque on an otherwise balanced air frame. The latter is more correct but, for me, it obscures the basic physics. I apologize to the real aerodynamisists out there. My intentions were noble but perhaps misguided. ■

If any of you have experience using Frank's trimming techniques or if you have developed trimming techniques of your own that you would like to share, *RCSD* would like to hear about them.

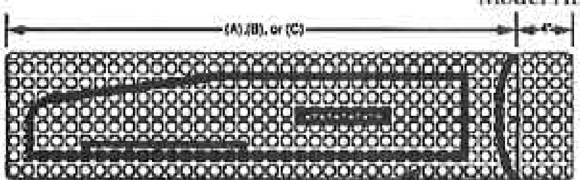
Who Is Frank Deis?

Frank has a B.S. in Aeronautical Engineering from Purdue University and a Masters in Engineering from the University of Florida. He has been building models since he was a kid. His first R/C sailplane was a Thermic 100 which he flew in 1963 as a member of the Purdue Aeromodelers. He reached LSF Level IV in 1975, but has not gone on to Level V due to lack of interest in the Level V tasks.

In 1972, Frank was a member of the Rocket City Radio Controllers (RCRC) who were practicing to win a National Championship at the SOAR NATS in 1973. After being humbled at the event, they embarked upon a serious program to learn how to fly. At the 1974 SOAR NATS, Frank won second place in duration with an original design!

From 1974 to the late 70's Frank rewrote the thermal soaring rules in the AMA rule book into their current form, developed the Triathalon event (with the help of RCRC), established the National Soaring Society (NSS) Excellence Award Program, and proposed changes in F3B competition rules. The result? Burnout!

In 1989, Frank joined the Pikes Peak Soaring Society (PPSS). He was surprised to discover that many of the flying secrets he had learned so many years ago were still secrets, today. So, Frank took pen in hand, at the request of others, to share the techniques and approaches that were so successful for him in the past. Frank says, "I believe that each generation must stand on the shoulders of the previous one to advance the state of any art." How very true. ■



Programming the X-347 Glider Radio

...by Tom Long
301 Black Kettle Lane
Alpharetta, Georgia 30202

JR Radio now has a glider modification available for their X-347 radio. Older radios can be sent back to the service center for the modification while new radios can be ordered with the modification already installed for an extra $30.00. This modification replaces the FLAP-Elevator switch with a three position mode switch to allow three separate configurations to be selected (eg., Launch, Normal and Thermal). There are other changes as well to both the software and the hardware. The Flap knob is electrically disconnected and some software functions are added and some deleted.

I found that programming the basic functions into a glider was quite straightforward but, when I tried to program in the features for a more sophisticated glider, I found the directions in the manual to be obscure and, sometimes, incorrect. This article is an attempt to save others the frustration that I experienced in trying to learn how to program the radio. The transmitter is capable of being programmed to issue most of the settings that are desired for a high tech sailplane such as a Saber and it has some very nice features such as the digital voltage readout, long battery life, built-in stop watch or count-down timer, and total "on" time since the last charge (INT.T). Relative to the Airtronics "Vision" radio, it does not provide for alternate program access with the flip of a switch nor does it provide for an "offset" setting to activate special functions.

I will assume that we are programming a sailplane with separate servos for each flap and each aileron for a total of 6. It will handle fewer, of course, but this is about as complex as you are likely to need.

Important ground rules:

1. To follow this discussion adequately, you need to have an X-347 instruction manual and be able to refer to the System Setting Mode Flow chart on page 84, the Function Setting Mode Flow Chart on page 83, and the sample X-347 Data Sheet on page 113. I will refer to these three charts as Figures 1, 2, and 3, respectively. (The settings I use are shown as figure 3 included in this issue.)

2. The channel assignments as shown in the manual are incorrect for the aileron servos: Channel 2 should be for the Right Aileron and Channel 5 for the Left Aileron servo. Unless you connect them this way, the aileron differential will be backwards - more down than up - rather than more up than down.

3. There are three switches that enable you to turn various mixing functions on and off: The Butterfly Crow switch (BTF) on the left side top of the transmitter; the Mode switch (MOS) which replaces the Flap mixing switch located left of center; and the Mixing switch (MXS) on the top right. The Mode switch has three positions: up, normal, and down. The normal position is for your normal flying configuration whereas the up and down positions can be programmed for launch, thermal, reflex, or perhaps some other desired combination of flap, aileron and elevator settings. The Mixing switch is best reserved for turning the aileron-rudder coupling on and off.

4. Several settings will affect the normal trim setting of the elevator, so I **strongly** suggest that you mark the elevator trim setting that is correct, or nearly correct, on the airplane itself so that you can always return to this setting after you have adjusted other things. My airplane, the TROJAN, has a full flying stab pivoted on the vertical fin, so I put a mark on the vertical fin for the stab setting that is close to the proper position for maximum L/D flight. I assigned a launch configuration to the MOS DOWN position. MOS UP is a Thermal configuration with a small amount of down flap for more camber and more up elevator to approximate a minimum sink configuration.

Programming

There are two main programming menus: A System Setting menu (Fig. 1) and a Function Setting menu (Fig. 2). Both menus are entered by pressing the "up" and "dn" keys simultaneously. You step through each menu using the "up" and "dn" keys on the front. Sub menus are reached by using either the "ch" or the "+" key on the front. Values are entered with the "+" or "-" keys as you would expect.

Enter the System Setting menu by pressing both keys while you turn the transmitter on. You use the System Setting menu to select one of the four available programs to set up, give it a customized name, and select an airplane type (i.e., GLID for glider). If your model has a V-Tail or, as in this case, dual flap servos, this menu is where you enter that information. The manual explains how to do this adequately, but you need to use the "+" key to inhibit (INH) the V-Tail mixing and activate (ACT) the dual flap (DUA.F) mixing function for our 6 servo example. This procedure is well explained in the manual.

Enter the Function menu (Fig. 2) by pressing both keys simultaneously after the transmitter is on. Setting the basic functions is well explained in the manual and is almost intuitive. Referring to the X-347 Data Sheet (Fig. 3), the left side block, e.g. Dual-Rate and EXP are menu items listed in the order in which they appear in the Function Menu. Sub-menu items (Ail, Ele, Rud) appear on the LCD screen by pressing the "ch" key. "0" and "1" represent the two positions of the respective dual rate switch. Values are changed or entered by pressing the "+" and "-" keys.

There should be no problem working down to the first mixing function - **Mix E-F**. Unfortunately, this mix is no longer functional at this location. The values must be set to zero. Toggle between "D" and "OFF" (instead of "U") with the Mode Switch (MOS). If you want elevator-flap mixing, you can program that into program C discussed below.

Mix F-E is where you set the desired elevator positions in the off-normal positions of the MOS. Move the MOS down and the LCD will show "mix F-E.U". Dial in the position you want the elevator to be in MOS DOWN position disregarding the fact that the display says "U". Now move the MOS switch up and dial in the position you want for that position.

Mix FL-A is where you enter the aileron position desired in the MOS down configuration. For example, if MOS.D is chosen as a launch configuration, you may want to drop the flaps about 1/4 inch, dial in a small amount of down elevator and some increased camber or smaller droop to the ailerons.

Flap Offset - set to zero. This setting affects the trim setting on the flaps and does not function as a stick position at which the F-E and FL-A mixing is activated.

Mix Diff is where you dial in the aileron differential desired in normal flight configuration or MOS normal.

Mix AL-F is where you dial in the amount of aileron flap coupling that is desired in MOS normal.

Mix SP (Butterfly/Crow mixing): "0" and "1" refer to positions of the BTF switch. Back is the normal or "1" position. Forward is the Butterfly configuration. Cycle through E, A, and F with the "ch" key.

mix SP:E.1 sets FL-EL compensation in MOS normal pos'n.

X-347 Data Sheet GLID

Model No. ________
Model Name TROJAN
Modulation (PCM) PPM

			Aile	Elev	Rudd
Dual-Rate EXP	0	D/R	100 %	100 %	100%
		EXP	LIN%	LIN%	LIN%
	1	D/R	100 %	100 %	100 %
		EXP	70 %	70 %	LIN %

LOW THROTTLE FOR FULL FLAP

	SPOI	AIL 1	ELEV	RUDD	AIL 2	FLAP	AUX 2
Reverse SW	(NORM) REV	(NORM) REV	(NORM) REV	(NORM) REV	(NORM) REV	NORM (REV)	NORM (REV)
Sub Trim (S. TRIM)	0	R 3	D 38	0	L4	U8	-8
Travel Adjust (T. ADJ)	H +100 %	L 75 %	D 100 %	L 70 %	+L75 %	U 100 %	+100 %
	L -100 %	R 75 %	U 100 %	R 70 %	-R75 %	D 100 %	-100 %

Elev → Flap Mix (Mix E-F)	Up (U)	OFF %	
	Down (D)	0 %	
Flap → Elev Mix (Mix F-E)	Up (U)	+11 %	EL IN MOS. DN
	Down (D)	+6 %	EL IN MOS. UP
Flap → Aile Mix (Mix FL-A)		25 %	AIL POS'N IN MOS. DN
Flap Offset		0	
Differential (MIX DIFF)		72 %	
Aile → Flap Mix (Mix AL-F)		0 %	IN NORMAL MOS POS'N

Butterfly (Mix SP:) — CROW SETTINGS	0	Elev (E)	-40%
		AILE (A)	-90%
		Flap (F)	+90%
EL COMPENSATION FOR FULL FLAP →	1	Elev (E)	40 %
		AILE (A)	0 %
SP-FL COUPLING →		Flap (F)	-100%
Spoiler Offset			-2

Flap-Pot. Travel (FLP.P T. ADJ) 5¢7	Trim (INH) Full	%

		Channel	+POS	-POS	SW	Offset
Program Mix	A	2 → 7	0 %	0 %	EL-F	
	B	6 → 6	-125 %	-91 %	ON	
	C	1 → 1	0 %	0 %	ON	
A-R MIX IN NORMAL →	D	2 → 4	+75 %	OFF %	MxSw	

AIL-FL MIX IN MOS UP OR DN
+POS = FLAP POS'N IN MOS. DOWN
-POS = FLAP POS'N IN MOS. UP

Fail Safe (FAL.S)	HOLD • 1.0 • 0.5 • 0.3	
	Memory	

V-Tail (V-TL)	(INH) ACT
Dual Flap (DUA.F)	INH (ACT)

mix SP:A.1 sets FL-A mix in MOS normal position.

mix SP:F.1 sets Spoiler-Flap mix in MOS normal. This allows you to drop full flaps by moving the throttle lever.

mix SP:E.0 sets elevator in butterfly/crow configuration.

mix SP:A.0 sets aileron in butterfly/crow configuration.

mix SP:F.0 sets flap in butterfly/crow configuration.

Spoiler Offset should be set as close as possible to zero. It changes the flap trim setting.

POT.5 Set to INH using the + key. Pot 5 changes trim otherwise.

POT.7 Set to INH using the + key. Pot 7 changes trim otherwise.

Mixing Programs A, B, C, & D

The switch to turn these on or off is selected by using the "ch" key to move to the "SW" sub menu and then choosing from four choices with the "+" key. Set program A SW to EL-F. Set program B SW to ON. Set program D SW to MxSw. Program C is available for your imagination.

Select the mixing channel assignments as shown for programs A, B, and D using the "+" and "-" keys. For programs A and B, the "+pos'n" and "-pos'n" values are selected by toggling the mode switch (MOS).

Program A sets the AIL-FLAP mixing level in either the up or dn pos'n of the Mode switch, i.e., in "other than normal" position.

Program B sets the FLAP positions in the up or dn position of the mode switch. The value in the "sw+" position is the FLAP position in the MOS down configuration. The value in the "sw-" position is the FLAP position in the MOS up configuration.

Program D sets the AIL-RUD mixing. It is turned on or off with the Mixing Switch (MxSw).

Program C is available for your experimentation. If you want to have Elevator-Flap mixing, set the channels to 3-6 and select whether you want it ON full time, controlled by the Mixing Switch (MXSW) or the Butterfly switch (BTF).

To recapitulate: **For the normal flight configuration.**

Flaps. The direction of FLAP travel relative to the throttle lever (Spoiler) is set by the reversing switches on FLAP and AUX2. The amount of travel is controlled by MIX SP:F1. The neutral position is set by the Flap SubTrim. Aileron-Flap coupling is set with MIX AIL-FL value.

Elevator. Mark the desired neutral position on the model! Set the FLAP-ELE compensation for full down flaps with the value in MIX SP:E 1. After making other changes, always check that the neutral position is correct by adjusting the ELE SubTrim.

Rudder. Set the AIL-RUD coupling with mixing program D. Turn the coupling on or off with the Mixing Switch (MxS).

Ailerons. Right Aileron servo plugs into channel 2. Left into channel 5. Right and Left travel can be set independently with the T.ADJ values. Trim adjustments are made through SubTrim AIL1 and AIL2. Differential is adjusted with MIX DIFF. Changes of aileron camber with flap travel can be made with MIX SP:A 1.

For surface settings in the Mode Switch UP position:

Flaps. Position set by MIX B:66 pos'n "-" value.

Ail. Position same as in MOS normal pos'n.

Elev. Position set by MIX FL-EL Up value.

For surface settings in the Mode Switch DN position:

Flaps. Position set by MIX B:66 pos'n "+" value.

Ail. Position set by MIX FL-A value.

Elev. Position set by MIX FL-E Dn value.

For surface settings in the Crow Switch ON (forward) position:

Flaps. Position set by SP:F.1 value.

Ail. Position set by SP:A.1 value.

Elev. Position set by SP:E.1 value.

There you have it. It is a good radio that can be made to hold customized programs for four different models. The information given above should help you customize it for just about any glider that you can come up with. As with any computer or computer radio, what I have described does not represent a limit to what can be accomplished. It represents a recipe for a good start at programming a 6 servo sailplane. As you experiment with it and become more familiar with the software, you should be able to do more than what is described here. Hopefully, JR will eventually come up with a software update to their computer chip that will add additional features to the capabilities of this system. I think that most glider flyers would gladly give up the capability to program powered aircraft and helicopters in exchange for a really "Ultimate" sailplane radio. ■

There are some X347s that do not have 3 position switch modification, requiring some programing changes to the above. Contact either myself, Gordon Jones, at (214) 840-8116 or Thomas Long at (404) 449-1968. ■

Hinges

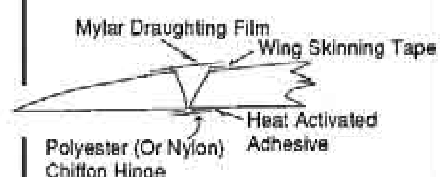
...by Bruce Abell
17 Ferguson Street
Cessnock, NSW .2325, Australia

Let's talk about aileron and flap hinges.

You (Jerry) mentioned that your "Ultima" had "tape hinges over the monokote" and this immediately makes me suspicious, because this means that the hinge ultimately relys on the effectiveness of the monokote adhesive. I've found this to fail under severe loads.

I'm in the process of designing a new "Dragonfly" style wing for my 3 metre "88[er]", so I set to and tried a few different hinges. Well, the final decision has come down to hinging on the <u>bottom</u> with the curved mylar draughting film (curved by rolling it up, sliding it inside an aluminum tube, heating the tube with a hot air gun, and allowing it to cool), attached to the top of the <u>wing</u> with double sided tape (ala wing skinning tape). I've yet to use the system on a bird, but bench tests look good.

For the actual hinge, I use polyester chiffon ironed on over heat-activated adhesive and you have to use several coats of adhesive so that it will fill in the weave of the cloth. ■



R/C Soaring Resources

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

Seminars & Workshops

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

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

Reference Material

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

BBS

BBS: Slope Tech, Southern California; (310) 866-0924, 8-N-1

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

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

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

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

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

Contacts & Special Interest Groups

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

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

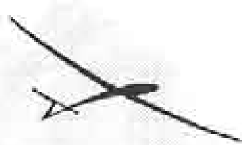
Canada - Southern Ontario Glider Group, "Wings" Program, dedicated instructors, Fred Freeman (416) 627-9090 or David Woodhouse (519) 821-4346

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

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

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

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



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- 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

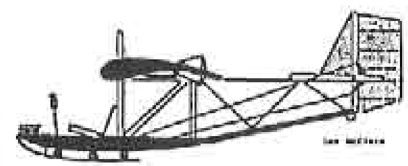
For Information, Contact:
NSS Secretary/Treasurer
Robert Massmann
282 Jodie Lane
Wilmington, OH 45177
(513) 382-4612

T.W.I.T.T.

(The Wing Is The Thing)

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

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



The Vintage Sailplane Association

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

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

NEW PRODUCTS

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

Unidirectional Carbon Fiber

...from Composite Structures Technology

CST has done it again! NEW - just arrived - the lightest weight unidirectional carbon fabric to be found anywhere - only 2.25 oz. per sq. yd. The cross thread is spun carbon every 0.25". The fabric is very easy to handle considering its extremely light weight. It is also very smooth - not an open weave like so many carbon fabrics. Since it is a very thin 0.002" and 8.25" wide, lay-up can be customized to meet the load requirement for the individual model. Strips can be butted for very light weight and lower loadings or overlapped at the high point on the airfoil to put maximum strength where it is needed the most. For this quality of fabric, prices are a very reasonable $5.00 per linear foot. Quantities are limited, so order quickly to build that ultimate model for next season!

A special buy has brought fiberglass prices to an all time low. Check out these fantastic buys: 0.72 oz. plain weave 38" wide only $1.95 per yard, 1.4 oz. plain weave 50" wide only $1.95 per yard and 3.16 oz. satin weave 38" wide only $2.95 per yard. To get these super prices, you must ask for the "special buy" fiberglass. You can save enough on your fiberglass to buy that nifty carbon!

Our fall '92 price list should be ready by October 1st. For the price list only send a self-addressed, stamped ($.52) large envelope or for a complete information kit including product catalog, price list, *Tech Notes* newsletter, reprint of "Composites in Modeling Applications" and a $5 gift certificate, send $3.00 postage and handling to: Composite Structures Technology, Dept. M-27, P. O. Box 4615, Lancaster, CA 93539. ■

Hand Crafted Pre-Sheeted Obechi Over Foam Core Wings

...from Elf Engineering

Elf Engineering provides hand crafted pre-sheeted foam core wings using only the finest materials and design techniques. Using 1.5 pound density foam as the foundation for the airfoil, a balsa spar with air-ply shearweb and wrapped with Kevlar provides the strength to withstand the hardest winch launch. The addition of fiberglass cloth along the control surfaces and carbon fiber upper and lower spar capping during the layup offer exceptional strength and rigidity to the already strong spar system. Obechi is used as the wing skin to afford a strong and durable outer surface that adds structural strength and wing integrity.

These wings come to you with the leading edges installed ready for final shaping. The tip blocks must be installed and sanded to shape; these have not been installed due to possible damage in shipping. The servo wire troughs are predrilled with the servo locations marked on the bottom of each wing panel. The root ribs are installed prior to the sheeting process allowing the builder to match the wing to the fuselage and drill the guide pin location for final wing/fuselage alignment.

Elf Engineering offers the wing of your choice; with almost every option available. (Yes, there are some we don't do.) You decide what you want in sailplane wing, and provide the dimensions whether it be a single, double, or triple taper planform. Select the length of the panels or let us assist you in your selection of that World Beater. Our prices are $185 for a plug-in wing up to 124 inches, and $225 for a three piece bolt-on wing up to 124 inches, plus shipping and handling. (Note: Texas residents add 7.25% tax.) Call Dale King (214) 475-8093 for further information or special orders. (We also cut foam cores for those of you who want to build your own wing.)

Why buy a kit for $250-$300 where you have to do all the work on the wing? (That's the part that takes the most of your flying time.) An alternative to that approach is to buy a fuselage from one of the Fiberglass manufacturers (for example: Viking Models, U.S.A.) and get a pre-sheeted wing that is almost complete from Elf Engineering. You can then finish "your" plane with the materials that are already in stock in your shop. This way you will be saving precious flying time and not be stuck in the shop putting those hours on a wing. Plus, you will have "your" own plane not one of the high dollar kits.

In the future we will be adding pre-sheeted stabs and other items to our inventory which will make the whole plane easier to put together. Elf Engineering is located at 1111 Highridge Road, Wylie, Texas 75098. ■

Grifter

...from Northeast Sailplane Products

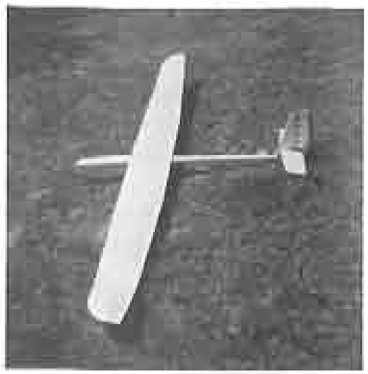
We have recently come across an exceptional airplane from Eastern Europe which we feel is a tremendous find and an excellent buy.

The Grifter was originally designed for F3J competition, which is the European version of our thermal duration contests. The Grifter comes essentially ready to fly. You need to install radio gear and servo hookups.

The epoxy fiberglass fuselage is gel-coated white and it sports a slide-off nosecone with an inner fuselage trimmed and ready to accept radio gear. The stabilators are foam-covered with balsa and are finished and lightly lacquered. The high quality bellcrank is installed. The built-up balsa rudder is covered with silkspan and is ready to paint.

The three-piece wing has a flat center section with a small amount of dihedral at the tips. A great, but unusual feature is the main bolt holding on the wing: it's directly connected to the towhook. This dramatically increases the sailplane's strength on launch. The tiplets turn up and the leading edge is curved. The wings are white foam with a fine light maple sheeting which is lightly lacquered. They are produced in a press and then precision sanded. The accuracy of the wing is the best we have ever seen. The tip sections fit so well it's hard to believe it isn't one piece. The ailerons and flaps are cut out and finished and are, like everything on this sailplane, close to perfection. The overall effect is a beautiful, elegant wing and glider. All hardware and fit on this airplane is first class and construction is similar to the best the Germans produce.

The wing section is a compromise between an F3B airfoil and a thermal duration type like the SD7037. This allows the Grifter to be a versatile sailplane capable of thermalling and climbing in very light lift, yet able to accelerate to a surprising speed between thermals. This is also due to its low drag design coupled with moderate wing loading. The curved tiplets contribute to the Grifter's ability to slow down in a high banked turns.



Grifter Wingspan:	116 . 5"
Wing Area:	975 sq. in.
Weight:	65 oz.
Wingloading:	9.5 oz/sq. ft.
Airfoil:	RG12 modified
Skill Level:	Int/Adv

It is correct to qualify the Grifter as a competition capable bird and considering the performance and finish of the Grifter, we feel it is an unusual value. Available for $749.95 from Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482. ■

Performance Report

"GRIFTER"

A NorthEast Sailplane Import from Poland

...by Steve Allred
5750 N. 1160 W., St. George, Utah 84770

After recently watching my Alcyone die a tortuous death (A shifting battery popped the hatch off and then went sailing on its own during a zoom launch... Needless to say, as well as the Alcyone flies, without a radio it performs horribly!), I needed something to replace it. I like to build, but as a clinical Marriage and Family Therapist, I have little free time and when I do, I'd prefer to fly rather than build. I called Sal at NorthEast Sailplanes and told him my woeful story. As usual, he was both sympathetic and encouraging, and told me of his new import from Poland, the GRIFTER. This is an almost ready to fly high performance sailplane. The wings are sheeted with maple veneer; the fuse only needs radio and the pushrods/controls installed. After deliberating overnight, I called him back and ordered one. Sal informed me that it would be about 3 weeks until the next one arrived, and that the only one he had at that time was his. I would have to wait, impatiently for the next three weeks to pass. The very next day Sal called back and offered me his plane, with servos and battery, pushrods installed for a slightly higher price. He was really concerned that without my Alcyone to fly, I might get reattached to my Minimax 1000... After deliberating about 15 seconds I decided to take it. Sal test flew it about 6 times and then boxed it up and shipped it to Utah. It arrived in perfect shape and was packed very carefully.

The day of delivery arrived and I was really excited. I unwrapped the package and noticed that the wing group was composed of three sections, with a center bolt-down section and tow plug in outer panels. The forward center hold down is also the tow hook bolt-on, so the tension of the launch is transferred directly to the wing. Total wingspan is 116 inches and the airfoil looks like a modified RG 15, but as of this date hasn't been identified. The wing is constructed of white foam sheeted with maple veneer and is really beautiful. Total dihedral is 4 1/4 inches per side. (1 1/4 to the base of the tip and then just over 3 inches of upsweep in the tip.) The workmanship is incredible, with tolerances that have to be seen to be believed. The fuse is very light fiberglass with a white gelcoat, and a slip on nosecone and stabilator. The fin is molded in and the rudder is built-up. The plane comes with ailerons pre-cut, but flaps (at least on this plane), are left to the owner to cut and finish. Sal informed me that later this summer those Grifters shipped would have flaps pre-cut. The wings are surprising light with a weight of 10 oz for the outer panels and 13 oz for the center section. All up flying weight for mine is 68 ozs, with skid, switch and some graphics. It could be trimmed down some, but flies wonderfully at this weight. I finished my maple veneer with a dark walnut stain, and then two very light coats of a polyurethane satin clear coat. The one major thing that was really noticeable was the quality of the structures and fittings, everything about this plane is absolutely top notch. The tolerances are incredible and it is obvious that the plane has been manufactured with a high

degree of control for both quality and weight reduction. Even though the cost may seem high, I believe it is really worth the expense if you want this type of plane.

After adding my receiver and programming the Vision, I was ready for flight test day. The first two flights off a large size pinnacle hi-start were O.K., but I wanted more speed. So after a couple more trim flights, we fired up the winch and let it rip. The wings didn't flinch, the plane towed beautifully up and had no vicious tendencies. The first flight off the winch we got a 45 minute duration, and only came down so I could get a Coke. The Minimaxes and Gentle Ladies were falling out of the sky and were getting only 2-3 minute flights. The Grifter is an exceptional plane, and for those of you who want to be in the air now, a great investment. For those of you who choose to purchase one, there is also the satisfaction of watching the gasbaggers jokes about the "expensive Polack plane" stop immediately after the first flight.

This plane handles like a thoroughbred, very sensitive, but not twitchy at all. It tracks through corners like it is on rails and will pretty much stand on the wing with combined rudder and aileron, then a little elevator to pull it around, cross controls will flatten it out while continuing the turn. To scream out of sink, all one has to do is nudge the nose over a tad, and it behaves as if it has an engine on it. Since my plane was the first to be imported, it didn't have flaps, and I flew the first 30 flights with ailerons only. Needless to say, the addition of flaps has greatly helped to control the glide path. Using crow, the plane is steady and predictable on final. For those of you that know motorcycles, this plane is like my Ducati 900ss, a plane that you can love and feel with. Flying this ship is like having an extension of your mind; it is really an experience.

I hate Sal now, because all my other planes sit and gather dust. (I even gave away my Quasoar.) I've stopped work on my Catalina and Pulsar, while weekend after weekend I charge up the GRIFTER and fly like I've never flown before. This plane makes you look good!!

All in all, the Grifter is in a league all its own.

If you want a plane that is already built, has beautiful workmanship and performs flawlessly, call Sal at Northeast Sailplanes and talk with him about the Grifter. You also get the great support that Northeast Sailplanes gives... I've been really impressed with the information and encouragement that they give. The Grifter is $750.00 and is worth every penny. ■

Dial Cord For Closed Loop Systems

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

Some years ago I started using closed loop systems on my gliders and Old Timers, and was happily using nylon coated stainless steel fishing trace wire until I set up my model of the "Rocketeer".

Not thinking (A habit of mine!), I fired up the motor and launched it on its first flight **without** doing a full ground range check!

The next thing I knew, I had an uncontrollable model that, luckily, crashed with relatively minor damage.

After much testing of the radio gear and a lot of thought, the penny dropped!! The wires in the closed loop system happened to be the **same electronic length** as the Rx antenna! This, of course, caused interference with the Tx signal and the end result was lack of range!

I cured the problem on that model (which I still have in one piece) by running the antenna out along the trailing edge of the wing at 90° to the closed loop wire but I then commenced looking for another way around the problem.

Soldering a jumper wire from one wire to the other, thereby effectively doubling (?) the electronic length, worked satisfactorily but this can be a fiddly job and, if the wire is stainless steel, requires the use of phosphoric acid as a flux which, in turn, necessitates thorough washing of the finished joint. Messy!!!

Another way around this is shown in the sketch. As you can see, the cable runs **continuous** from one side of the control surface, through a crimp lug, through the servo arm, loops across through another crimp lug, then through the other arm of the servo and back through the crimp lug to the other side of the control surface.

However, this creates another problem for me, as I like to have the adjustments (via rigging couplers) on the system **inside** the fuselage, rather than outside near the control surface where they create unnecessary drag. This can still be done by inserting the clevices and rigging couplers between the wire loops and the servo arms.

Now, I don't know who told me about dial cord, but it was the answer to all my closed loop problems!

Closed Loop Sketch

This dial cord appears to be made from multiple fine strands of nylon enclosed in a braided, waxed, rayon (?) sheath.

Some basic tests I have conducted show that the 0.4mm diameter cord has a breaking strain of over 8 lbs. and will stretch approximately 1/4" for each 1 lb. load applied. Now this is far more than we are likely to load it up in most thermal gliders and, if in doubt, the 0.7mm cord can be used.

Finally, a couple of suggestions for setting up your closed loop system:

1) Fit plastic tubing (available from most craft shops) through the fuselage to carry the cords, as this enables changes to be carried out easily.

2) Where the cord is threaded through metal holes (e.g., rigging couplers), the hole must be champhered to prevent the cord being cut by the sharp edges.

3) The crimping of the crimp lugs should be done with round-nosed pliers to minimise the risk of damaging the cord with the sharp edge caused by flat nosed pliers.

The problem arises, of course, of where to obtain the dial cord. It is available at T.V. & radio spare parts suppliers, comes in spools, and costs about $12 Australian, but should be cheaper in the U.S.

Green Air! ■

Eleventh Annual Rose Bowl Soaring Festival

...Photos by Robin Riggs
North Hollywood, California

(The Eleventh Annual Rose Bowl Soaring Festival held on June 6 & 7 was sponsored by the Pasadena Soaring Society. Daryl Perkins took first place in Unlimited and 2 Meter. Joe Wurts took second place in both events.)

Harvey Jenkins, President of ISS, with his new Banshee, Brian Agnew's new 2 meter kit.

Joe Wurts launches Daryl Perkins' unlimited entry on another winning flight.

Mark Hambelton of DCU shows his new 2M & Unlimited entries in the thermal duration arena. Both ships are prototypes and will be kitted, soon. Both use foam/balsa 7037 wings with Mark's great glass fuses.

Mark Levoe, Pasadena Soaring Society (PSS), and his own design unlimited ship.

Don Edberg, Harbor Soaring Society, with his brand new Modi 900. Although he is still fine tuning, it flew beautifully.

A Mini-Legend

...by Pancho Morris
Mesquite, Texas

I have been flying my latest edition, two meter EHECATL for about six months and have been very happy with its performance. It was an improvement over the last one and I was even able to take third place at our spring two meter contest with it. It was, however, a bit heavy as are all my EHECATL series planes because of the fuselage construction technique. I have become known as King Lead Sled because of my planes and one friend even made me some stickers that say "TRINEO DE PLUMO", which is lead sled in Spanish.

Robert Taylor had just finished a Falcon 600 and has been flying a Legend as his big ship. (I have been flying a Legend, also, for about six months and have been very happy with it. We have been calling ourselves TEAM LEGEND against TEAM FALCON-EAGLE and TEAM BOUNTY HUNTER here in our club.) After looking at his 600 fuselage, I thought, "Why not build a two meter Legend?" The Legend and Falcon have very similar fuselages except that the Legend is a T-tail. I could get some foam cores cut here in the area and do the rest pretty much like on the big one. Robert liked the idea so much he said he would build one, too.

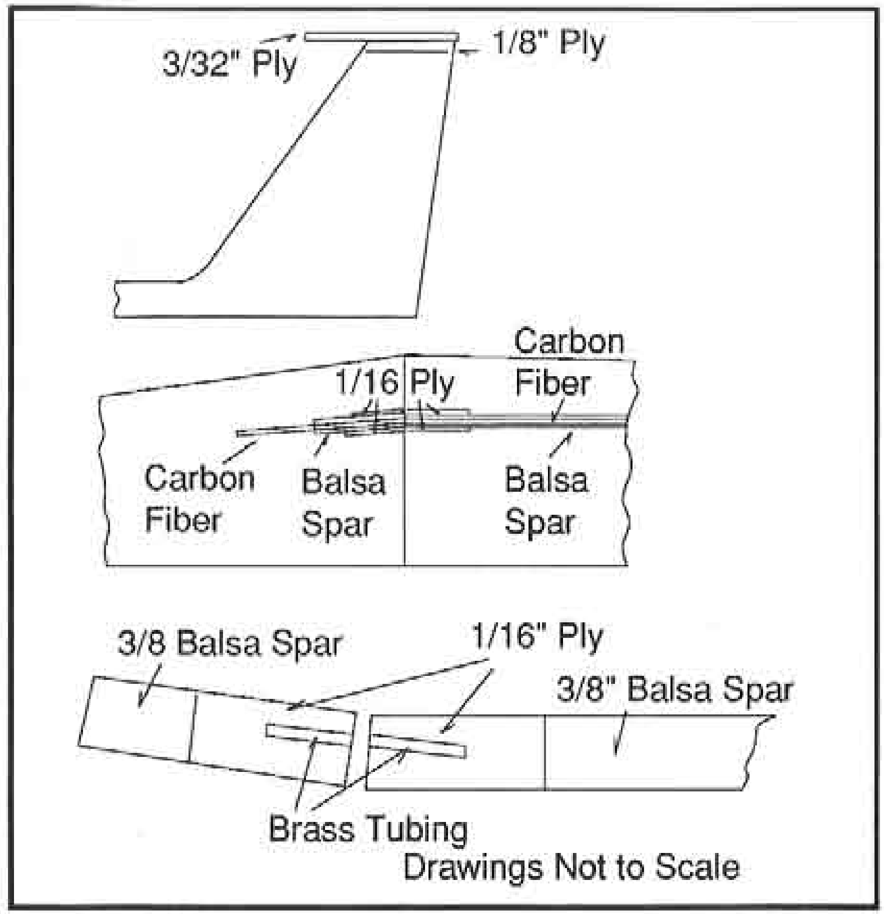
We ordered two fuselages, had two sets of cores cut and got some Obechi for the wings. The wings were cut using the Airtronics Whisper planform as this is their version of a two meter Legend wing. We used white foam to keep the weight down. The cord on both the Whisper and the Falcon 600 is nine inches, so that worked out perfectly.

I decided to make my wing three-piece like the big one for ease of transportation. I used a solid 3/8" hard balsa spar full length in the center panel. I used a very short spar, also 3/8" hard balsa, in the tip panels mainly to accept the joiner rods. The joiner rods are 3/16" music wire. Slots were cut into the balsa spars to accept the brass tubes for the rods. The spars were then faced with 1/16" ply front and back after filling up the cavity around the tubes with epoxy and microballoons. The center spar was capped full length top and bottom with carbon fiber. Carbon fiber was carried a short way past the spar on the tip panel onto the foam, top and bottom.

The very top of the vertical fin was cut off on a line parallel to the wing saddle. A 1/8" plywood plug was epoxied into the top of the fin. A 3/32" plywood rectangle was glued to the top of the fin to be the mounting plate/alignment key for the stab. The elevator bellcrank/pushrod assembly and tailpost and rudder hinge assembly were done just like in the large Legend except that 1/8" X 3/8" spruce was used for the tailpost.

The stab, elevator and rudder were built basically as per the plans though they were scaled down in area. I initially drew my stab/elevator using the TLAR method of calculation and design. I then figured I should check it, so I got out the calculator and figured Tail Volume Coefficient on the big one and Aspect Ratio on the big one, and used these to come up with my two meter stab/elevator and found that I had done it exactly right the first time. The cord is 4 1/2" and the span, 20". The stab bolts onto the fin like the large Legend.

I used Kevlar pull string on the rudder. The wing bolts on with two bolts as in the Falcon 600. I put a plywood block in the wing behind the leading edge for the front bolt. Two and one half inch carbon fiber mat was used top and bottom on the wing cores at the trailing edge. I put a large patch of 1/64" ply top and bottom at the trailing edge for the rear bolt and ran a 2" wide strip of 2 oz. glass cloth around the center of the wing. We sheeted the wings with Obechi using a vacuum



bag. The flaps and ailerons are 2" wide like on the big Legend and the Whisper. The leading edges are basswood or spruce.

I used Airtronics 401s on the rudder, elevator and flaps with 501s on the ailerons. The servos were mounted in the wing as per the big one. The model was covered with Monokote and the fuselage was painted with K&B. Flying weight came out at 44 oz.

The Mini-Legend flies very well, just as you would expect a two meter version of the big one would. It is more nervous and agile than the big one, yet it flies with the smoothness, stability and authority of the big one. I was so confident in the new plane that, on its first launch, I did a roll during the zoom. The truth is that I had just finished CDing a LONG, HOT multi-task contest and I had had about all the abuse I could stand for one day and I thought I might as well go for it. What's a little more? I also had a pretty good audience. I then lucked out and flew right into some good lift and took it up. I did a few more rolls coming in and made an 85 point landing on the tape that was still out. It looks like it will be a keeper.

Robert is starting work on his, now. He will probably make his a one piece wing and use a cable to drive his elevator ala Bob McGowan in California and his 100" Legend. ■

Schedule of Special Events

Date	Event	Location	Contact
Sept. -	F3B Team Trials	Carson, CA	Steve Addis (310) 835-7631
Sept. 12-13	CASA 10th Annual Open Soaring	Gaithersburg, MD	Steven Lorentz (301) 845-2311
Sept. 27	World Postal 2m (July, 1992 Issue - invitation)	Everywhere	Steen Hoej Rasmussen Denmark
Oct. 3-4	CSS Pumpkin Fly	Cincinnati, OH	Chuck Lohre (513) 731-3429
Oct. 4	Unlimited Thermal AMA & LSF Regional	Kirkville, NY (Syracuse)	Dave Zinteck (315) 656-7103
Oct. 10-11	2M & Open Last Fling of Summer	Tulsa, OK	Sandy Hay (918) 747-4112
Oct. 24-25	M.A.R.C.S. Symposium	WI	Al Scidmore (608) 271-5500

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.

For Sale - Business

"SAILPLANE DESIGNER'S HANDBOOK" + "DRAG REDUCTION & STRUCTURES HANDBOOK", $7.95 apiece. Size/locate stable components, many low ReyNmbr airfoils via breaking Eppler's code, define speed/glide slope, design wing structure, drag reduction techniques. Eric Lister, 2214 Regina Dr., Clarksburg, MD 20871.

GREETING CARDS, humorous, assortment package in groups of 10 for the sailplane enthusiast. We have a card to fit any occasion. Send $10.95 plus $2.50 postage (CA residents please add 8.5% tax) to Curt Nehring, SOAR TOONS, 469 N Central Ave. Ste. #261, Upland, CA 91786; (714) 920-1261. Please allow 3 - 4 weeks for delivery.

COMPOSITE SAILPLANES ARF, FOAM CORES & CUSTOM WINCH ACCESSORIES fully machined. On-board multi-purpose computer MINI-MIXERS™ for upgrading non-computer radios: $49.00 - $69.00. Basic Aircraft Tech, Bob Harman, 10424 Golden Willow Dr., Sandy, Utah 84070; (801) 571-6406.

For Sale - Personal

Multiplex FIESTA, complete w/flaps, aileron, releasable tow-hook, excellent condition...$200.00 firm; ALCYONE kit, fiberglass fuse, box never opened...$200.00 firm; 4 Airtronics standard servos, never used...$50.00; MARIAH 4 meter, complete & built, excellent condition...$275.00 firm. Contact Hans Wiederkehr, 4 Gary Place, Selden, NY 11784; (516) 696-3361.

Electric package: Astro Flight 112 DC charger, Astro Flight Turbo-05 racing motor, SR-1800 7-cell flat battery & SR-1000 7-cell flat pack, both w/sermos conn., Graupner folding prop 7-3", 8-4.5", 6-6", w/2 hubs, Airtronics MA-3 speed controller. Everything new w/ less than 1 hr TOTAL TIME...$250.00 O.B.O. Might trade for the right glider. Ken at (907) 248-9069 Alaska.

DON'T YOU HAVE ENOUGH TROPHIES??
***** ATTN: CONTEST DIRECTORS!!!**
Award your winners w/shirts, caps, jackets, bags, individualized w/screen art (incl. place & class). Designed by fine artist and past Natl. Champion, Tom Jones. Golf shirts from $20.00, T's from $10.00. For more info. send S.A.S.E. to: **Zoomit Creations, 16 S. Woodstock Cir., The Woodlands, TX 77381; (713) 363-3384.**

On Flying Upside Down

...by Martin Simons
13 Loch Street, Stepney,
South Australia 5069

When, some 23 years ago, my family and I decided to leave England to live in Australia, my friends warned me that I should have to learn to fly inverted all the time. I think they were joking.

It did take me a while to get used to the midday sun being in the north and I somehow transferred the confusion for a while, thinking the sun was rising in the west and setting in the east. Also, the circulation of the winds round low pressure centres goes the other way here, so there was quite a lot to get used to. But upside down flying ... no problem.

Except that there is one.

Have you ever flown a model sailplane upside down? Of course, when upside down, moving the elevator stick forward gives nose up instead of nose down. It takes practice to get used to this, but it isn't puzzling - just a bit tricky, like patting your head while rubbing your tummy.

Ailerons work in the same sense as usual. When upside down, right aileron causes the right wing to go down and the model turns to the right, which is just like normal flight. When inverted, the port wing is on the right hand side of the glider, so right stick actually raises the aileron on that side, giving the normal banking effect.

There may be some difference with inverted aileron control if the glider has differential ailerons. (I.e., more up movement than down in normal flight.) You may hardly notice anything; basically the ailerons will work normally.

But with the rudder we encounter a little puzzlement.

Get your favourite two control 'rudder elevator' model, switch on the radio, get someone to hold the model inverted, and apply right rudder. Naturally, the rudder moves in its normal way, but because the glider is upside down, left stick gives right rudder and vice versa. In normal flight, right stick gives right rudder and the model yaws to the right. In inverted flight, right stick gives left rudder so the glider must yaw to the left. The rudder effect is reversed, isn't it? Well, isn't it?

So now go and fly your 'two control' model, invert it at a safe height, trim the elevator for a sensible attitude and airspeed, and give right rudder. Which way does it turn? Despite the reversed rudder movement, right stick gives right turn. Why? If right rudder in normal flight gives a right turn, why is it that left rudder (inverted), gives a right turn?

Now go and get a slope soaring aerobatic sailplane, which has ailerons as well as rudder, and **no dihedral**. As before, when inverted, rudder sense is reversed. In flight, invert the model, hold the ailerons central, and move the rudder stick to the right. The model yaws to the left. It may even enter a left hand turn, though not, as a rule, a very tidy one.

The main difference between these two types of model, apart from the control set up, is that the 'rudder elevator' sailplane has a lot of wing dihedral and the aerobatic model none. This is the secret.

Right way up, when rudder is applied, the 'two control' model yaws. This pushes one wing forward and the other back, relative to the airflow. Because of the ample dihedral, the forward yawed wing is forced to face the air at a greater angle of attack and, correspondingly, the angle of attack of the back yawed wing is reduced. The model has more lift on one side than the other, and so banks, and as soon as it banks, it turns. Turning is caused by banking. The turn is the secondary effect of the primary yaw caused by the rudder.

This explains why, if a two control model does not respond well to the rudder, the reason is usually that there is insufficient dihedral.

With the model inverted, the dihedral also is upside down, so it works the other way round. Right stick does give left rudder and so the primary response is left yaw. But left yaw upside down now forces the left wing, (inverted) to the greater (inverted) angle of attack, the right wing angle of attack (inverted) is reduced and so despite the left yaw, the model banks to the right and turns right.

Mind you, turning right with a left yaw, is very inefficient, with a lot of skidding and high drag. But once the model is in a turn, the rudder can usually be centred anyway, and the bank will carry the turn round without any serious yaw, providing the elevator is raised (forward stick inverted) sufficiently to keep the model flying at reasonable attitude.

I have several sailplanes with ailerons but also a few degrees of dihedral. If I leave the ailerons alone, the rudder will turn them, but not briskly. What happens when I fly them upside down, and try to turn with the rudder alone? Naturally, it depends on the amount of dihedral and whether the primary yaw to one side is strong enough to overcome the secondary dihedral effect to the other. Dihedral is powerful, and even a little will usually be sufficient to give right turn with right rudder stick, inverted. But it is possible to reach a peculiar state of balance in which primary and secondary effects just about cancel each other. The ailerons will be essential. ■

Some Notes About F3B

...by Manny Tau
San Clemente, California

(The following article was originally written by Manny for The Harbor Soaring Society's (H.S.S.) newsletter, *Plane Rap*.)

So, how about a little focus on F3B? Well, it's 1992 and one of my goals this year is to try out for the U.S.A. F3B team in September, along with Don Edberg, another H.S.S. member. It looks like the team trials might be held at the S.U.L.A. (Soaring Union of Los Angles) site. What a great opportunity to track the chronology of our next U.S.A. team from the beginning. The U.S.A. team did phenomenally well at the World Champs at Terlet, Holland, making it now known that the U.S.A. will be a competitive force to contend with in F3B.

I don't know what people know of F3B, so I'll assume that you have a general idea of the distance, Duration, and Speed tasks. Ah, yes, the Speed tasks... turn and burn, bank and yank, sphincters a tightening...It is truly wild to be at the sticks of a ship with 2-4 lbs. of lead, pinging off the winch with monofilament line and getting 500-700 feet of altitude, coming back to base A, rolling vertical, entering the course at who-knows-what speed, watching your wings flex as you hit the first turn, and praying to anyone who's listening, that the composites are going to hold up. I've been really fortunate to spend some time and learn from some outstanding and world-class pilots. Perkins and Wurts have been great coaches, along with the likes of Steve Lewis, Don Edberg and, of course, the team manager, Randy Spencer.

As you probably know, Joe and Daryl are flying F3B Eagles with 7003 and RG 15 airfoils. These are great ships and currently high in demand. Most likely, there are a number of you out there who are on that most dreaded limbo state...Mark Allen's waiting list. The Muller Comet 89T, though considered outdated by some, still is very competitive with its RG 15 airfoil. At the last F3B practice, I was able to get a respectable 18.8 seconds speed task with only 2 lbs. of ballast in my Comet. I could have used another lb. Pilots were getting times with a range of 16-23 seconds. Steve Lewis is another fellow contender, and flies a couple of unique ships. He utilizes a Muller fuse, and has various sets of wings for it. He has wings from a Synergy 91 (2048), along with wings from an Eagle (7003), and practicing with each to find that right combination.

Manny Tau

I've just finished with the MODI 900 with the RG 15 wings (FYI - Rolf Gersberger), and able to place 3 lbs. of lead ballast into it...approximately 21 ozs./sq. ft. The RG 15 is a great airfoil that is fast and utilizes higher wing loadings very well. Energy retention on the MODI is outstanding. The MODI has only about 5 hours on it so far, but I was able to earn 6th place in Division I at the first California Slope Race at Torrey Pines on March 14th and 15th. I know, a stupid thing to do...to fly a new plane in a slope race. There were about 40 competitors over the 2 day event, and over 12 mid-airs and the like...giving a 30% hit rate. Not too good, but the ship had to be given a good loosening up prior to the next F3B practice. ■

Manny mentioned a waiting list for Mark Allen (Flite Lite Composites). However, Flite Lite has changed hands, recently. In the August issue of *RCSD*, page 49, Mark announced that the new owner of Flite Lite is Ron Vann. Ron advertises that there in only a "one week delivery on all Falcons". You may want to check with Ron on the F3B Eagle to see what their new schedule is. ED. ■

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