Schedule of Special Events

Date	Event	Location	Contact
Nov. 14	Calif. Slope Racers State Championships	Miguelito, CA Duane Gibbs	Hal Krammer North (510) 449-0441 South (714) 731-3461
Dec. 12	Calif. Slope Racers TPG 60"	Duane Gibbs	Hal Krammer North (510) 449-0441 South (714) 731-3461
Jan. 1-9	International Model Engr. & Modelling Exhibition	London, England	Argus 0442 66551
Jan. 9	Calif. Slope Racers TPG 60"	Duane Gibbs	Hal Krammer North (510) 449-0441 South (714) 731-3461
June 26-27	NASF/MASS Mid-South Soaring Champs	Huntsville, AL	Ron Swinehart (205) 883-7831
July 16-27	AMA NATS	Lubbock, TX	
Sept. 18-19 (Tentative)	TNT Texas National Tournament	Dallas, TX	Henry Bostick (214) 279-8337

Press Release

International Model Engineer & Modelling Exhibition
Olympia, Hammersmith Road, Kensington, London, England
1st - 9th January 1993

Come to Olympia - the new home for the International Model Engineer & Modelling Exhibition, this time being run in conjunction with the Society of Model & Experimental Engineers (SMEE), and see the many exciting *competition displays; *Scale model locomotives, boats, cars, aircraft; *5" Gauge Steam Railway Track - rides for all!; *Associations, Societies and Clubs; *Remote control boat pool; *Remote control car track (every day except January 1st &7th); *Indoor fun flying (January 1st & 7th); *Over 100 trade stands.

...Everything for the model enthusiast...

Also on show this year - BLUEBIRD - the reconstructed boat being presented by its present owner, Paul Foulkes-Halbard - and the MODELLER 2 INSHORE LIFEBOAT by kind permission of the Royal National Lifeboat Institution.

There is plenty of seating in the Gallery to view the activities in the Grand Hall. Travelling is easy - Olympia is well served by bus routes and the Underground District Line which stops outside the entrance. Main Line British Rail from Clapham Junction goes to Olympia too, and if you choose to come by car, parking is half price in the Olympia multi-storey car park for the duration of the Exhibition and at Earls Court Seagrave Road up to and including 5th January (underground shuttle from Earls Court to Olympia will be in operation). There should also be parking available at £4 in Russell Road.

Don't miss the beginning of a new era for the Model Engineer & Modelling Exhibition at Olympia - open daily from 10 am - 6 pm except Thursday 7th January 10 am - 8 pm. Admission: Adults £5; Senior Citizens £4; Children £2.

Further information and competition details from Argus Specialist Exhibitions, Argus House, Boundary Way, Hemel Hempstead, Herts, HP2 7ST England; Tel.: 0442 66551. ■

R/C Soaring DIGEST

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Vol. 9, No. 11

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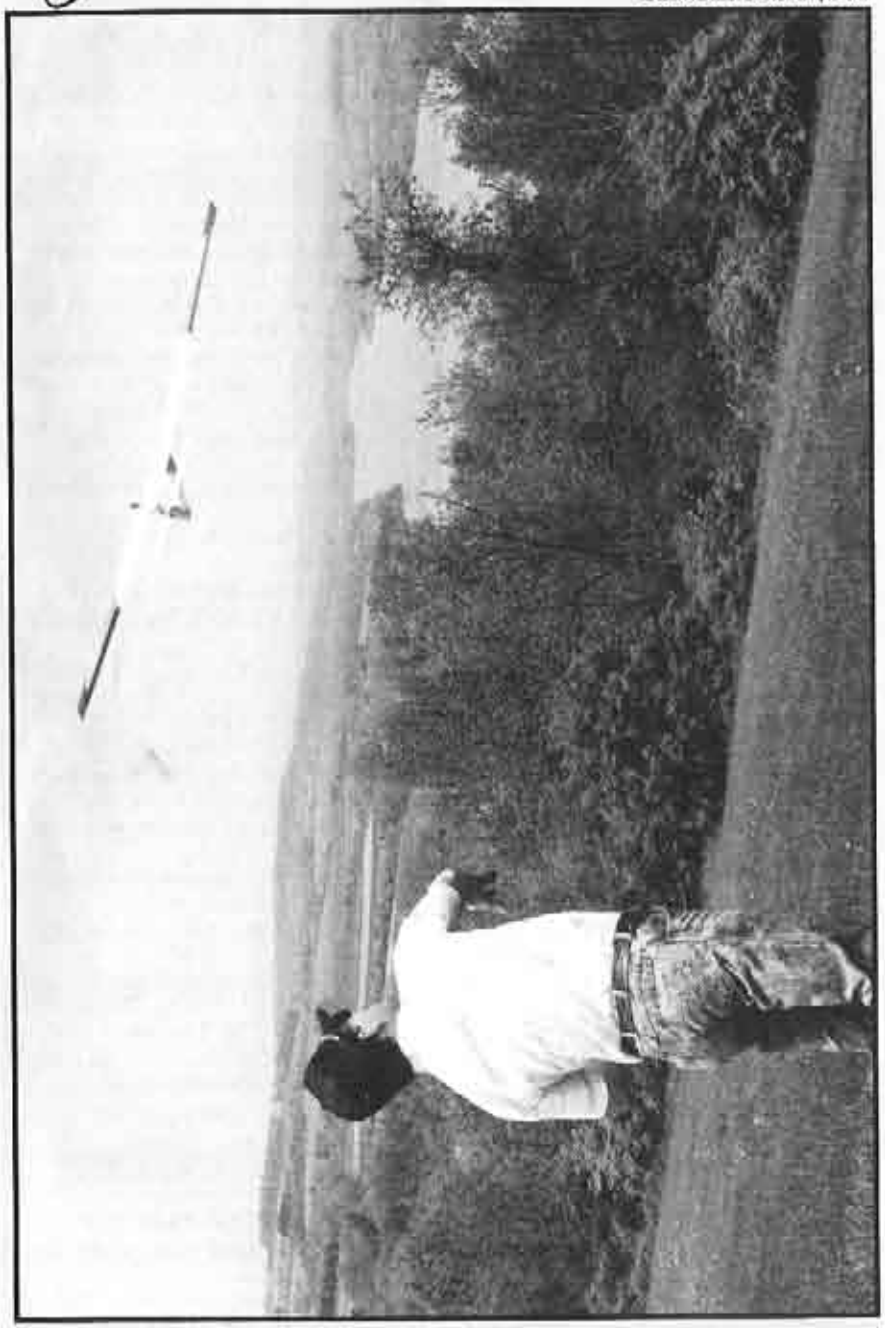
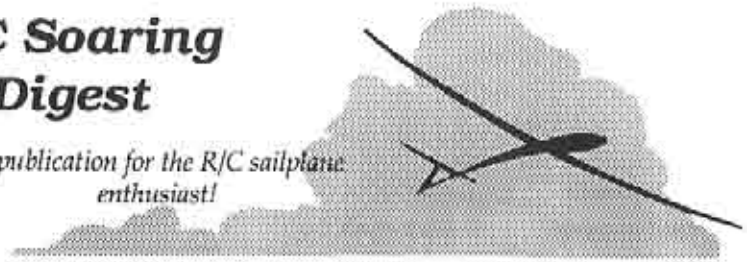


R/C Soaring Digest

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

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The Soaring Site

About the Cover

The photo shot was sent in by Mark Bresler of Reading, Pennsylvania. He says, "My friend Jeff Beyerle and myself have had many hours of great flying at a slope located above Blue Marsh Lake. The lake and watershed were a project of the U.S. Army Corp. of Engineers and opened in 1979. The lake and slope are a few miles north of Reading on route 183. I have sent pictures of myself flying a Sparrow and a Chuperosa and Jeff flying a 10' span semi-scale, ASW-17 type glass and foam core model. When the sun is out and the wind is north, this site offers aerobatic and duration quality conditions. Two hours flights are easy!" The photo on the cover is of Mark Bresler and the photo on the next page is Jeff Beyerle.

A New Club in Nevada - L.V.S.C.

Steven Smith, President of a new club in Nevada, has written to say, "I am writing to let you know that a new club has been started here in Las Vegas. It is called the "Las Vegas Soaring Club" and was started in May of this year. We currently have 20 charter members and are growing fast. Currently, we are the only "sailplane, only" club in Las Vegas. With your support, we could possibly grow even more! Could you possibly give us a mention in *RCSD*? Who knows, the next time a reader comes to Las Vegas, he/she can bring their plane along and have some "real fun" in the "daylight". Perhaps you could also list us under "Contacts & Special Interest Groups". Steven Smith, L.V.S.C. can be reached at 6978 Starwood Dr., Las Vegas, Nevada 89117; (702) 873-9591 and has been added to the list, as well.

Visalia Fall Soaring Festival

We received a call from Ron Vann and a note from Dave Darling, both of California, regarding the Visalia event in Cali-

fornia. There were approximately 230 fliers and, with 18 planes in the air at a time, there were no mid-airs! It sounds like everyone had a great time and that the weather conditions could not have been better for this yearly event. First place went to Southern California Harbor Soaring Society President, Ben Clerx, flying a Flite Lite Composites Falcon 880. Congratulations, Ben, and to all the folks who worked so hard to make the contest a success!


Jeff Beyerle

Open Request

The following request is from Ron H. Richardson, 381 Stonebridge Rd., Birmingham, AL 35210.

"I would like to make an open request to the readership for a technical article on the theory that there is an optimal wing loading for a given airfoil and/or planform. I think that wing loading promotes a cruising airspeed which may (not) equal the best L/D airspeed. Maybe someone could explain this for me as I am trying to design a standard class sailplane with a Selig 3021 airfoil and a 10.5:1 aspect ratio." Anyone?

Another Request

This request is from Daniel Hatfield, T.B. 14 UCD Campus, Davis, California 95616.

"I have a question for the readers of *RCSD*. I am designing a model glider for F3B competition and one of the details that remains to be worked out is the design of the stabilizer. These are the questions I have:

1) What are the advantages and disadvantages of an all moving stabilator versus a fixed stabilizer with hinged elevator? I notice that most high performance full-size sailplanes use a fixed stabilizer, yet most of the model gliders in F3B competition are using the all moving variety.

2) Is there any advantage to using a non-symmetrical airfoil for the stabilizer? I believe the ASW-24 incorporates such a feature, however I am not certain which way the camber goes. I assume that it is a "lifting" surface. I have examined an ASW-24 and I noticed that there are zig-zag turbulator strips at about 65% of the stabilizer chord. This would suggest that the designers are incorporating a laminar flow airfoil with a late transition. This is more food for thought.

3) How thin should we be making our stabilizers? I would think that the thinner the better. Liese's Epsilon features a 7% stabilizer section. If thinner is better, than why is Selig's stabilizer section (the 8020) 10% thick? This last question also applies to vertical stabilizers, as well.

4) If we are going to expect some lift out of our stabilizers, than should we be concerned about the planform? Mark Allen incorporates a double tapper on the stabilizers of many of his designs, including the F3B Eagle, however I suspect this is more a matter of style than aerodynamics.

5) In "Soartech 8", Selig talks about a deadband for the symmetrical NACA 0009 section. I can't see this in the plots. What am I looking for?

"I plan to do some experiments of my own in this area, but I would very much like to discuss with other people their thoughts and ideas about this topic. In case anyone is interested, I am studying Aeronautical Engineering at the University of California, Davis. We seem to have a good upper division program here, but I am frustrated at the lack of courses that involve model aircraft aerodynamics, or even sailplane aerodynamics."

Wanted - F3B/USA Editor

Byron Blakeslee, current editor for the F3B/USA newsletter says, "I will be stepping down as editor at the end of the year and am asking for some interested person volunteer to take over the job. Randy Reynolds began F3B/USA in 1988 and edited it through 1990. I have put it out the past two years and feel it's time for someone else to take over. A person with access to desktop publishing facilities would, I'm sure, improve the looks and popularity of the newsletter. Current U.S. subscribers number only about 72, with another 20 or so outside the country. The only purpose of F3B/USA is to promote multi-task flying and circulate information about what's going on around the F3B world, so the editor need not be an "expert". His job is to print reader's contributions. It is a "non-paying" donation of time. Funds are not a problem - there is sufficient balance in the checking account to service subscriptions. Interested persons should please contact me so the changeover can be made by December." Byron's address is 3134 Winnebago Drive, Sedalia, Colorado 80135; (303) 688-9572.

Correction

We inadvertently reversed two photos in the October issue of *RCSD*, page 20. We apologize to both Lars Erickson and Bob Sowder for the error.

Happy Flying, Jerry & Judy

Flying in Wind and Weather

...By Martin Simons

13 Loch Street, Stepney,
South Australia 5069

Thermals

A famous German meteorologist, Walter Georgii, in the nineteen twenties declared in print that thermal convection currents strong and large enough to carry up man-carrying gliders, did not exist. Thermals were strictly for the birds, he thought. He did not consider model aeroplanes. To his credit, Georgii quickly proved himself wrong and subsequently took a leading role in the development of thermal soaring. Research flights made, under Georgii's direction, by Nehring and Kronfeld in the late twenties, soon established the feasibility of soaring in thermals.

If any light and heat energy from the sun reaches the ground, as it does on even the gloomiest day, there will be some warming of the air from below and this extra heat must be dispersed by some means. The most usual method is by convective stirring, i.e., thermal currents. Even after a cold front brings a cool change of air mass to a district, the ground retains some warmth and heating from below continues.

Convection occurs even on frosty days. Air which is at freezing point may still be warmer than that a few metres above the ground and convection must then take place. The local variations in temperature are more important than the absolute values. It is true that when the sun is pouring down and the ground gets very hot, there is more excess of energy to generate thermals, than when the sky is cloudy or the sun low. Summer is thus a better time for thermal soaring than winter, the middle and afternoon of a day better than cold mornings and evenings. But the general principle remains; if the ground is even slightly less cold than the air, some convection will occur. While a damp area, such as a lake, a broad river or an irrigation area, may be cooler than the surrounding dry lands during the day, when the dry land cools down, as it tends to do quickly in the evening, the moist areas retain their heat longer and then generate thermals even into the night. Thermals occur over the plains and over hills. A slope facing the sun tends to produce strong thermals that flow up the face of the hill and take off from the summit. Thermals in hilly or mountainous country are often aligned along the ridge crests. (This does mean that shaded slopes and valleys tend to be areas of sink.)

Strong winds break thermals up, move them along and make them more turbulent but they will still be present and useable by the glider pilot.

There is no place, in fact, and no season of the year, where convection currents never occur!

Once all these facts are realised, it becomes a cause for comment when thermals cannot be found, rather than the other way round. Model glider pilots who **expect** to find thermals, usually do, because they are usually there. The secret for the model sailplane flier is to go looking for lift even when the prospects seem poor. It helps in this, to have a slightly greater understanding of how thermals are formed, how they are shaped, and how to manoeuvre within them when they are found.

As discussed in the previous article, the limit of convection may be only a few feet at sunrise, but it rises. As the day goes on, more and more heat energy is fed by the warm land into the air low down and eventually, on most reasonably clear mornings, the inversion is destroyed, it 'breaks' altogether. Model fliers with a little experience at their site, soon begin to recognise this fairly abrupt change in the conditions. The time when this happens on a particular occasion depends on various local factors and the general weather situation, but when it occurs the sky may be completely transformed within a few minutes. Previously, small thermals will be present, possibly difficult to centre but useable by models. Climbs end when they reach the inversion. Then a few small, puffy cumulus clouds form, often appearing first over hill crests, if there are any in the area, indicating that a few upcurrents have broken through. A short time later, the entire sky seems to be boiling and cumulus develops everywhere.

Things can go too far. If the convection is so strong and extensive that the entire sky is quickly covered with cloud, cutting off the sun, the ground tends to cool and thermals may weaken again. This gives a chance for the clouds to evaporate, after which ground heating begins again and more clouds form, over develop and then there comes another quiet spell. This sort of cycling during the day is quite common.

A cumulus cloud forming is a sure sign that a strong thermal, or thermals, exist and the lift continues into the cloud, often to great heights. The clouds are themselves produced by thermals. The air carries a certain quantity of water vapour. Since rising air cools at about 3 deg C per thousand feet (the dry adiabatic lapse rate or DALR), if the thermal rises high enough it will cool until the moisture condenses to become visible as a cloud. After this, the cooling is slower, at the saturated adiabatic lapse rate (SALR), so the thermal inside the cloud, cooling more slowly, usually gets stronger. Rain showers which cool the ground and usually spoil convection at least in the local area where the ground remains wet, very frequently fall from cumulus clouds. The most powerful thermals of all are those which produce cumulonimbus clouds, with lightning, thunder, often very heavy rain or hail, and stupendous up and downcurrents. Glider pilots who have been forced to bail out inside thunderstorms, have been carried upwards and frozen. Models can easily be sucked up and lost. Transmitter aerials pointing skyward from hilltops can be struck by lightning. It is safer not to be flying, in such conditions. Even so, the existence of cumulus does at least indicate that convection is going on and thermals must be available if they can be reached.

Unfortunately for model fliers, it is very difficult from the ground to position a model glider in the best place relative to a particular good-looking cloud, to find the thermal. Even when a nice fat cumulus is directly overhead, as will be explained below, the thermal is not just a column of hot air pouring up all the way from the ground. Moreover, after a cumulus has formed, the upcurrent feeding it often fade and the cloud then begins to dissolve and evaporate, developing a ragged, loose appearance and eventually evaporating entirely. There may still be weak lift near it, but eventually it will produce only sink. Learning which kind of cloud is useful and which not, is a skill for the model sailplane flier to learn.

There are also, especially in dry countries, many days when good thermals exist but have no clouds to mark them. These are sometimes called 'blue thermals', indicating that they are found under cloudless skies. (Life would be too easy if thermals were really coloured in some distinctive fashion.) The blue thermal is simply one which does not rise so far that its moisture condenses. Otherwise, it is the same kind of current.

Thus cumulus clouds mark thermals, blue skies indicate that there are invisible thermals. Even dull, grey overcast skies with some darker and lighter patches of cloud suggest that there may be thermals.

There are not many days when they are wholly absent.

The size of thermals

It is found that thermals are related in size and strength to the depth of the convection layer, that is, to the height of the inversion (Figures 25, 26, 27). When the 'lid' is only 100 feet above the ground, thermals tend to be quite numerous but small and weak. Hand launched free flight and very light radio controlled gliders can soar in such small currents, but the inversion prevents much altitude being gained. The areas of sinking air between thermals also tend to be small, weak and frequent. As the inversion is progressively eaten away, the height to which thermals rise increases steadily. They grow both larger and stronger. However, the air that ascends must be replaced by air coming down, so the downcurrents between thermals also become larger and stronger. After a climb, the model sailplane has further to travel before it will find more lift, and the long stretches of air through which it must pass, is likely to be sinking quite rapidly in places.

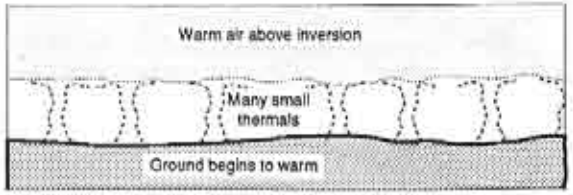


Figure 25 Small thermals beneath inversion

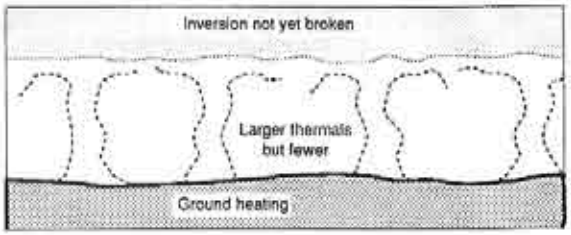
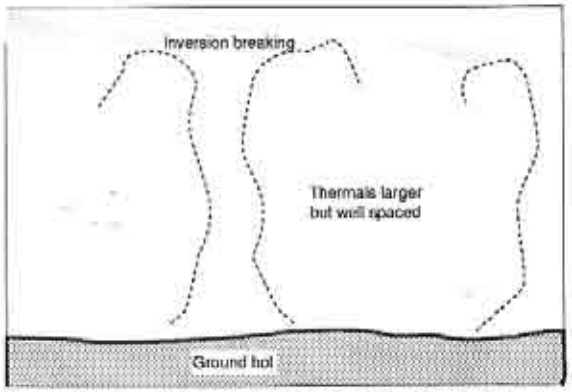


Figure 26 Inversion rising; larger thermals



Inversion breaking; larger but spaced thermals
Figure 27

It is wise for model glider fliers to realise that thermals after any inversion has broken, are not small and feeble, but are capable of carrying up a full-sized sailplane loaded with water ballast. The best modern single seat sailplanes now span more than 25 metres (82 ft) and with ballast weigh three-quarters of a ton in flight. Two seaters are heavier. A full-sized sailplane can circle, steeply banked, without ballast, at a **radius** of about 60 yards. With less bank and more ballast the radius of turn is a good deal greater, perhaps 100 m (330 ft). This suggests that a minimum useable thermal for such an aircraft would have a **core diameter** of about 110 to 180 yards. This is a 'ball park' figure - that is, minimum useable thermals are about the dimensions of a ball park! Bigger thermals are common. The pilots of full-sized sailplanes intending to do cross country flights do not usually even take off, unless they are confident of finding thermals with cores of at least this size.

The core is mentioned because the thermal as a whole is a complex structure. The core is that part of the upcurrent that is rising fastest. Outside the core, for a radius all round of perhaps as much again, is an area where a glider will feel some effects of the thermal, often in the form of weak and 'broken' lift, turbulent, but rising. The thermal does give an indication of its existence over quite a large region.

Very near the ground and early, under a low inversion, the full sized sailplane waits on the ground, but a model, even a relatively heavy one, can circle with a much smaller radius than its full-sized counterpart. Without banking steeply, even a heavily ballasted model sailplane should be able to circle easily on a 20 yard radius. Models, therefore, can often be soaring long before the full-sized ones are in the air.

Once the morning inversion has been broken, the full sized sailplanes take off and useable thermals can often be found at heights about 300 to 500 feet above the ground, and upwards. Circling steeply low down is not considered very safe but experienced pilots in competitions do it when the need arises and it is quite possible to 'get away' in a thermal from 400 ft., providing a safe landing place is available very nearby in case the thermal fails. It appears, then, that on a reasonably good thermal soaring afternoon, model fliers should **expect** thermals of ball park size at least to exist at heights attainable from a good towline, bungee or winch launch. It also follows that areas of sinking air between will have at least similar dimensions. This implies that if the model is in sink, a well judged move of something like 100 to 500 yards horizontally may be necessary to find better air.

Thermal streets

Fortunately, convection is almost always organised in some fairly regular pattern. For instance, thermals are frequently aligned along the wind direction. It is then possible to fly along a 'street' of lift for surprisingly large distances. The lift along such a street will not be continuous, for there are commonly weaker patches and areas of sink along the way, but these tend to be less fierce than between streets, so the glider can penetrate them easily and reach the next thermal in the row without much loss of height. It is this phenomenon which probably explains the so-called 'wave lift' found sometimes by model fliers. Once lift is found, by heading into wind and flying at the airspeed for minimum rate of sink the model can gain height without circling, sometimes for several minutes, perhaps longer. Quite often in these conditions a model which has drifted far downwind while circling in one thermal, can fly all the way back to join another glider circling overhead, with no loss of height on the return, or even a gain. This suggests, not that a single thermal extended for a mile or so, but that several thermals were present, in a street. The model eventually runs out of the end of the belt of lift, but even then, on such a day, by casting around a little the next street of thermals may be found and the same exercise repeated. In full-sized gliding the best pilots quickly recognise the thermal streets and use them to the fullest possible extent, rarely having to stop to circle but flying fast through the sinking and weak lift patches, pulling up steeply to pass slowly through the better stretches, so regaining height lost, then diving steeply to accelerate to 130 knots or so when sink has to be penetrated. Such flights are comparatively easy when clouds marking the thermal streets are present, but blue thermals too are often arranged in the same way. This 'switchback' style of flight is called 'dolphin soaring' and can be copied by model fliers, except that it quickly takes the model out of sight.

If thermal streeting is suspected, it is

important to remember that the sink areas also will be aligned. The pilot who then flies straight ahead in sink, hoping to find a thermal, is likely to be disappointed. When it seems likely that the model is in a sink street, the best chance of finding lift is to turn at right angles, to one side or the other, flying across towards the flanking upcurrents. Such convective patterns tend to be on the large scale. A thermal street may be a thousand or more yards wide, containing strong lift in narrow cores embedded in the more diffuse areas of gentler lift. The sink streets on either side are likely to be just as broad or broader. A model launched into the sink may never reach the lift.

Using thermals and getting home again

Loose cloud? The dead, decaying thermal's there!
Stay not, and ever bear in mind,
Crisp cumulus are formed by rising air,
If downdraughts come, can lift be far behind?
(Not P.B. Shelley)

To find a thermal becomes something of an art and experience helps a great deal. Beginners in radio controlled soaring should observe other pilots constantly and follow the example of those who succeed. **Watch the model** very carefully and do not give up the search too soon. Look out for birds circling, because they do so only when there is a thermal. Eagles, buzzards, vultures, kites and hawks, pelicans, gulls, soar habitually. Small birds like swallows will sometimes chase excitedly round in a thermal to snatch the small insects which are swept aloft in them. A really vigorous thermal will carry litter, paper and plastic bags, dead leaves, to astonishing heights. Other model sailplanes are not quite so reliable, because their pilots may be no more expert than you are, but if another glider is obviously climbing, and if yours is near enough, investigate that area.

In the absence of any such signs, changes of wind direction on the ground are quite often useful indicators of a thermal nearby. The thermal leaving the ground or passing over the area where the pilot stands, draws air into itself from some distance all round. Following the inflow may lead to the core. Sometimes a thermal indicates its presence by causing a sudden calm and, perhaps, a recognisable warming in the air where the pilot stands. This may mean there is lift directly overhead. If the air seems to be warm, and is then replaced by slightly chilly breeze, turning the model to fly with that breeze may take it to the thermal. Thermals, as noted above, can be as large as football fields, so they take a little time to move past. There is often time even to organise a launch, switch on the radio, do a quick check, and go straight into the thermal. On the launch, if the model seems suddenly to be pulling harder on the line, or reaching a higher altitude than usual for the day, begin to circle immediately when the line comes off the hook. Often, the model will climb away.

These ideas do not work always by any means. Perhaps what really makes the difference is that the thermal soaring pilot becomes highly sensitive to any change whatever, of any kind, in the air where the model is flying, and develops a nearly instinctive feeling about where the lift is going to be. It is not always possible to explain why this person succeeds and that one does not. Fortunately, with practice, anyone can learn. ■

Flying on the Wing

B²
P.O. Box 975
Olalla, Washington
98359-0975

Dieter Paff's PN 11

In the June issue of *R/C Soaring Digest* we described Dieter Paff's PN 9f model and promised to provide information on some of Dieter's other models in the future. Well, the future is now, and the model is Dieter's PN 11!

The PN 11 is an older design, having been constructed in 1978; still, it is unorthodox, even as tailless designs go. This planform is the result of mixing the simplicity of a constant chord plank with a swept wing. The result is reminiscent of NASA's scissor-wing X plane and some SST designs. Several small free flight gliders were constructed and tested in order to produce a viable configuration.

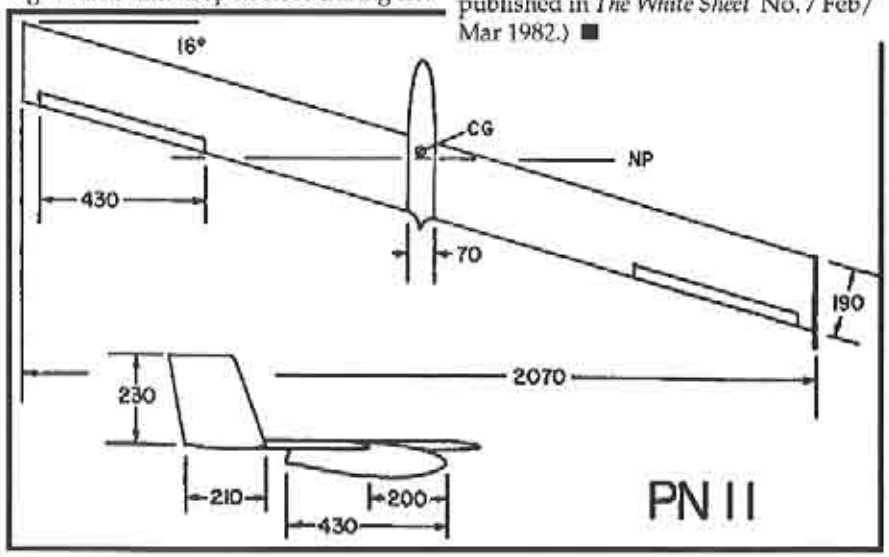
The PN 11 spans a bit more than two meters and is perfectly at home on the slope. Control is through elevons; both move in unison for elevator, and in opposite directions for aileron. The elevon on the forward wing is very close to the CG and does not affect pitch. When both elevons are moved downward, the PN 11 dives straight ahead, as drag is equivalent for both wings. The left elevon's lack of pitch authority does show up when aileron function is called upon, however. The 'ship tends to climb slightly during right turns and drop its nose during left turns. Still, the PN 11 flies easily, and control idiosyncrasies are minimal.

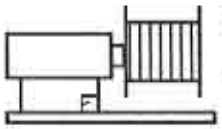
The single fin is mounted on the tip of the trailing wing, where it is very effective at keeping the 'ship on track. The fin's total drag apparently approximates the induced drag of the bare wing tip.

Wing construction is of the "sandwich" type. Total flying weight is under 1 Kg at 960 gm, yielding a wing loading of 25 gm/dm^2, just 8 oz/ft^2. The wing section, designed by Dieter, is 10% thick. Despite this, the PN 11 can be very fast.

Picture this scenario... Two PN 11s, a right handed and left handed version, flying in formation above your favorite slope... Wow!

(The above information was derived from an article by the late Werner Thies, published in *The White Sheet* No. 7 Feb/Mar 1982.) ■





Winch Line ...by Gordon Jones

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

Composite Wings Part 4

With all the pieces in place it is time to get around to doing the layup. Get out the resin, mylar, cloth and the vacuum pump; it's time to put one in the bag. Before you start make sure that all the pre-layup operations have been accomplished and everything is in readiness. A stop at his point can preclude problems later on in the process if you catch it now.

Lay out the cores and using a razor blade make some cuts about 1/8th inch deep running lengthwise the span of the core about two inches apart. This allows the excess resin to flow out of the wing and provides an extra place for the glass/resin to attach to the core. Another method of doing this is to use a hard dog hair brush (Yes, I said dog hair brush.) and tap it lightly making small holes all over the cores. I haven't used this method but I hear that it does work rather well.

At this point if you are going to try the Kevlar hinges you will need to mark the hinge lines out on the cores for the flaps and ailerons. Just measure where the hinge line will be and mark them on the cores with a felt tip pen as a reference for laying on the Kevlar later on in the layup. Cut the Kevlar so that you have plenty (about 2 inches wide) for a good hold on the control surfaces.

Lay the mylar out on the work surface. (I use a piece of plywood over another table but newspapers over a workbench will work.) Be sure that the mylar has been waxed or that a release agent has been applied to the mylar. Mix a small amount of resin for the outer coat. The amount of resin will be determined by the size of the wing and a little practice. I usually mix as I go so that I don't have large quantities sitting around that could possibly cook off before I need it. (I use West Systems resin that has pumps that measure the right mixture so I use only one pump at a time.) Spread a layer of resin over the mylar as evenly as possible; this will be the outer coat that will fill most of the pin holes so that there is less work to do later on.

Once the resin has been spread out, place the first layer (the outer layer as you have to apply the layers of glass in the reverse order) of glass over the mylar. A hint here, first this is really a two-man job to make things go smoothly. Secondly start at one end and carefully pat the cloth down as you go so that the cloth is smooth over the mylar. Next mix some more resin. Spread some of the resin over the cloth. Spreading the resin can be accomplished by using either a plastic squeegee or a small roller; both work well and it boils down to what you are comfortable with or have available. Be sure to work the resin into the cloth real good so that you avoid dry spots and fill the cloth.

Squeegee off the excess resin when the cloth appears to be filled. It will have a slight sheen to it without any puddles or dry looking spots. One way to look at the layup is to back off from the table and look at the cloth at an angle; as the light shines on the cloth you will be able to see the wet and dry areas easier. I generally do this quite often so that I don't miss any spots. In addition, be sure to get some resin along the leading edge of the mylar especially. This will provide enough resin for the leading edge so that you don't get voids, and it helps to hold the cloth to the work surface so that it doesn't move around.

Once you are satisfied with the first layer, place the second layer of cloth over the first again working from one end to the other and patting the cloth down as you go. Again mix a some resin; then spread it over the cloth. You will note that some of the resin from the previous coat helps to wet the new layer of cloth

and hold it in place. Spread the resin as you did on the first layer. By this time you will have more of a feel for this and it will go a little quicker. But don't get in a hurry; most resins allow plenty of time to work so that you get the resin worked into the cloth.

Now that the base layers have been put on, it is time for the support layers. By this I mean a piece of cloth over the carry through area about 12 to 14 inches out from the wing root from leading edge to leading edge. This will provide a little additional strength for the launch. I generally use a piece of 3 ounce cloth the width of the core and place it over the bottom layer so that it is next to the core when bagged. Just lay it on as you did the base layers and with a little resin wet out this piece.

Next comes the carbon fiber for the spar/spar cap. Size wise I use pieces of 4 ounce unidirectional cloth cut in 4 inch root width to a width of about 2 inches running out to about 2/3rds of the wing panel along the aerodynamic center of the core or over the spar itself. This can be either layed up along with the rest of the glass on the mylar (You will have to be careful to measure this out prior to laying up the other layers of cloth.), or wetting it out and laying it directly on the core itself. Use whatever method that you feel comfortable with.

One advantage with laying the carbon on the core is that you will be sure of the location every time. If you use this method wet out the carbon fiber on another work surface and then place it on the top of both cores. Next squeegee or roll out the carbon fiber so that it stays in place. If you are using the Kevlar hinge system, wet out the Kevlar for the aile-

rons and lay these on the top of the core as well.

Next, get your buddy to pick up the core, wet out the flap hinge piece and with your helper holding the core steady apply the hinge material. Then wet out the carbon fiber for the bottom of the wing and apply it to the bottom of the cores. Next comes the fun part; wet out the strip for the leading edge. Take the leading edge piece and apply it to the leading edge by laying across the leading edge and then with your hands smoothing it down on both top and bottom at the same time. I start at the root and work my way down the wing panel smoothing with both hands at the same time so that the cloth is even on both top and bottom. This is an interesting technique but it works.

Now with all the cloth on the core and the cloth on the mylar it is time to lay the core on the mylar. Carefully place the foam core on the mylar allowing about an 1/8th inch at the trailing edge from the end of the mylar joint. Check to ensure that the core is centered on both ends and that everything generally looks right. With your buddy holding down the core get under the edge of the mylar by peeling up the excess cloth until you find a corner; then lifting the mylar up so that you have one side off the work surface. Then gently flip (I can't think of a better description.) the mylar/cloth over the core as you would an obechi or balsa sheeted wing. Again check to insure that the alignment has not changed.

At this point we can do a little trimming of the excess cloth. Using a razorblade or Ortho wheel cut the cloth back to about 2 inches from the edge of the core. This will provide enough cloth for the excess resin to run out on and not enough cloth to get in the way while you are putting this mess in the bag.

Now comes the other fun part, getting the core into the bag! Very, very carefully pick up the core holding it firmly so that the alignment of the glass and core is maintained. At this point you can take a little alcohol and paper towels and clean off the excess resin on the outside of the mylar. This alleviates a little cleanup after the wing has come out of the bag. Like I said, working with two people makes many of these steps a lot easier.

Place the core/glass/mylar in the bag by laying the core down on the "wick" material (whether it be peel ply or waxed paper/paper towels or whatever). Gently open the end of the bag and slide the core into the bag while making sure that nothing moves around and hoses your alignment. Once the core is in the bag recheck the alignment one more time; you want everything in place now so you don't have to fight with it after you apply vacuum.

There are a couple of theories on how the core should go in the bag; some folks put the core on top of the bottom foam bed shielded by Saran Wrap while others just lay the core and bag on the outside of the bag while the resin is curing. Both ways work and again it depends on what you prefer to do.

Seal the ends of the bag and attach the vacuum hose to the bag making sure that everything is as tight as possible so there are no leaks. Switch on the vacuum pump and apply about 10 inches of vacuum to suck all the air out of the bag and as a check for leaks. The bag should flatten out to the contour of the core in short order. Again check the core and look for excess cloth that is not laying flat. In addition, when the bag has collapsed place the bottom core under the core/bag and align them so that the core is positioned on the bottom bed as it was cut.

Again there are some differing theories on the amount of vacuum that should be used and even the procedures for applying vacuum. Some suggest that you just suck the bag down and let it go, while others suck the bag down in stages.

Obviously each option works or builders would not use them. I am a middle of the road type I guess because I suck down the bag to about 10 inches and check for layout of the glass. I then pull the pressure down to about 22 inches of vacuum where it stays until it comes out of the bag. Some folks like 15 inches while others go all the way to 29 inches; it depends on the pump system and what you have heard that works. Obviously again with all the differing vacuum setting they all seem to work.

When the core is in the bag the way you want it, monitor the vacuum gauge for awhile to insure that you don't get any leaks. When things seem OK, leave it alone. Allow the resin to cure under the vacuum pressure for the recommended time specified by the resin. A couple of notes here, first I leave the core in the bag for 24 hours so that if there is a problem with the resin it will have a chance to fully cure. I also use a long metal plank along the trailing edge of the wing to give me piece of mind about the trailing edge. It will come out straight without it, but it gives me a warm fuzzy feeling.

After the curing phase remove the wing from the bag. Prior to removing the mylar from the wing cut off the flashing around the wing with a bandsaw or hacksaw. Cutting off the flashing prior to removing the mylar will keep the scratches and dings on the wing to a minimum. Now carefully use a razorblade and lift one corner of the mylar. Using your fingers peel the mylar off one side of the wing panel. Repeat the process on the other side of the wing.

You will note that the trailing edge has a small hump that will require some sanding, but not a lot. The leading edge will also require sanding to bring it to shape as well. But, the rest of the wing is a mirror that will require very little filling prior to painting. Obviously since you have one wing panel you need another to make a sailplane. With the experience you have gained with the first attempt the second and subsequent wings will go faster and each will be an improvement over the previous one.

I have learned that if you let the wing cure for about three or four days it will finish the curing process and will harden to almost the final finish. It does take the resin awhile to fully cure so don't get in a hurry.

Next, we will finish out the wing panel. ■

LIFT OFF!

...with Ed Slegers
Route 15
Wharton, New Jersey 07885
(201) 366-2525 Day
FAX (201) 366-0549

Carl Holzworth (C.E.H. flight boxes)

Keystone R/C (KRC) 1992

The KRC meet, held each year in eastern Pennsylvania, is probably one of the largest, if not the largest, electric meet in the United States. This year was no exception.

Just about every type of model you could imagine was there, powered by electric and flown by modelers from all over the United States. The planes ranged from multi-powered to flying wings and the pilots came from as far away as California.

The KRC event is truly a meet and not a contest which makes for a very relaxed atmosphere. The purpose of the meet is to show what can be done with electric power.

The Institute of Silent Flight with (L) Elliott Boulous & (R) Tony Smith (West London Models in England)

Although my main interest is in electric powered gliders, of which there were many, it is still very interesting to see and learn from all the different types of models that were there. To see Keith Shaw fly a Gee Bee, or to see Steve Neu go vertical and out of sight in seconds with his world class F3E plane is worth the trip to KRC alone. Speaking of Steve Neu, He was kind enough to give me all the specs on the F3E plane that he flew to seventh place at this year's world championships. The specs and some pictures will be in a future *RCSD* article.

Another neat thing about the KRC meet, besides all the planes, are the vendors. Each year more and more vendors are coming to the meet to display their products.

The people that organize and run the KRC meet should be commended for all the fine work they did. Everyone gets many chances to fly. The field is in great shape. The club has on-field charging facilities, lots of food, and even overnight camping for this two day event.

If you want to see many different types of electric planes and see new electric support equipment from various vendors, all in a relaxed, non-competitive meet, try to get to next year's KRC event!

Good Flying! ■

Keith Shaw with flying wing

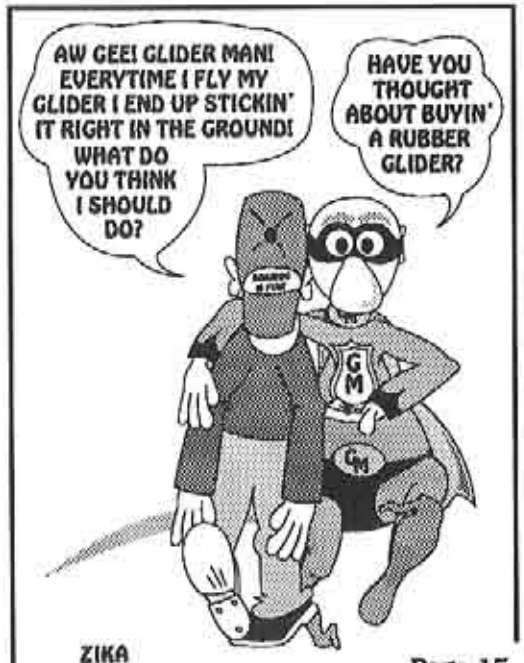
Larry Sribnick (S&R Batteries) with Amptique

John Mountjoy (R/C Report) with Surprise II

Joe Utasi (Jomar Products)

Mike Prager with Flite Lite Composites 550E

Chris True with Robbe Arcus. (*Future* RCSD *report.*)



A Couple of Western Gambits

...by Ned Snead
Georgetown, Texas

Back in the late 1950's when I was getting into sailplane competition (full scale), an article in SSA's magazine, *SOARING*, described two different methods of psyching out the other competitors. The Eastern style, or gambit, involved going first class with everything from paint schemes to instruments, including a panel loaded with impressive gadgets, even if some of them were fakes. A competitor looking in the cockpit would be so overwhelmed that he would be beaten even before the first race.

The Western gambit would start with a glider and trailer covered with scratches, dents, and patches, and an instrument panel with just the bare minimum held together with baling wire and masking tape. This might indicate a pilot who couldn't afford the necessary equipment and should have stayed at home, but it could also hide a pilot so skilled and experienced that he could win with anybody's rig, but he didn't want to be followed by the beginners.

Now, 35 years later, when I have discovered a much cheaper and safer way to fly with the buzzards, I am still partial to the Western style. Since I am still struggling with the requirements for the League of Silent Flight level two, I am no threat at any contest, but I have developed two Western gambits which will help to hide my developing skill in the future. They are offered here to other RC pilots who need to conceal their increasing skills, provided only that they refer to these gadgets by the names suggested by the inventor. So far, I have not been able to have an ohm or volt or henry named after me, and I am already having sweet young things ask if I would qualify for the senior citizen's discount.

Ned Snead

The snead hook is a high-tech device made from a few inches of coat hanger wire. It is bent into a loop to fit the broad leather belts I wear to hold my pants up and my belly in. It ends in a hook which holds the ring at the end of a high start or winch line. When I am flying alone, my landing target is the parachute or streamer. So, on my best flights I can pick up the glider and use both hands to manage it in the wind while walking back down wind for the next flight, stretching the high start from the snead hook on my belt. The real payoff comes at the next launch when I have to hold the glider while putting the ring on the hook, with the line on the right side of the transmitter antenna, turning on switches, working up nerve for the next launch, and looking for swallows and buzzards. It's almost as good as having a helper.

The LIMBER NEDDO was developed when I discovered that I could not buy a rubber ducky antenna for my Futaba transmitters like I had seen the big boys using on their X-347s. I have found that slope flying is pretty easy until you get to the landing part. I have no trouble landing among boulders or in trees. I have also developed a useful technique for landing at the bottom of the rock quarry. I just head into the wind and keep the wings level until the glider and its shadow come together. The retrieve takes a little time, but not as much going home for the ladder, or the glue job that goes with the boulder landing.

(L-R) Ned Snead, Rex Titsworth, Don Schmidt & George Parks
Photos by Bob McKay of Georgetown, Texas

I noticed that the big boys can catch their gliders gracefully by the nose with their left hand while flying with their right. That looked like a big improvement over my usual slope landings. However, on my first try I caught the glider with both hands and the transmitter antenna at the same time. After congratulating myself on the smooth landing, I noticed that the antenna would no longer slide back into the case. It still worked, but the bent antenna was a little more than is required for a Western gambit, and it made the transmitter hard to transport.

Then, I noticed that receiving antennas seem to work without being proud and stiff. Maybe a limber, drooping transmitting antenna would also work. I cut off the telescoping antenna about a half inch above the top of the case and drilled a small hole in the side of it. Then I stripped about 1/4 inch of insulation from the end of a 36 inch piece of flexible wire from Radio Shack and ran it down the hole at the end of the old antenna and out thru the new hole in the side. It's a little hard to solder to the chrome plating, but the brass at the edge of the hole takes it pretty well.

To try to make it look like it was all planned, I filed the end of the wire flush with the outside of the chrome tube and stuffed some florist's clay in the end of the tube to make the wire come out in the middle. Then, I put a little baking soda and CA glue on top of the clay for strain relief and a professional look.

I didn't want to tell the big boys about the LIMBER NEDDO until I was sure it would work, but I used it when a bunch of old buzzards went down to Canyon Dam for some slope flying. It was OK as far as I could see the glider and kept working even when the transmitter power was down to 40 percent. When George Parks saw it, he thought it was so funny he couldn't wait to tell Henry Bostick.

So there you have it, two items to start your own collection of Western gambits. If the technical details are more than you think you can handle, send me your busted antenna and a slice off the end of your favorite belt with a Self Addressed Stamped Envelope and your check for $19.95 and I will fix you up. Please allow six to ten weeks for delivery. ■


Bob McKay's Thunder Tiger


George Parks

An Update On The Dragonfly

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

These comments on my Dragonfly design, as shown in the diagrams, were made by Dr. Ferdinando Galé (Italy) in reply to my letter to him with the 3-view drawing. I said that Jim Gray and I thought the better than expected penetration at the low wing loading of 6 1/4 oz./sq. ft. could be partially due to the higher Reynolds Number near the polyhedral break, where the chord is wider, giving better efficiency here. Also, this area is where I felt most of the wing's work was being done and coupling this with the higher Rn was the main cause of the good result.

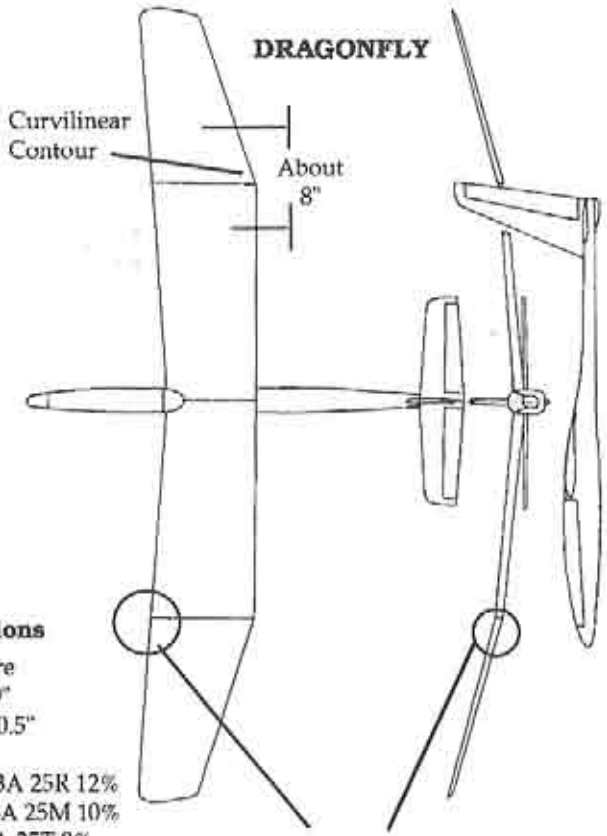
Ferdi's letter said that he agreed with this and went on to say further that the extra performance was also due to the straightening of the airflow over the tip panels and consequent reduction (or even possibly total elimination) of the turbulence at the polyhedral break.

Now, does this mean that the tip vortex is (a) reduced in size but not intensity, (b) reduced in intensity but not in size, (c) reduced in intensity and size, or (d) not changes at all but the T.E. drag/turbulence is reduced???? The new version is now flying utilizing the T.E. curvature suggested by Ferdi and plans are now available from B^2 Streamlines. Any comments on the above would be greatly appreciated. ■

Further correspondence with Ferdi has confirmed that this planform significantly reduces the tip vortex! Also, correspondence with Herk Stokely has shown that the forward swept planform is equivalent to a higher aspect ratio swept back wing, probably because of this straightening of the airflow and reduction of the tip vortex. So, is the so-called "Schueman" planform really that beneficial on model sailplanes, or is it just an esthetic fad?? (The Dragonfly was in the May, 1991 issue of *RCSD*.) ■

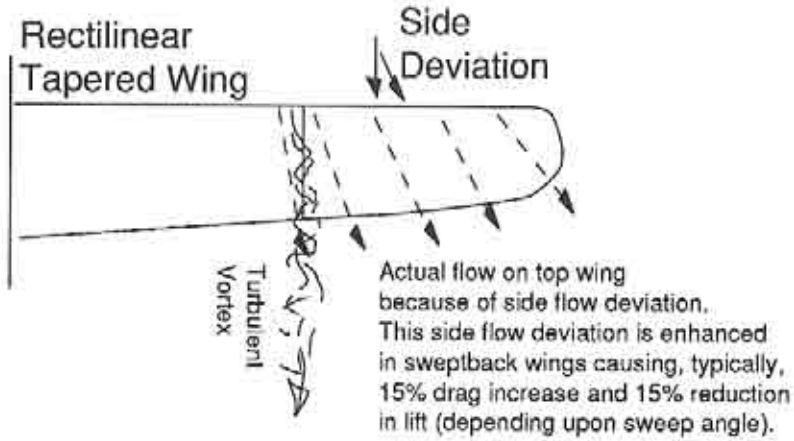
Specifications

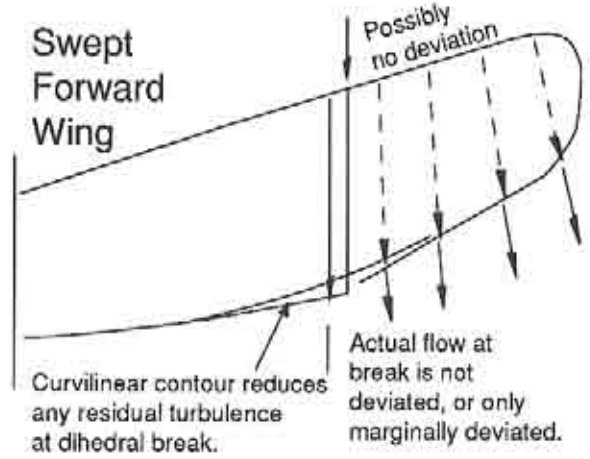
Span:	2 Metre
Chords:	Root 9"
	Mid 10.5"
	Tip 6"
Sections:	Root BA 25R 12%
	Mid BA 25M 10%
	Tip BA 25T 8%
Wing Area:	718 sq. in.
Wing Loading:	6 1/4 oz./sq. ft.



Elimination of leading edge turbulence on top of wing

Dragonfly Analysis by Ferdi Galé





Photos Taken at the L.S.F. NATS

...by Alan Schwerin, Lake Charles, Louisiana

Bob Champine about to launch his scale ship during the afternoon event for scale. ROG flights have their drawbacks, unfortunately, as Bob found out ten minutes later. His right aileron snagged on the grass and forced the plane to cartwheel violently on launch.

Michael Selig has designed a new airfoil and put it to test on his recent design. A compromise between the famous SD4061 and the under-utilized SD6080, Michael put in solid flights with this built-up 118", balsa - fuselaged light weight in the unlimited class on Friday, and also in the F3J event on Saturday. The nose of the plane is interesting in that it appears to slope down some 15° to minimize drag.

Joe Wurts launches his standard class new Airtronics Whisper, while Brian Smith manages the retriever. Joe appears to always heave his ships - whether hand-launch or cross country - thus ensuring adequate airspeed from the very start of the flight. Notice the steep launch trajectory. Joe is famous for his energetic launches, especially where hand launch flying is concerned. With a fly-off for first place against Brian Agnew and his dominate V-tailed Vertigo, the crowd was treated to a fine display of launching and flying. On this occasion, Joe appeared to out-launch Brian and went on to take the hand-launch contest.

A fine example of Dave Corven's new unlimited ship, the Infinity. With a slip-off nose cone, the strong fuselage differs from most in that its profile is triangular up front. As one might expect, it is a full-function ship, and operates best with a computer radio.

Mike Fox appears to be praying before stepping up to the pedal for that launch! Flying his very elegant Scorpion and other ships that he designed, Mike placed consistently in the top throughout the tournament. His father, Charles Fox, is ready to time, and Jim Thomas at the winch surveys the ritual with bemusement.

Brian Agnew's superb new design has clearly made an impact on the Florida soaring scene, and will very likely offer stiff competition. Sheeted with Obechi, most builders seem to prefer the uncovered look, with either a clear varnish or a tint on the wood. This Banshee is by Buddy Roos. He stained the wood a light yellow, and still had to paint the fuselage. Unfortunately, the plane was caught in the rotor from the wind and smashed into the wall of the building.

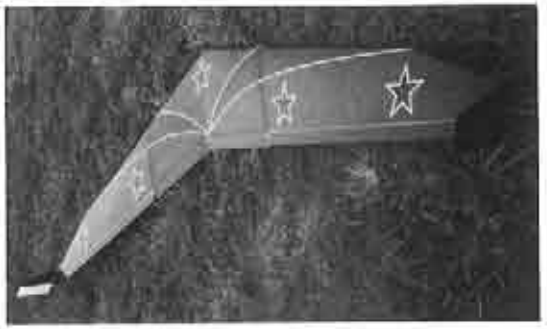
Mike Lachowski launches the new unlimited carbon fibered Probe. Despite the E214 it uses, the ship appears to penetrate very easily, at will, and offers very stable landings.

Part of the distance course is for F3B. The stringed pyramid took almost an hour to set up, with a second one erected 150 meters upwind. With the world champion present, the organizers were determined to get it right, in case any world records were set. No new records were set at the contest.

There were two examples of Roger Chastain's recently released unlimited Shadow. Covered in Obechi, the wing planform appears similar to Mark Allen's Falcon 880, except that the tips are more rounded. Don Vickers unfortunately shredded one of his Shadow wings on the very first launch of the contest, thus serving notice on the rest of us to respect the

pedal. (Those who witnessed the fiasco at the '91 AMA NATS at the same field very likely had a heavy dose of deja vu!!)

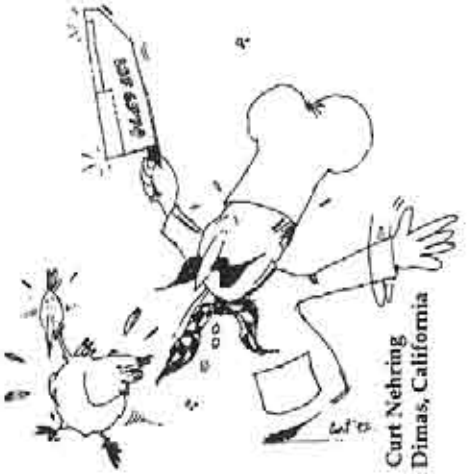
Herk Stokely had been sent the 100" Klingberg Wing to test fly. Ken Bates tested it out after the contest on Friday, and appeared to be reasonably impressed with its performance.



Rick Lake flew this 'compromise' between Mark Allen's 400 Swift and Brian Agnew's Vertigo. The Agnew E387 wings had turbulators on them at the tips. Unfortunately, this plane was lost in the trees during the unofficial golf hand-launch event that was held at the local country club. (We used hula-hoops as holes.)

Ken Bates flew this all-composite kevlar reinforced V-tail in the hand-launch contest. Designed by Frank Weston, the WACO 434 is a full-function stick machine. Ken placed turbulator strips on the tips of the wings to help improve the stall characteristics of the plane. (Should we learn anything from the fact that two of the leading fliers of hand-launch planes in the U.S., Brian Agnew & Joe Wurts, both fly polyhedral ships, rather than the more exotic aileron and flap creations that appear now and then in the H.L.G. contests?)

Equipped with the very compact Cox radio equipment, this H.L.G. weighed 6.5 ounces.



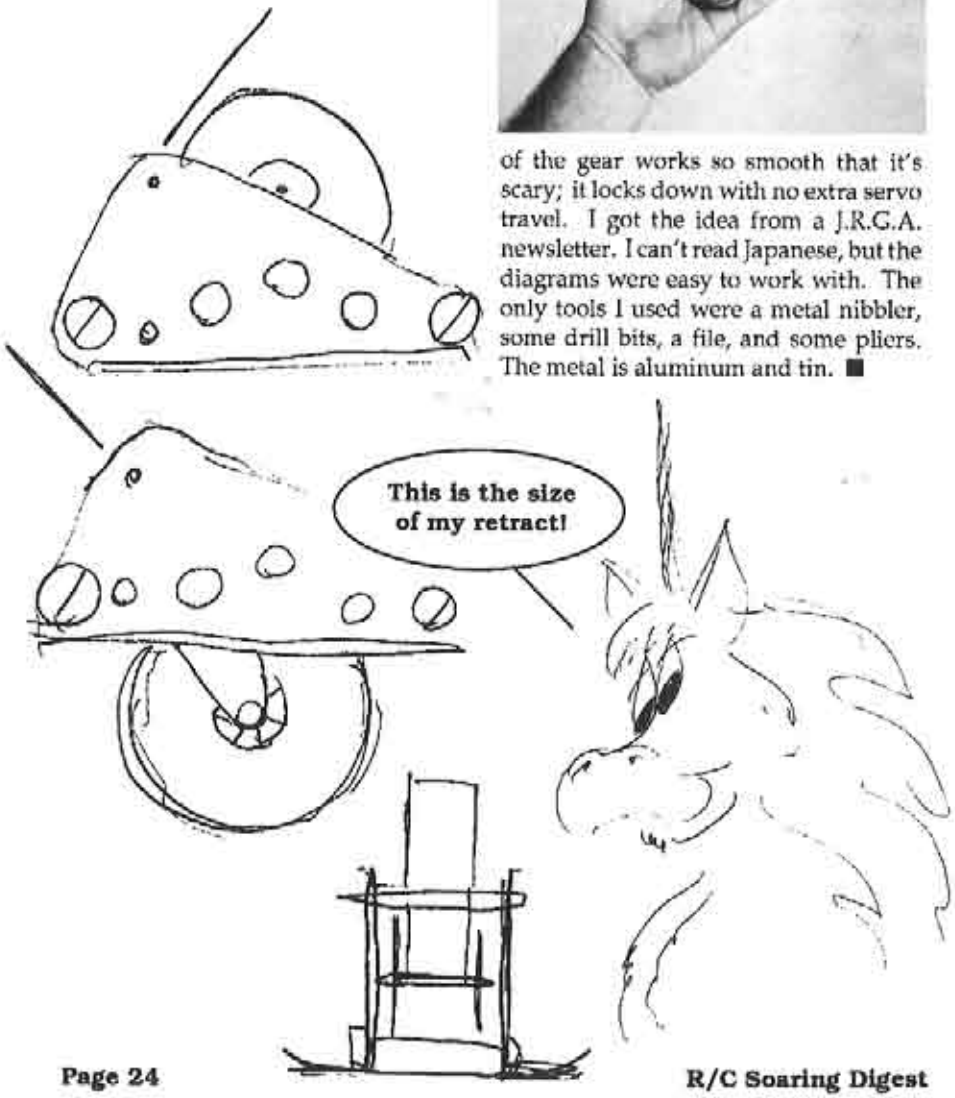
Curt Nehring
San Dimas, California

My Retract

...by Rick Palmer
Springerville, Arizona

I have been working on my 2 meter DG-100 and it came out like I wanted it to. But, I had one problem, as I didn't want to land it on the new paint job. So, I did what I said I always wanted to do; I built a retract for it. It is 2 1/4 inches long; the opening for the wheel is 3/4 inches wide, and it is about 1 3/4" tall when closed; the wheel is a 1 1/8 that comes out or down 1 inch. It weighs in at 1.38 oz. The action

of the gear works so smooth that it's scary; it locks down with no extra servo travel. I got the idea from a J.R.G.A. newsletter. I can't read Japanese, but the diagrams were easy to work with. The only tools I used were a metal nibbler, some drill bits, a file, and some pliers. The metal is aluminum and tin. ■

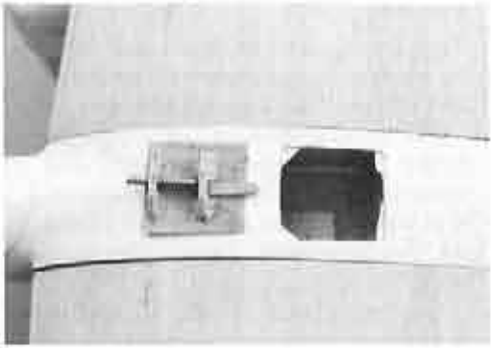


A Canopy Latch & Finishing Techniques

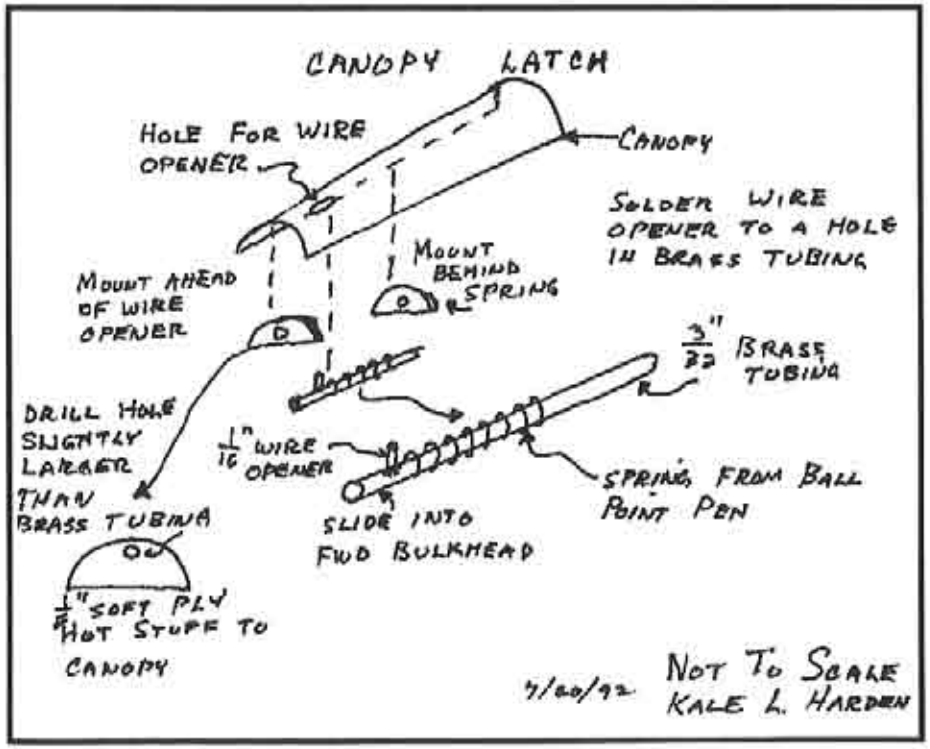
...by Kale Harden
Palm Harbor, Florida

Lots of guys have become fed up with the plastic coverings and so, with the increasing use of foam wings, have gone to filler and paint for wing/elevator finishing. I am one of these. Paint adds some weight which is a disadvantage in some cases. I have found that a lighter finish can be had by dying the wood (balsa, Obechi, etc.) with "All Purpose Rit" and then finishing with lacquer or polyurethane. The dye comes in many colors. Just add it to water and spread it on with a folded paper towel. Where dry, sand lightly. Then finish. ■

Banshee 2m before "RIT" coloring of wings and elev., photo by Kale Harden July '92, Palm Harbor, Florida.



Latch from tall point pen.



Tale of Two Hedrals

...by Ed Jentsch, 2887 Glenora Lane
Rockville, MD 20850, (301) 279-7611

(Bunky's at it, again! He is a fictitious character called up from the realms of never-never land to lend a hand in providing a simplistic and humorous explanation on one or more aspects of R/C sailplane flight. Any resemblance to real people or incidents is obviously purely coincidental...Ed.)

Hey, guys! Knock it off. If you don't lower the volume on that argument, the neighbors will get the cops to do it for you.

OK, that's better. Nice to see you again, Bunky. Who's your adversary? And, where did he go? Oh... You were arguing with yourself... I see... Who won? No one yet. Understandable. Anything I can do to help?

Yes, I recognize the book. I should, it's from a well known publisher of model aviation books. I read it too when I first got interested in RC soaring. No, I don't recall the author's explanation of how dihedral wings work.

He says that when a plane with dihedral wings banks, one wing inclines from the horizontal, producing less lift, while the other inclines toward the horizontal, producing more lift. The difference in lift causes the plane to level off.

You like that explanation because it's nice and simple... (that figures)... Then what was the argument about? You remember from somewhere that lift on a wing is pretty much independent of its inclination, so you can't convince yourself the author's right?

Well, Bunky, you should argue with yourself more often, your odds of winning would improve. The author's explanation isn't just simplistic, it's misleadingly simplistic. I'm impressed that you didn't fall for it. Readers who did will go through life completely unaware that their knowledge is flawed.

You don't want to be flawed? (A little late to worry about that.) You want to know the real scoop? Are you sure? OK. But be warned, it involves another of your favorite subjects: physics... Wasn't that the class you dropped when you discovered Miss Myers wasn't teaching it? Yes, I absolutely agree, an "F" was a steep price to pay for watching someone less qualified.

No, we won't need to do any math; we'll leave that for some other time and place (and a more receptive audience). But you do need some understanding of vectors... No problem there? Good, then we can proceed.

Let's start with a simple drawing of a banked plane (Figure 1). It shows two forces (vectors) acting on the plane, lift (L) and gravity (W). When they are added together - keep in mind it's vector addition not checkbook addition - the result is the force "Y". As you can see, it's pushing the plane to the side and down relative to the horizon, but slightly "up" relative to the the plane.

So what does that do? Let's try an experiment and find out. Where's that straight-winged space-age glider you bought a couple of years ago? ... That's OK, the dust and cobwebs won't interfere, just put it on the table over there.

Take a look at it from the airflow's point of view. With the plane moving forward, and force "Y" pushing it, the airflow is from the front, off to the side and above. That looks about right. What do you notice about the wings? ... Aside from the wrinkled covering... Nothing? No, you're doing fine.

Now put your dihedral ship in its place and look at it the same way. Notice any difference? ... Take your time, it's something subtle... You can see the top of the wing further away from you (the up wing) but not the top of the closer one (the down, wing). Not bad, Bunky.

What does that tell you? ... I'll give you a hint - it has to do with angle of attack... Now you've got it. Relative to the airflow, the wings' angles of attack are different. The down wing's is higher than the up wing's. And that's the same as saying the

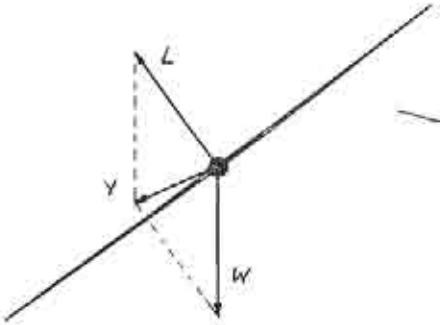


FIGURE 1

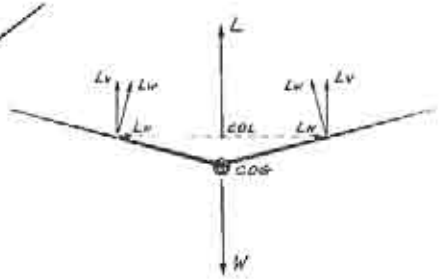


FIGURE 3

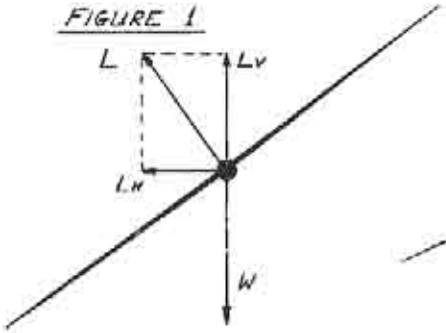


FIGURE 2

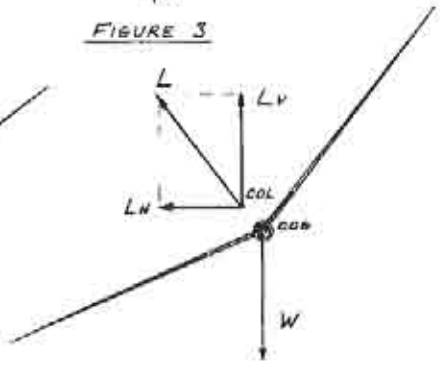


FIGURE 4

down wing's lift is greater than the up wing's. The difference in lift will roll the plane back to level.

I knew you were going to say that, Bunky. But I have to disagree. That author didn't get it right. He disguised an effect as an explanation, which is worse than none at all.

What we've just demonstrated is that when a plane enters a bank it sideslips - it becomes yawed relative to the airflow. On a straight-winged glider nothing much happens then because both wings have the same angle of attack and lose lift equally. But on a dihedral glider, the angles of attack become different so the down wing produces more lift than the up wing.

This is commonly referred to as yaw-roll coupling... Absolutely not, Bunky, it has nothing to do with the reproductive practices of a your favorite bakery product!

What? Good point. Dihedral wings are just a limited case of polyhedral wings. No, I don't know why they're called polyhedral. Strictly speaking, the ones we typically see on gliders should be called "quadrahedral". Maybe someone much like yourself (a neolithic mathematician, for whom "many" is the only number after two) coined the term... Yes, that was a compliment... You're welcome.

Now that you've mentioned it though, let's put your polyhedral plane on the table and look at it from the same vantage point... Yeah, it's pretty obvious isn't it? The angles of attack of the outer wing panels are dramatically different. Polyhedral wings produce much greater yaw-roll coupling than dihedral wings. That's why they're so highly regarded for stability.

You feel much better now that your understanding of dihedral wings has been deflawed? Interesting way of putting it... And we could leave it at that. But there's one more piece to the puzzle. It doesn't change anything, but best we delve into it than leave you with a "de-flawed" but incomplete understanding.

Let's change the picture we drew earlier and look at it from a different perspective (Figure 2). Notice lift and weight are still there. But instead of adding them as we did

before we're showing the vertical and horizontal "components" of the lift vector. No, the components aren't real, they're just a way of depicting the lift vector's effects using the same frame of reference (horizontal-vertical) as gravity.

Good observation, Bunky. It is the horizontal component of the lift that underlies the adage, "What causes a plane to turn is lift." And, loss of vertical lift is what makes a plane want to lose altitude during the turn.

You realize of course that Figure 1 and Figure 2 both tell essentially the same story, just in different ways. Figure 1 is useful because the direction of "Y" highlights the angle of attack change. That's not as readily apparent from the second drawing. But the approach used in Figure 2 can show some other interesting effects.

In both these figures lift and gravity are acting through the same point. Because of this, the forces on the plane are balanced so its orientation is stable; it won't roll back to level on its own.

That's not the case with a dihedral plane (Figures 3 and 4). I know, Bunky, Figure 3 looks complicated, but bear with me and I'll try to explain it. Each wing generates lift perpendicular to its surface (Lw). Each Lw, in turn, is composed of a vertical component (Lv) and a horizontal one (Lh). The vertical components, added together, constitute the total lift on the plane (L).

Study the drawing carefully, Bunky. Do you notice anything that's different from the previous figures? Take all the time you need... Right, dihedral raises the Center of Lift (COL). It's now above the plane at the midpoint of an imaginary line connecting the two wing lift points.

There's something else that's not quite as obvious: the two horizontal components of lift cancel each other out - they're wasted lift. Interesting, isn't it? Dihedral wings are less "efficient" than straight wings. Everything it seems, including stability, has a price tag.

Figure 4 shows what happens when a dihedral plane is banked. Unlike a straight-winged glider, the bank displaces the COL horizontally so that gravity and the vertical component of the lift no longer act through the same vertical line. This creates a torque that works to re-level the wings. The bigger the difference between the Center of Gravity (COG) and the COL, the greater this effect is.

Uh oh. When you get that look of deep concentration, I get worried. What's on your mind? ... True. Now you know another reason why people have been advising you not to ballast your plane by sliding lead slabs under the elastic bands on top of the wings. Not only does it disturb the airflow over the wing, it reduces the COL-COG difference. Maybe not enough to worry about for most pilots, but some need every little advantage they can get... Of course not, Bunky, I didn't mean you.

This does raise another interesting point though, Bunky - you know wings aren't weightless, don't you? (You should, given the amount of epoxy you use.) What's the point? Just that increasing dihedral not only changes the COL, it raises the COG too. How much depends on how heavy the wings are relative to the weight of the rest of the plane. The lighter the wings are, the less effect they have on the COG and the better they are at enforcing roll stability.

Increasing the COL-COG difference is another effect of using dihedral wings, but you don't need them to get it. Straight wings mounted above the fuselage would accomplish the same thing, though not as well.

What about polyhedral wings? Oddly enough, they're not as good as simple dihedral wings at increasing COL-COG separation and they're less "efficient" too. But the improved yaw-roll coupling more than makes up for these relatively small losses.

So there you have it Bunky: how dihedral, and polyhedral, wings really work...

You're deep in thought, again. What is it this time? Yes, of course. Dihedral does increase a plane's willingness to turn with just rudder movement. Tweaking the rudder on a dihedral or polyhedral ship causes it to yaw. That increases the leading wing's relative angle of attack, etc., and the plane banks into a turn. Then, returning the rudder to neutral creates the situation we've just examined, so the wings roll back level...

I think we've covered enough ground for one evening. It's getting late and we have an early contest tomorrow. Let's call it a night. If you get into another argument, do it quietly; they don't allow hi-starts in the jail yard... See you tomorrow, and don't forget to bring your plane this time. ■

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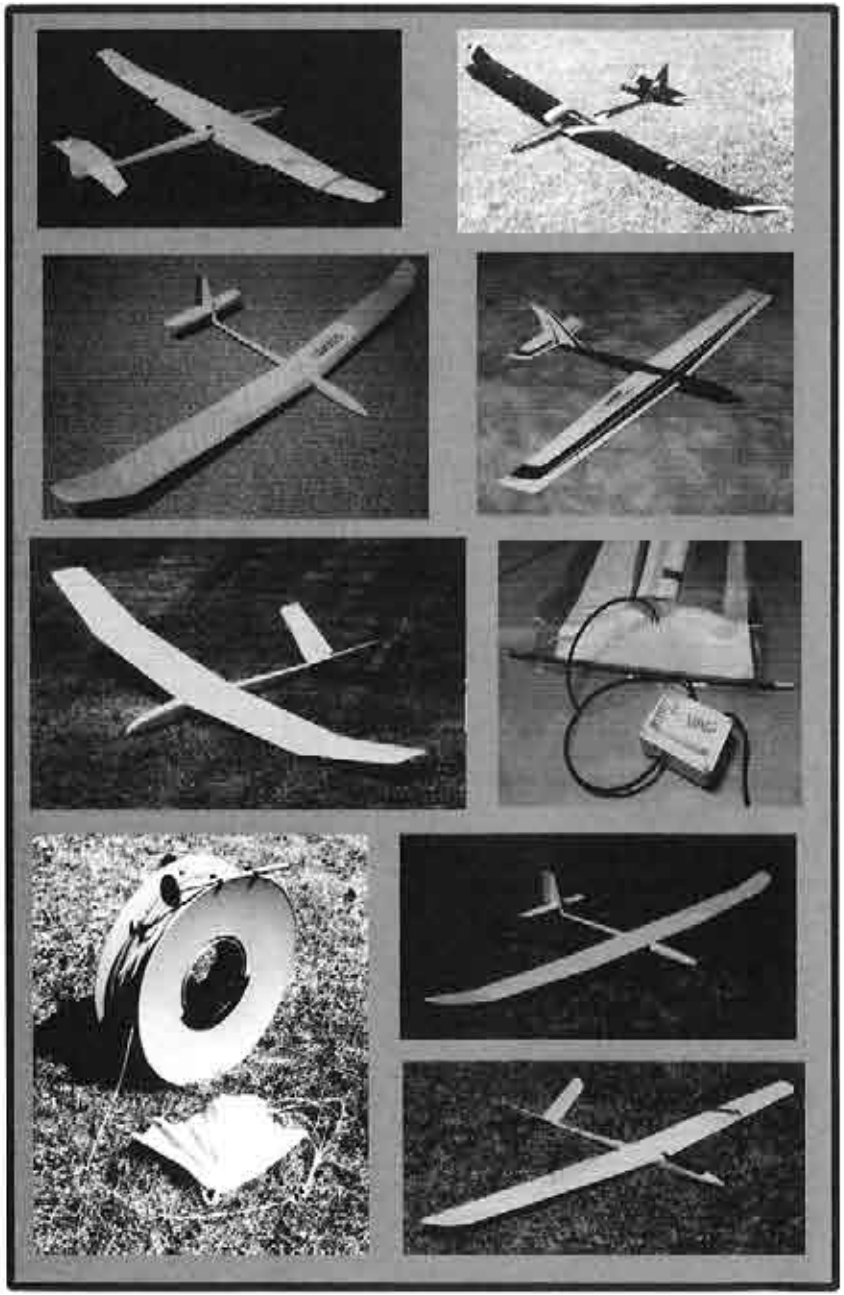

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Ridge Writer

...by Wil Byers

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Many of us R/C soaring enthusiasts have built and flown more than one design. It is, however, a rare bird that can boast of not only flying but building 34 designs. This month's column contains a letter from just such a fellow, Mr. Barry Hawkins of New Milton, Hants, England. (This letter originally appeared in *The White Sheet* in England, Sean Walbank, Editor. *The White Sheet* is an informative publication and our thanks to Sean for all the hard work it has surely taken to continue to publish it over the years! Ed.)

The letter was forwarded to me by my good friend and scale R/C soaring devotee Gary Brokaw of Spokane, Washington. Gary recently visited England to meet with other likeminded individuals such as the famous Cliff Charlesworth. During his visit he was able to meet with Barry and found him to be quite an interesting fellow. As a result of their friendship, Barry sent Gary this letter, which is now, fortunately, going to be shared with you. The letter gives a bit of analysis about each model Barry has built and flown and how they have performed for him.

"Planes I have Built, Flown, and Sometimes Broken"

...by Mr. Barry Hawkins

"People often ask me which plane they should buy, when they feel they would like something a little more adventureous. So, I have listed some of the planes I have built that may be of interest. I must stress these are my own personal findings and may well differ with the views of others.

WIK Kestrel 2.5 Meter - A builder's kit with built up very undercambered airfoil. Nice to fly in light air.

WIK Twin Astir 3 Meter - Again built up wings, but suprisingly strong. Moderately aerobatic in moderate air. Fit for airbrakes.

Dick Edmunds 2.5 M Ail Algebra - Glass Fuz & SD3021 - A nice plane to build, but tight on space for radio gear. Brakes *(air I assume...WB)* best but not needed if you have a class radio.

Graupner Discus - A nice kit but expensive with no air brakes. Very unscale although not so far off as a Diamont. A super plane to fly. I still regret selling mine.

Multiplex Arriba Electric 3.4 Meter - Best kit to date with seamless epoxy fuselage (very clever). Expensive to fit out with all the electrics, but quite outstanding to fly, completely aerobatic and yet at 9 1/2 lbs. will thermal as the best.

Multiplex Schampus 3.4 Meter - As above but with the electric flite. Outstanding to fly but the fuz is showing signs of cracking around the wing joiner.

Multiplex Flamingo Contest 3 Meter - A good kit, but I feel the plane is now a little dated. Mine flew O.K., but the wing joiner broke out at the wing root.

Multiplex Alpina CS 4 Meter - Nice kit, good plane, everybody should have one at some time. Nearly customer proof, mine broke at the wing joiner in fast (very) snap roll. *(I've seen and flown my friend Bob Lawhead's Alpina and what Barry is saying is no exaggeration. Super Ship! WB)*

Multiplex DG 300/17 4.25 Meter - Usual quality kit but mine not yet finished. The one I have flown felt really nice. *(This is an exceptional model both on the slope and at the thermal field. It uses a Wortmann FX-60126. WB)*

Multiplex DG500/22 - A joy to build and fly, looks good with twin pilots, has Alpina Magic wings. *(I think it is the most enjoyable scale model I have ever flown. Wings are a special white foam with obechi sheeting. WB)*

Cliff Charlesworth ASK-18 plan model - If you like building from plans, Cliff's are some the the best and you can be sure they will fly well. (Cliff told me off for selling mine.) *(This is a fine flying glider. Gary Brokaw has flown one he built from Charlesworth plans now for a couple of years, and it does fly exceedingly well. It has thermalled out to well over 3000'. WB)*

Silent Flight KA6 4 Meter - Interesting kit, not yet completed.

Ellipse F3B - Fabulous kit only needing radio fitted, not flown, not really me. *(Byron Blakeslee has assured me that this is one super ship. So, if you can get your hands on one, buy it. Then call me and I will take it off your hands if necessary. WB)*

Ikaros MU28 3.25 Meter - Very unusual 1/4 scale aerobatic plane, looks a bit like a large Phase 6 with flaps. Now ready to fly.

Robbe Verso - Nice kit but poorly designed wing joiner and servo mount. Flies fast and will need some sort of air brakes.

Robbe DG100 4.25 Meter - The original 1/4 scale with two part fuz and built up wings (Pat Teakle made me some foam core ones with the fat Wortmann section.), flew well in light air even at 13 lbs.

Robbe Targens 2.5 Meter Electric - I did not like the wing mounting system (a'la Pat Teakle Dart). Did not feel good in the air.

Robbe ASK-23 3.2 Meter - The first time I have ever needed to write and complain to a manufacturer about the poor quality of a kit. Also, expensive and no air brakes supplied. On the plus side this plane flies exceptionally well in light air.

Pat Teakle Vega 3.75 Meter - More work to build than most and quality of materials used are not the best, but can be built into a very good plane. A really good aircraft to fly and as with all Pat's models, a fantastic value for the money. British kit and available.

Pat Teakle Dart 3 Meter - I don't like the wing joiner system used. My model tip stalled.

Pat Teakle PIK 20 3.75 Meter - This kit is simple to build as Pat's Vega. Flies well, I eventually bent the 15mm flat steel wing joiner (my fault, not Pat's).

Pat Teakle ASW 17 5 Meter - Usual Teakle kit, but this plane's a good floater and lovely to fly.

Pat Teakle ASW 22 6 Meter - Kit as above but needs a bit more work on the wings. (I fitted extra spars and glassed them, but they still bent like an a large "S" when I rolled it. This plane died because I put too much speed on from a great height and it then produced a tuck under. But a very graceful plane when flown by someone with more sense.)

Krause Discus 4 Meter - One of the very best quality kits (expensive and again no airbrakes supplied). Fully aerobatic, lovely.

Krause ASW-24 4 Meter - As above, but more floaty (very pretty).

Roebers ASW-24 4 Meter - Good quality (Best wings I have seen.) round steel wing joiner which I like. Flies OK, too.

Roebers Discus 4 Meter - As above, a very good all around ship, recommended.

Roebers Twin Acro 4 Meter - Again as above but need more tailplane area and wheel pants need adding to the fuselage. Looks really nice when finished.

Roebers Pilatus B4 3.75 Meter - One of my favorites and can look a bit more colorful than most modern scale planes. Takes some beating in the air. (I now have two.)

Dieter Schmitt Pilatus B4 4.6 Meter - The very best, very expensive, true scale even wing section. Flawless in every way and a pussy to fly.

Peter Weiss ASW15B 6 Meter - Not for the fainthearted at 44 lbs, but super to fly, fully aerobatic and will even thermal inverted. *(Are you paying close attention? Barry says 44 lbs. Scale models really are in a league of their own! WB)*

Scather Sailpanes Club Libelle 5 Meter - Not liked, tipstalled badly.

Carerra SB-10 5 Meter - Very unusual kit and totally unscale, but flies exceptionally well.

Jaraina Calif. A14 4.12 Meter - Another

strange kit, but in an odd way very nice. Flew well in light conditions.

Werner Mihm ASK23 4.28 Meter - An impecable true scale beauty which I still moan. (Elevator Snapped.)

"I hope the preceeding has been of interest and that it will encourage you to have a go. Meanwhile I am still looking for the customer proof plane." Barry Hawkins

I don't know if you found Barry's comments as interesting as I did, but he certainly offers a rare insight into his exploits with scale models. Scale soaring is such a fascinating part of R/C soaring and it truly has limitless potential for all so inclined. If you need the addresses for some manufacturers of scale model see Ridge Writer, June 92.

Slope Soaring Campout

The South Bay Soaring Society (SBSS) is a club located in the San Fransico, San Jose area in California. They are also a club that can boast a membership of approximately 180. More importantly this club is active. They plan a number of events each year ranging from thermal duration to slope racing to scale.

I recently recieved their newsletter and found a piece in it that really caught my eye. The reason it caught my eye was that the article started with a picture of Orin Paulson making sand-cakes. Orin appears to be about two years old and is probably oblivious to R/C flying at this stage of his life; however, it was fun to read this article and see how much fun was had by all family members during the event. Most noteable, was how the event was planned around family member participation. It is great to see something like this attracting father, mother, and children to the slope.

So, if you have some ideas about ways to get the whole family involved let me or *R/CSD* know about it. We can hopefully share those ideas with others. It appears all the SBSS did was have a new twist on an old idea: camping while substituting a model for a fishing pole. Sounds like an excellent concept, don't you think? And, it can certainly helps perpetuate this wonderful hobby of ours. ■

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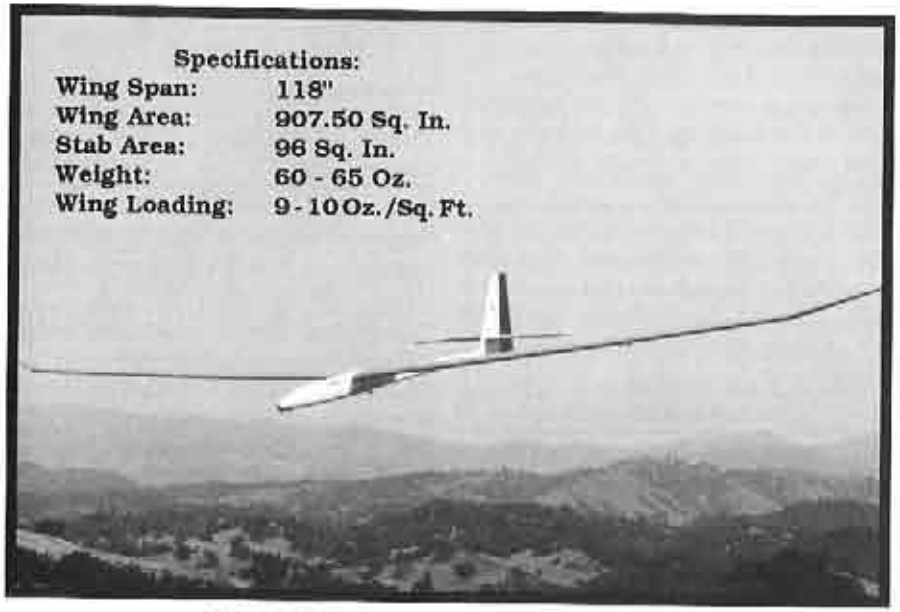

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Reference Material

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

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Contacts & Special Interest Groups

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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.

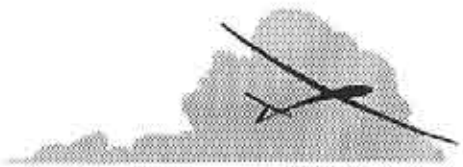
Maryland - Baltimore Area Soaring Society, Steve Pasierb (President), 21 Redare Court, Baltimore, Maryland 21234 U.S.A., (410) 661-6641.

Nevada - Las Vegas Soaring Club, Steven Smith (President), 6978 Starwood Dr., Las Vegas, Nevada 89117 U.S.A., (702) 873-9591.

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.

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

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



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...from Model Land Yachts, Unltd.

After 5 years in the design process, the most sophisticated R/C model landsailer on the market is ready to go. The kit features all fiberglass construction (hull, rear axle, mast), a mylar sail (eliminating the need for battens), and an elegantly simple rigging system that eliminates the pulleys, extra batteries, and expensive sail winches used on other model landsailers.

Designed by the 1991 & 1992 America's Landsailer Cup Winner, Robert Weber, Stiletto is not just a "sailboat on wheels". This is a true landsailer, with features such as a double-tapered wing mast, weight-tuned suspension, oversized 11 mm O.D. ball bearings on each of the 3 wheels, and a variable rake sail found on full-size racing land yachts.

The kit is designed to minimize set-up time. All you need to do is charge the niCd's for the radio. When you get to the sailing site, simply step the mast, turn on the radio, and go! The kit even comes already painted white. This provides a nice finish for those who do not wish to deal with painting. However, for those who would like a different color scheme, the white provides a good base coat.

Stiletto is sold complete with a 2-channel ground-frequency Futaba radio, with 1 - S148 servo, 1 - S125 sail servo, radio gear installed, and the sail trimmed to the radio. The kit can also be provided without the radio gear for those who already have the radio and don't mind installing it themselves.

Each model sold in the U.S.A. will have a consecutive sail number already on the sail. Also, each owner/pilot will automatically be registered by the sail number for competition and social meets.

Specifications

Length:	52"
Height:	60"
Width:	34.5"
Sail Area:	367.5 In2
Weight:	3 lbs. 6 oz.
Speed:	30 mph+
Control:	2-Channel Gnd. Freq.
Price:	$395 w/Radio
	$325 w/o Radio

For more information, contact Jon Haverstick at (714) 748-7154 (after 5:30 P.M. PST) or FAX (714) 750-6823. The address for Model Land Yachts, Unltd. is 10044 Adams Ave., #339, Huntington Beach, CA 92646; (714) 963-6167 or (714) 633-1725. ■

EZ-LAM Epoxy Finishing Resin

...from Aerospace Composite Products

EZ-LAM, the only epoxy laminating resin specially formulated for model aircraft use, is now available in a 12 ounce package. This new size is ideal for trying out laminating and fiberglassing techniques, without investing in large quantities of resin. Available in either a 30 minute or 60 minute "pot life" version, the 12 ounce EZ-LAM kit retails for $12.00. 30 and 60 minute EZ-LAM epoxies are also available in 1 - 1 1/2 gallon kits ($84.00); 1 - 1 1/2 quart kits ($34.00); and 1 - 1 1/2 pint kits ($21.00). EZ-LAM epoxies are available from your hobby dealer or direct from Aerospace Composite Products. Dealer inquiries are invited.

To make working with EZ-LAM Epoxy truly convenient, Aerospace Composite Products now has available calibrated dispenser pumps. These laboratory quality hand pumps are pre-set to dispense 1 ounce of resin per stroke, and 1/2 ounce of hardner per stroke... the exact mixing ratio for EZ-LAM Epoxy. No more calculating, weighing, and fussing with getting the correct proportions... just pump out equal numbers of pump strokes. The dispenser pumps are available for fit pint, quart, and gallon cans.

EZ-LAM Dispenser Pumps retail for $6.00 per pair and are available from your hobby dealer or direct from Aerospace Composite Products. Dealer inquiries are invited. P.O. Box 16621, Irvine, CA 92714; (714) 250-1107, FAX (714) 250-0307. ■

Gargoyle

...from Model Construction Videos

D.O. Darnell

I have been lucky enough to sample most of the best of the "high tech" sailplane kits during the last several years. These kits are very expensive because of several reasons we won't go into here. Quality sailplane kits are, however, a labor of love for those who kit them. It is extremely difficult to make any profit while providing the kind of quality found in kits such as Legend unless you sell a whole lot of them. Some manufacturers offer semi-kits consisting of fuse and cores allowing the builder to select the best wood. All the manufacturers I've talked to say that obtaining quality wood is increasingly difficult. Anyway, many builders go the semi-kit route purchasing only the plans, a fiberglass fuselage and foam cores, which can reduce the cost considerably.

As an aside, it should be stated here that regardless of what kit building plans or manufacturers say regarding the construction of kits, you can often obtain satisfactory if not superior results by trying something new. Improvising will certainly teach you something while improving your skills and providing, hopefully, new knowledge. Variants ultimately improve the breed because, without risk, there is no improvement. To aid the hesitant, there are a variety of instructional materials, printed and on video tape, showing new ways to build wings, finish fuselages, etc. Videos are great to learn from and are the future of documentation as evidenced by the variety of subject matter, exclusive of models.

Today, I see an interesting trend emerging where one manufacturer may concentrate on what he likes to do best, and allows the builder to experiment. This can save some bucks which is of interest to most of the modelers with whom I am acquainted.

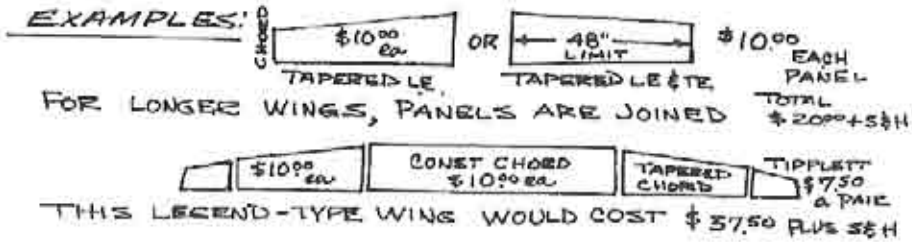
For me, this developing trend is indeed

timely as, for the last few months, I have been looking for some new MCV video material and have decided that an interesting project might be "Building a State-of-the-Art Sailplane for Under $150". Yeah, I know that "state-of-the-art", "cutting edge", "high tech", "high performance", etc. are phrases which are much over-used. Here, however, these trendy buzzwords imply the use of modern materials and evolving techniques rather than me-too dialogue. Like, I ain't selling kits, remember? The point is that this fits right in. Buy a few components here, some glass, CF and laminating epoxy there, a video there, and go for it: Roll your own! The subject which I have in mind is called the Gargoyle - an ugly flying machine! Gargoyle #1, a two meter ship, utilizes a standard size fuselage (BAME) which has been marketed by Sealy Quality Fiberglass for several years, and foam cores from the same place. The BAME fuse was chosen for its universal shape and extreme rearward strength, lightness and cost, and I had a couple in the closet! Fiberglass and carbon materials are from Aerospace Composites, and balsa, covering and hardware is from the local hobby shop, Wings and Things, in Tulsa, OK. I am using Selig airfoils (the video version will be a 7037) with balsa vacuum-bagged skins, conventional spar and joiner, etc., and an Airtronics Vision radio. The video will tell where to get materials, show how to do all the construction, covering, radio installation and flight preparation. Certainly, it will have something for everyone. I feel that building from components is probably the most cost effective method and provides the greatest potential for discovery of new performance breakthroughs. So, never be afraid to be different. Do your own thing! I would like to hear readers viewpoints on this project and will try to answer any questions. If you want to chat, I prefer the telephone as I have very little time for writing letters. I can be reached at (918) 481-5855 most any time of day. ■

Foam Wing Cores

...from Basic Aircraft Technology (B.A.T.)

We cut wing cores for a company producing model airplane kits. We also cut custom, one-off, cores for individual modelers. One-off cores are time consuming and, therefore, much more expensive. Shipping cores is rather costly due to the bulk size, not the weight. We recommend one-off customers look for foam cores in their local area to avoid shipping costs. Check *R/C Soaring Digest*. One-off cores cost $10.00 a panel. We can do any airfoil and will cut cores of 1, 1 1/2 and 2 pound beaded or extruded foam. Light beaded foam is good for sheeted wings. Extruded 1 1/2 or 2 pound foam is stronger and best for highly stressed wings and with composite skins. No charge is made for different foam or templates. A panel is a wing section either with a constant chord (width) or one taper on L.E. and/or T.E. Panels length limit is 48". To cut your cores, I must know your wing dimensions to include skin thickness. Provide root and tip finished chords and length of each panel. Specify type and weight foam to be used. Specify amount of washout if desired. If you tell us what type plane you are flying and the type of flying you are doing, we can help. For more information, contact: Bob Harman, Basic Aircraft Technology (B.A.T.), 10424 Golden Willow Drive, Sandy, Utah 84070; (801) 571-6406. ■



New Lines for Glas Flügel, Unlimited

...from Windspiel Models, Pete Bechtel

This year 1992-93 we have more to offer than ever in our scale sailplane lines from Fiber Glas Flügel, Unlimited. If you are looking for a large scale sailplane, I suggest either the ASW-22 B 1/4 scale or the ASH-25, a two place super ship with a wing span of 20'6" and an aspect ratio of 37:1. It will be available later in the year. Both of these models are built nearly 100% scale. The tailplane has been slightly increased in size for slow flying speeds. Like its full-size original, the wings are in four parts. They are standard with inboard flaps, flapperons in the middle and ailerons on the tips; all three are hinged with our famous KNUCKLE-JOINTS. All of these fiber Glas Flügel planes are capable of covering tremendous areas of sky. Due to their built-in strength they are able to perform aerobatics, but should be flown like the full-size version to attain the full aesthetics of these beautiful sailplanes.

The ASW-24, 1:3.75 scale, is a replica of the newest standard class sailplane from Alexznder Schiecher, and has a wing span of 4.20 m with a Quabeck HQ 3-15 profile. If this is too big, we carry a 24 scaled at 1:4.5 with a span of 3400 mm and an RG-15 profile. Both of these planes are more suited for thermal soaring and are aerobatic. You may require a car "aircraft carrier" for your Glas Flügel sailplane to ride in on the way to the field. Experience has shown that most damage to model aircraft, especially longer models, occurs during the transport to the field. The carriers are moulded in fiberglass and come in lengths of 140 cm, 168 cm, 180 cm and 225 cm. The carrier is delivered in three easy to assemble parts. You just fit the model onto the base and attach the top. Access to the model is via the rear lid and comes with a carrying strap for easy transport to the flying site.

At last, Glas Flügel, Unlimited has filled the wishes of many of its customers with the building of the racing class DG-600 glider. Use has again been made of the specially developed profile HQ 3-14. This medium sized glider can be flown in virtually all flying conditions, being excellent for both thermal and slope soaring. It is flapped and has knuckle-jointed hinges; its speeds are amazing at best. Wing span is 360 cm, length 141 cm, gross weight 3400 - 4200 grams, wing area 59 dm^2, aspect ratio 22-1, and a wing loading of 55 - 65 gdm^2.

In our Salto department, we have two to offer the modeler. The queen of gliders, the big Salto H101, is a model which catches the eye not only because of her outstanding performance and unusual appearance. The flying capability of the Salto, whether flying or performing every imaginable aerobatic maneuver, is restricted only by the experience of her pilot. The sizes of Saltos are 4.25 m and 4.55 m wingspan; flaps are optional. This year, the little Salto H101 will come with not one set of wings but a choice of three. The profile is an Eppler 393-374, spans of 2.30 cm, 2.70 cm (standard) and 280 cm. You can get this Salto with flaps or spoilers or, for sheer speed and aerobatics, ailerons, only. At approximately 1/6 scale, you will like this lively performer.

The Kimbo is new for 1992-93. It is a T-tail version of the little Salto, without a fixed wheel, and it sports the same three wings in all three sizes. The standard version of the Kimbo can be flown with only 2 channels; flaps and spoilers are optional.

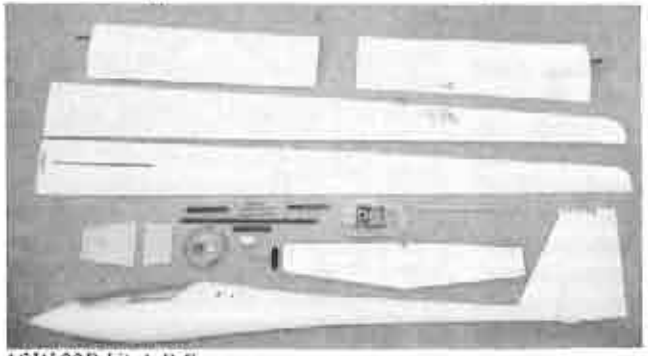
The Sithebe, also new, is strictly for the slope. This little devil is built and recommended for the experienced glider pilot who wants to "RACE" through the skies leaving all else standing. The wings comprise the outer panels of the Glas Flügel F3B model "Ze Ultimate". All air resistance has been reduced to a minimum even to the extent of not including spoilers so that optional flying speeds can be attained. The span is 1800 mm, length 104 cm, profile RG15/RG15A, weight 1500 grams, aspect ratio 8.6, wing area 36 dm^2,

wing loading 40 g/dm^2, radio control function, rudder, elevator and ailerons. Keep your eye on this one.

Last, but not least, of course, is our ASW 20L, 4.15 m - 4.50 m. This is the flag ship of the Glas Flügel sailplane line of fine scale models. This outstanding plane has a record of National and international wins a mile long. The last being, again for the third time in a row, at the AMA Nationals 1992 where it was flown by Terry Edmonds in Sport Scale soaring. Having once flown this beautiful scale version of the ASW 20L with its superb performance, you will understand why Glas Flügel is proud of this wonderful glider which is incredibly stable, yet has an aerobatic potential as yet unsurpassed in the area of thermal flying. This aircraft is a trophy winner in the "Great Race" cross country, a feat which serves to underline its superior glide ratio, which is far beyond that possible with conventional aero modeling materials.

I am very happy to be able to bring you, the modeler, this great line of R/C sailplanes. When you buy a Glas Flügel, Unlimited model, you get: aerospace quality epoxy resins, tempered parts moulded in highly accurate forms, incorporated spars and joiners, knuckle-jointed hinge constructed flaps and ailerons (where applicable) to eliminate all air turbulence and to promote the ultimate glide ratio, unlimited aerobatic potential, white gel-coat surfaced fuselages and wings, and construction using the "wet-in-wet" technique, a fuselage with several layers of woven cloth and extra reinforcing for known stress areas, and a fuselage prepared with the necessary wing fixing supports so you cannot misalign the wings. Separately available are individual spare parts that we stock at Windspiel Models.

We import these and other models on a limited basis. If you are interested in reserving one of these fine sailplanes, you should get on our reservation list as soon as possible. THEY GO FAST!!



ASW 22B kit A.R.F.

For more information, send for our new 1992-93 full color English catalog and price list; the price is $10.00 U.S. sent via first class mail. The address is Windspiel Models, Peter H. Bechtel, P.O. Box 2121, Coeur d'Alene, ID 83816; phone (208) 667-2276 FAX-answering machine after 5:00 P.M. (PST). ■

The Vertigo

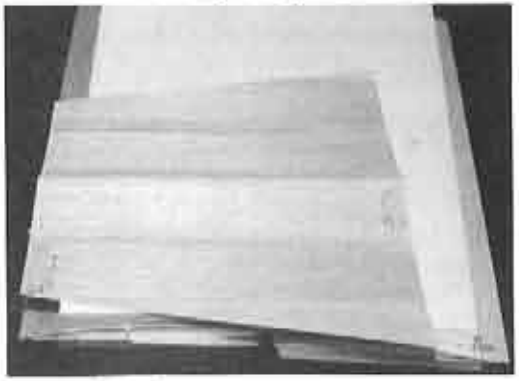
...by Mike Stump
Cadillac, Michigan

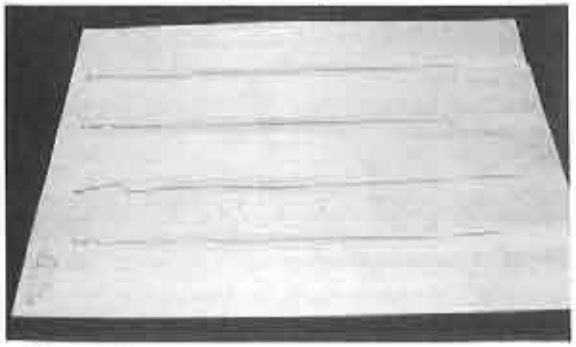
The VERTIGO is a hand launch sailplane designed and kitted by Brian Agnew. My first impression of this plane came at the 1990 AMA NATS. Brian placed second in HL with his prototype. The clean overall lines and V-tail made this sailplane consistently one of the highest launching through the whole event. (Brian's throwing ability didn't hurt either.) After finding that this plane was going to be available as a kit it didn't take long to pick up the phone and track Brian down to place the order.

The kit is very complete with foam core wings and V-tail, pre-cut balsa and ply fuselage sides and bulkheads, and complete hardware. The VERTIGO uses the E-387 airfoil. The wingspan is 59.75", length = 31", and the projected weight is 13.5-15 oz. for a 5 oz./sq. ft. wing loading. It is intended for micro servos for controls and the receiver compartment was designed around the VISION 8 channel receiver. Plans are also shown in the instructions for a mechanical V-tail mixing system.

The foam core wing construction is very basic with no spar used in the construction. The sheeting is a good quality 1/32" balsa and can be applied using a number of different methods. Regardless of the method of applying sheeting, a 1" wide fiberglass TE reinforcement is installed between the top and bottom sheeting in the process. The kit instructions recommend using 3M-77 spray contact adhesive to attach the sheeting to the cores. I opted to use the EZ-Vac system and EZ-Lam epoxy in building my wings and stabs. This gave me a stiff, strong and still very light structure for my flying surfaces. My only other deviation from the wing plans was to wrap the polyhedral joints with a 1.5" strip of 1 oz. glass cloth secured with CA to help strengthen the joints. 5 minute epoxy was used to attach the main wing panels and thick UFO to attach the tips to the main panels. I cut the optional holes in the wing (3 in each panel) to help save weight with a 2" hole saw.

After gluing the stabs together at the proper V angle, I strengthened that joint by making 8 saw cuts across the joint and using thin UFO to glue in 1/64" ply shear webs across the joint. This added little to no weight and much strength in the tail. (Thanks goes to Troy Lawicki for this idea.) Due to the relative small size of the stabs I did not attempt to lighten this area with holes.





Vertigo tip section. Top and bottom sheet taped together at T.E., and ready for bagging.

With edges trimmed straight, sheeting is taped together (shown by dark lines) and is now ready to cut to size for each panel.

Vertigo in "bare bones" before covering. New version features Obechi sheeting instead of 1/32 balsa. Wings can be sealed with light coat of shellac, etc., instead of covering.

The fuselage is of traditional construction. The sides are 1/16" balsa with a 1/64" ply doubler from the nose to just behind the TE of the wing. The formers in the wing mounting area are of 1/8" plywood. The forward former is of 1/8" balsa. 1/8X3/16" balsa longerons run the full length of the fuselage top and bottom. The controls are driven by 1/32" music wire run through the small size Sullivan cable sheath. All hardware for this system is supplied including the EZ links to connect to the servos.

After the fuselage has been assembled, the wing is aligned to the fuselage and the hold-down system installed. The wing is held in place at the LE by a 5/32" diameter dowel and secured with a 10-32 nylon bolt secured in a blind nut mounted in the fuse. Fuselage construction is completed with hatch assembly and mounting the V-tail.

I covered the entire assembly with Monokote. In the instructions Brian recommends leaving the fuselage bare to save weight. The plans show an optional finger hole placed in the ply floor near the center of the wing. I deviated from this location and placed my finger hole just in front of the TE as this location is more comfortable for me. I installed a 3/16" former to the front edge of this hole and reinforced this former with 2 oz. glass cloth and CA.

For a flight pack in my VERTIGO I am using 2 AIRTRONICS 94631 mini servos. These are slightly wider and heavier than the 401 or 141 micros, but they have a lower profile and, more importantly, I already owned them. The 4 channel FM micro receiver fits with ample room as the receiver compartment was designed with the VISION 8 in mind. Power is supplied with a home assembled 270mah pack from Sanyo cells.

The initial flights were performed at the forward CG range shown on the plans. At this setting the VERTIGO tracked very well. The apparent drawback to this forward balance point was the slow rate of climb and the difficulty to stay with small areas of lift. It was time to move the CG back and look for more performance.

With the CG at the rear location shown on the plans, my VERTIGO became an entirely different sailplane. It would turn in a much smaller radius, launched higher, and was much more sensitive to lift. It became a good bit more sensitive (read, squirrelly) which required that the airspeed be kept a little higher, but in lift it almost seemed to work itself toward the core of small thermals and the rate of climb was excellent. A great trade-off for having to pay a little better attention.

Some people would look at the price of this kit ($60.00 including S&H) as very high for a hand launch. The pre-fabrication and quality as well as the complete hardware selection make it worth every penny. The VERTIGO builds quickly and accurately and is the most durable of any hand launch I have owned. If you're looking for a competition oriented, or just a high performance hand launch sailplane the VERTIGO is worth consideration.

Late breaking news has the VERTIGO now available in a standard tail configuration which allows the use of any basic radio and no special linkages. For information or to order contact: Agnew Model Products, 166 C Springwood Circle, Longwood, Fl 32750; Ph. (407) 260-6223. ■

Fourth Annual Precision Slope Aerobatics Contest

...by Jef Raskin
Eight Gypsy Hill Road
Pacifica, California 94044

The Fourth Annual Precision Slope Aerobatics contest, held in Pacifica, California turned out to be a lot of fun. Nearly 100 people attended, coming from as far away as Reno, Nevada and Topeka, Kansas. Many who thought they would fly got cold feet at the last moment and their planes sat idle as they watched the 14 contestants in action. Unlike previous years where we went pilot-on-pilot in a challenge format, this year we flew the contest as per task A1 in the AMA competition regulations for Radio Control Sailplanes. Fortunately, we were able to obtain the help of two experienced IMAC aerobatic judges, Roger Tennyson and Bruce Estes, from a nearby powerplane club, the Peninsula Channel Commanders, of which I am also a member. Members of our club (S.F. Vultures), of course, volunteer to help in their contests, as well, and it is a pleasure to see power fliers and us silent types working together so smoothly.

As in most precision aerobatics contests, the fliers went through a pre-announced sequence of maneuvers and were scored on a 0 to 10 scale on each. To equalize skill levels a bit, no K-factors (for difficulty) were assigned to the maneuvers.

There was plenty of lift, and a bit of fog drifted by, giving rise to jokes about flying IFR aerobatics, but there were almost no delays. To the delight of the spectators, the

Local T.V. taped the event - 8:00 news! Note spectators.

The judges grade a contestant.

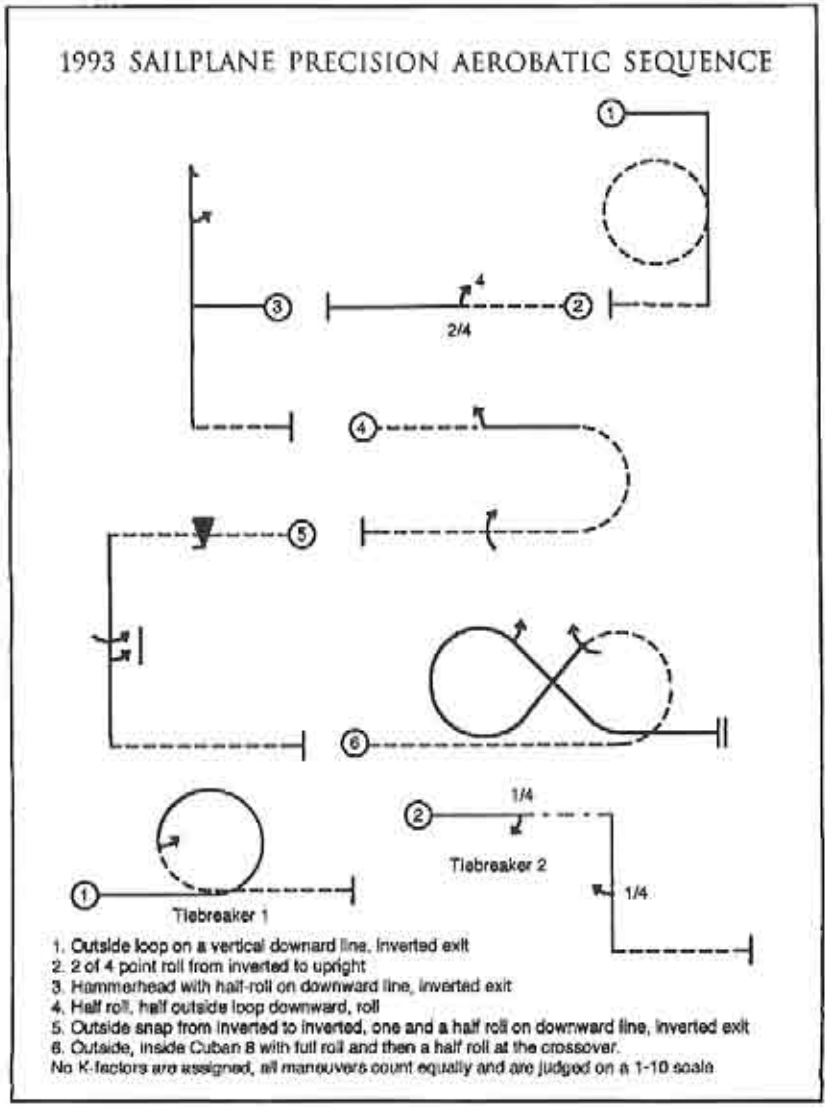
final results led to a cliff-hanger (if I can use such a term at a slope contest) since there was a tie for first place.

The first tie-breaker was a quarter-roll to knife edge, a quarter knife edge loop downward, a quarter roll downward and a pull-out to inverted flight in the original direction. The two fliers, amazingly, tied again! The second tie-breaker was three-quarters of an inside loop upwards with the plane executing a half roll on the downward leg, completing the figure as an outside loop. The first flier did it in textbook fashion, and the second didn't quite keep the outside portion tight enough (perhaps because he was flying without the benefit of a symmetrical airfoil), which ended the contest. Prizes included Shogun and Anabat sailplane kits and half-price coupons on free-flight and electric R/C models.

Here's the results in the first seven places:

#	Pilot	Plane
1	Jef Raskin	Anabat 2 (kit)
2	Ricky K. Wong	Silhouette (kit)
3	Peter A. Tjeerdsma (highly modified kit)	Talon
4	Paul Love	Swift AT (kit)
5	Anthony E. Carl (slightly modified kit)	Anabat 2
6	Allan W. Morse	Original Delta flying wing
7	Neil Davis	Anabat 2 (kit)

I'd like to present the Vulture's proposed Precision Aerobatic Sailplane Sequence (PASS) for our 1993 contests. We hope that other clubs, whether slope or thermal in orientation, will consider using this sequence, perhaps leading to inter-club fly-offs. These maneuvers can be flown off a winch or high-start just as well as at a slope. I would be very interested in comments on the proposed sequence.



The Aresti charts were made on my Macintosh, using Claris CAD, and I could make the templates available to anybody who would send me a blank formatted Mac diskette, a S.A.S.E. for getting the diskette and a short manual back to you, and $5.00 to cover my costs. I could put them on the diskette in either Claris CAD format or PICT format; just let me know.

Lastly, the Anabat models with their symmetrical airfoils are proving very popular; I have been startled (and gratified) by how fast our first 200 kits went out. I am putting together another 200 kits. As far as I know, there are no other symmetrical-airfoil conventional configuration sailplanes made in this country. I'd like to hear about (and buy) any that I might not be aware of. I predict that in a few years almost all serious competitive aerobatic sailplanes (and many sport models) will have symmetrical airfoils. ■

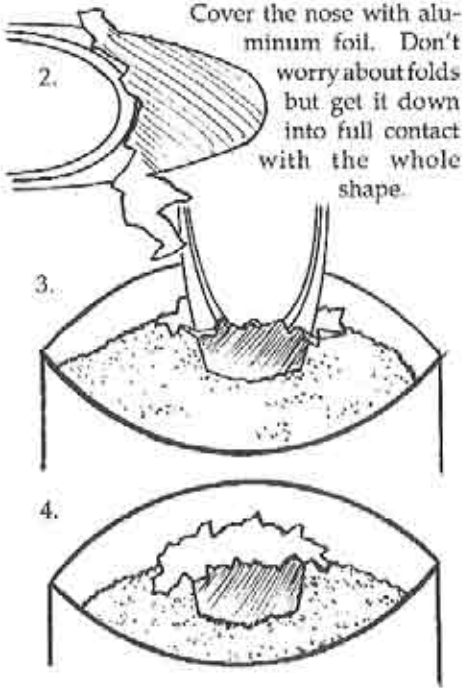
Casting Lead Nose Weights

...by Paul Brabenec
Wilson, Wyoming

Here's another method for casting lead nose weights. My friend Dan told me how to do this.

1. Get some small split shot and put some in a ziploc bag. Put this in the nose with battery, etc. Adjust amount of lead to balance the glider. Weigh the lead and record amount.

2. Cover the nose with aluminum foil. Don't worry about folds but get it down into full contact with the whole shape.



3. Press the foil covered nose into a can full of damp sand. Carefully remove the fuselage, leaving the foil.

4. Melt a couple of more ounces of lead than you need. Pour into the foil form. Let this cool down.

5. Remove the lead from the sand and peel the foil off. Weigh this lump and remove material until you have the proper amount. Stick it into the nose with silicone sealant. Let this set for a couple of days. Done! ■

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

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.

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.

A.M.A.P. FOAM CUTTER, bows, parts, repairs, upgrades, etc. Contact George Hollidge, 2943 Broadway, Oakland, CA 94611.

For Sale - Personal

VS Sailplanes ROTOR w/pre-sheeted 58" and 84" wing, carbon wing rod, NIB ...$150.00; Midwest Elec HOTS w/Futaba attack elec, 3 S-133 servos, Kyosho motor, 3 1200ma battery packs, props, test flown only, new condition...$275.00; Topflite METRIC w/spoilers, Futaba FM Conquest, 3 S148 servos, contest winner, ready to fly...$175.00. Contact Ken Stone at (714) 632-7393 and leave message (California).

Mueller COMET 89T w/Airtronics servos, 4 flights total, mint...$900.00 firm; Robbe ASW-17, NIB...$250.00; VAMPIRE, NIB...$125.00; SAGITTA 900/ excel cond w/new Futaba 4 ch...$200.00. Call Preston at (603) 654-5675 New Hampshire. Eve best.

ASW-24, fiberglass fuselage w/clear canopy & cockpit (wing & tail surfaces drawings available), 3.5 - 3.8 M span...$130.00; CIRRUS 75, fiberglass fuselage w/fiberglass canopy (wing & tail surface drawings available), 3 M span...$60.00. Both fuselages available all time. UPS shipping not incl. in price. Call Peter Zak at (305) 687-7706 Florida.

Wanted

Muller Ellipse from Czechoslovakia, new or used. Contact Manny at (714) 492-9553 California.

Northern California CAD operator with software to do drawings for foam cutter. Possible Tech. manual. Contact George Hollidge, 338 Primrose, Pleasant Hill, CA 94523.

Strange Encounters of the Fourth Kind!

...by Al Sugar
Lewisville, Texas

The 4th of a series of 100 mtr low launch contests had a few star performers in head to head competition, Although only two fliers, indirect representation was had by Hans Mueller the German Sailplane designer, by his Ellipse, and Blaine Rawdon, the designer of the Mirage. Mr. Doyle Modesto piloted the Ellipse, and I the Mirage, The task was 4 rounds of 4 minute flights, no landing tapes. The launching system was a FabTeck winch with a weak battery yielding less than 15 lbs. of stalled torque. The turnaround was set at 328 feet, right on the runway of Lake Point's power field in Lewisville, Texas. The warm-up flights were done in dead calm, and the Ellipse, an F3B machine surprised witnesses and pilots by easily launching to reasonable height under less than ideal conditions. Right in synchronous harmony with the first launch the wind picked up to 15 mph heading for the turnaround. So, with this being a super small meet, the towing direction was changed to permit the machines to launch into the wind with the light force of the winch. Remember, safety should be paramount at all contests. Although the Mirage had a much lower sink speed, the wind forced this bird to fly at max L/D or higher airspeed because no provisions were made to launch and chase our machines downwind like a balloon. Also, our pride and proof of concept required us to land back on the runway. The Ellipse was flown mostly at min sink and we soon learned that its L/D at this speed was still greater than the Mirage (i.e., it was moving against the breeze better and sinking less). Let me inform you that I plotted and chose this day because the wind was supposed to be less than 10 mph. I wanted to use a whole bunch of light lift tricks to bedazzle Doyle. I had offered him a 2 to 1 scoring ratio with calm air in mind. Doyle won with a score of 14:46 against my score of 12:26. All Hail the new Low Launch King.

King Doyle's intent was to "wax" me with his Ellipse, ooops now my Ellipse. He foolishly thought he could hook me on High Tech Machines!! Fate is sure funny because the wind lasted exactly the length of the meet. We did get in a few flights with my new Ellipse and got the trims up to meet my flying style. Yes, I will be flying an F3B Machine for awhile to learn more about soaring, however I am not interested in multi-task; and my intent is to apply what I learn onto the style of machines that I build. Although the Ellipse is remarkable in light air I still believe my Oly 3, or Mirage will give it a rough time under that condition, the problem being not to call it a contest so the wind won't blow.

Let's see what we really proved by this adventure.

1. The 100 mtr launch dimension with 15 lbs of winch force can yield a very flyable contest for 2 mtr through F3B. Also, because of the short dimensions, a retriever is not necessary to keep things moving.
2. The 100 mtr launch is not a trick scheme to open the door to an inferior product, and the winning advantage still remains in the hands of he who has the superior equipment for the conditions of the meet.
3. The vertical dimension stayed below 700 feet (i. e., no one was able to sky out) and the spectators enjoyed the jousting because they were able to see all the action.
4. A field set up for power planes to be flown safely can host large R/C sailplanes, and is not limited to 2 mtrs or hand launch.
5. Downgrading tasks to accommodate the lower launch is probably a temporary cure (i.e., 12 minute add-um-up, or 5 minute precision). If the 100 mtr launch became standard, our designs would evolve naturally until the original tasks were easily accomplished.
6. Winch motor design needs to be looked at. Seriously, if a 1/6 hp PM motor can haul an F3B machine up in a calm, just think of what a 2 speed 1/4 hp dual field shunt wound motor could do... efficiently. With the field in parallel you could have enough ampere turns to yield the typical 2000 rpm of the standard winch drive motor. Switch the fields in series and your ampere turns drop to 1/4 intensity. Because of the weaker field the motor wants to spin at 5000 rpm. What we have here is a 2 speed electric transmission that is very efficient. Picture a double treadle foot switch that you press on one side to get the thrust to launch and accelerate; once over the top and at the same time you switch your launch flaps off, you simply stomp on the other side of the pedal for the dive. In a short time, a lazy flier will use a system to detect the current sag at the peak of the launch and change the field intensity automatically (simplifying the launch). NOTE: let me add a philosophical thought here - "If ingenuity is the Mother of invention, laziness is the Father".

What you see here is an attempt to give soaring a shot in the arm because I believe it needs something to fire up the interest. Flying tighter in a smaller field is one way of gaining more participation because there are far more football size flying sites available than the 1 million square foot surfaces we are presently using. If the activity is increased because of the more compact site, the safety must also be increased because the population growth in our sport of soaring would be in fliers, not necessarily in experts. The bottom line is to have fun, safely.

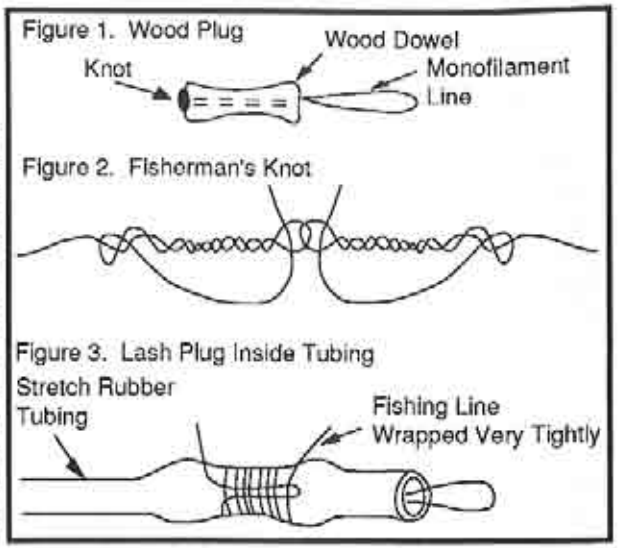
Postscript

The 5th contest was to be held in Denton, however the contestants got to the field late, and it ended up a fun fly with 2 channel 2 mtr type machines. The air was quite interesting, with large intense thermals in the upper air, and a maze of small hand launch type feeders that would either dead-end or leak into the more active air. With the very light wind shifting directions continuously, the small but intense high starts (50 meters in overall length) were extremely effective. All those that tried the system of 100 mtr launch felt it was adequate and enjoyed the mild zoom in calm air they never experienced previously. The Denton group tends to build light 2 mtr machines and is uncomfortable about winches, and it will tickle me when they find out the heavy duty hi-starts equal the same force as my FabTek winch that they have rarely used unless under duress (i.e., no other launch system available). Once I can get them "addicted" to the winch so that they can launch higher from the same base dimension of 100 mtrs, then out comes the Ellipse... ■

Hi-Start Connection

...by Wildey Johnson
Boca Raton, Florida

One thing that has always bothered me about a hi-start is the connection between the line and the rubber. It seems so wasteful for the sailplane to have to carry aloft that metal ring and big rubber knot. This was a problem that existed mainly in my mind. However, a very real problem is that the ring and knot catch on weeds and brush when the rubber is being stretched. I mentioned my desire to streamline the rubber-line junction to Mark Atzel, who is a regular flier with the Broward Thermal Chasers in Southern Florida. Mark gave me the idea for the technique described as follows:



1. Locate a wood dowel slightly larger than the inside diameter of the rubber tubing and drill a very small (I used 1/16".) hole down its center.

2. Sand a waist on the dowel over the drilled area and saw that section off (about 1").

3. Pass both ends of a one foot section of monofilament line through the hole in the dowel as shown in figure 1.

4. Next, tie the two ends together. I used the fisherman's knot shown in figure 2. The knot was large enough that it did not pull through. Test this by pulling firmly on the monofilament loop. You may need to jam the hole with a toothpick; then, break it off.

5. Wet the plug and the inside of the tubing with water. Force the plug inside the tubing far enough so that you can grip the tubing on either side of the plug.

6. Ask someone [Jack Wright from Atlanta did this for me.] to stretch the tubing over the plug. [By the way, Jack is new to R/C soaring and is eager to find someone to fly with. Give him a call at (404) 955-3126.]

7. Next, I formed a short loop with fishing line and continued wrapping over the loop as shown in figure 3. It is important to make these wraps tight. On the last wrap, the end of the line was passed through the open loop in the fishing line (not the monofilament line). The loop was then pulled half way under the tight wrappings. After trimming the ends and attaching the launch line, I had eliminated the metal ring and the knot in the rubber tubing. ■

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