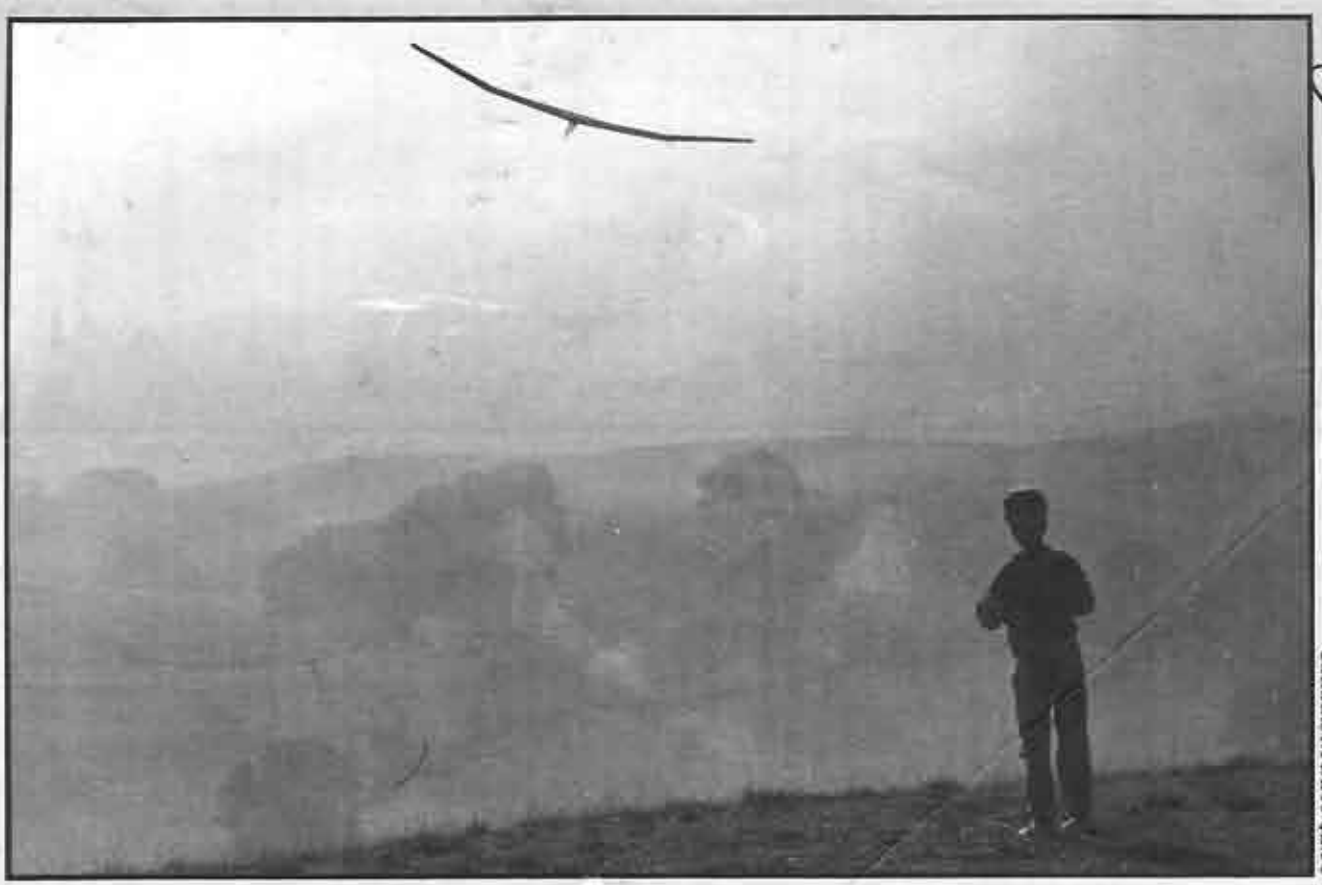

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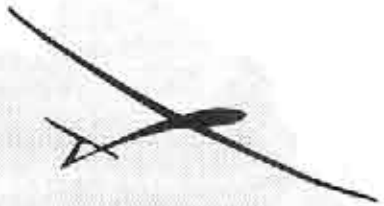
R/C Soaring Digest

A publication for the R/C sailplane enthusiast!



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

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The Soaring Site

About the Cover

The cover photo recently appeared in the Spring 1992 newsletter of the Silverado Soaring Society of Napa, California. Robbie Lattimer is flying his Paragon from a Sonoma county slope. The photo is by Jack White, Robbie's Grandpa.

"Formenbau und Glasfasertechnik für Flugmodelle" by Peter Holland

Are you a scratch builder? Do you like to tinker and make a one of a kind canopy? Do a bit of molding? Need help repairing a fiberglass fuselage? This book might just be what you are looking for. Although the text is in German, there are more than enough pictures and step-by-step figures to get through some of the how-to's that you have been wanting to do. This book has claimed shelf space over my work bench! Available from: Verlag für Technik und Handwerk, Postfach 1128, D-7570 Baden-Baden, Germany, Order number: Best.-Nr.: FM9; Price: DM 19.50.

Flying in Rain

We received an interesting bit of humor from Waid Reynolds, Editor of the Seattle Area Soaring Society (SASS) newsletter, Washington. We couldn't resist passing it along. Waid says, "There is a high level of interest in RC soaring here - in spite of all the rain. SASS, for instance, is looking to increase membership from 70 last year to 100 this year. Two years ago we started out with 10! Speaking of rain, our gliders and transmitters are required to pass a submersion test before the first flight in order to assure that all components will function properly in the high moisture environment commonly in evidence. In addition, each transmitter antenna must be fitted with an umbrella to be legal, not to mention stylish. Needless to say, the

umbrellas must carry your channel and AMA numbers. Waders and snorkels are commonly used flying accessories. Oh, and any pilot observed wearing sun glasses is referred for psychiatric treatment for delusions of sunshine. This information should be of assistance to any of you Southerners who may be planning trips to the Great Northwest." If you're planning a trip to this area, Waid says to give him a call at (206) 772-0291. He is included in the resource section of each issue, as well.

A New Club in Alabama

There is a new soaring club in Alabama called the Central Alabama Soaring Society (CASS). Their field is located at Long Meadow in the Maylene/Alabaster area. For more information please contact Charles Roberts, 319 13th St. SW, Alabaster, Alabama 35007; (205) 663-2722.

1993 F3B U.S.A. Team Trials

The 1993 F3B Team Trials are scheduled for September at the Soaring Union of Los Angles (SULA) club field in Carson, California. These trials will select the 1993 United States F3B Team, and are the equivalent of the Olympic trials for radio-controlled sailplanes. Approximately 20 helpers per day are needed to run the contest efficiently. Spectators are welcome. Additional information, directions, etc. may be obtained by calling Steve Addis (Contest Director) at (310) 835-7631 or Don Edberg at (714) 896-5210.

Looking for Dave Acker?

Well, he is in the process of moving, again! The first week in August, Dave's Wood Products (Dave Acker) can be found at 12306 Bergstrasse, Leavenworth, Washington 98826; (509) 548-5201.

The First Gliding...

When did the first gliding occur? Martin Simons, Australia says, "George Siposs' contribution in the June issue (page 54) was interesting, though he is a little confused about dates. The first gliding on the Wasserkuppe, by the schoolboys from Darmstadt, was in 1911 & 1912, not after the First World War but before it. The first gliding competition was held there in 1920, not merely with schoolboys but with academics and ex war pilots, etc. Peter Riedel was the **only** schoolboy entrant. One could also quibble about George Cayley's coachman who "flew" a glider half a century before Lilienthal."

And from Colorado...

A line was dropped from Dale Willoughby's letter in the July issue of *RCSD*, page 2. His trip took him to "Norfolk, VA, Detroit, Tokyo, Guam, Seoul, Bangkok, Bombay and Paris." Additionally, Dale says, "The course layout for FAI F3B Class 33 is now 100/200/100 for entry, base and exit." Dale has also provided a copy of his FAI rules proposal "to change the original course layout for Speed in a Closed Circuit". If you wish a copy, please send a S.A.S.E. to Dale or *RCSD*. The photo is of Dale at age 75 trying to renew his R/C glider reflexes after a 20 year hiatus by flying a Dave Thornburg BIRD OF TIME. Dale was one of the foremost proponents of slope soaring 30 years ago; the only American to set two World Records in FAI F3B Class 33. The address is: Dale Willoughby, Captain USMC Retired, 26278 Woodard Ave. KVE, Moffat, CO 81143-9701. ■

Strictly for Beginners

...by Howard Pecker
Westfield, New Jersey

This letter is strictly for beginners, whom I spend at least half of my time at the field with. It is a question in three parts.

Just this Sunday I was at the field, flying my Eclipse which runs on a geared tin can motor and seven SR Max cells. I had just completed a flight which was about twenty five minutes. I came down because the thermals were too good and I was getting bored. While making my landing, I could feel a pair of eyes on my back.

After retrieving my plane I was asked how I managed to get my plane to fly so well. I said, "It's not the plane that's doing the flying, it's the pilot." He didn't believe me.

Part 1.

He had two planes. A Goldberg Electra and a Sagitta or some other similar floater. The Electra, he told me, was refusing to fly from the day he bought it. It wouldn't leave the ground no matter how much he coaxed or bribed it. Possibly a religious conviction. I have heard about these fanatic planes many times.

I told him that it weighed the same as my Eclipse but had much less power and so, unless he could thermal it from a hand launch, it never would fly. He needed one or two extra battery cells or an FAI type motor. He didn't believe me.

Part 2.

He also could not seem to find a thermal with his Sagitta. There were no thermals anywhere in the state and whatever thermals there were, his Sagitta refused to fly in them. He knew this for a fact. Another conscientious objector posing as a model sailplane.

I told him that it was my opinion that, from watching his earlier flight, he was flying directly through the thermals instead of stopping to circle inside them. He said that when the plane hits the thermal, it should rise like a bullet.

I told him that when he sees a wing tip rise a little bit, that he had to turn around and go back to find the thermal and then work it to death. He didn't believe me.

Part 3.

We took the Sagitta up on the high-start again and this time I told him when and where to turn.

Amazing Grace! A twelve minute flight!

He said that it was just luck.

When will they believe me? ■

on the Wing

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

Aileron/Elevon Differential - Some Possible Adverse Effects on Performance

Turning a sailplane should be a simple thing to do, right? Well, it should be, but it isn't. Several aerodynamic quirks get in the way of achieving automatic smooth coordinated turns. In this column we'll explore these quirks as they apply to both tailed and tailless designs, and give some suggestions for improving matters.

To begin, there are three types of drag which affect a sailplane in flight. First there is friction drag, created as the air moves along the surface of the model. It is friction drag which slows the air next to the aircraft surface, rapidly building a thick boundary layer. The second type of drag is form drag, caused by the changes in pressure over the skin as the air flows across it. The third and last form of drag occurs any time lift is generated. This induced drag or vortex drag is created by any lifting surface. It is especially strong at the end of the wing, where air is free to move from the lower to upper surface around the wing tip.

Friction drag and form drag are closely related and usually considered together by the term profile drag. Profile drag increases with greater velocity.

A slow flying glider must operate at a high C_L to generate sufficient lift to remain in the air, while the same glider flying at a higher velocity can stay aloft while generating a lower C_L. Induced drag therefore increases with greater C_L.

There is thus an interesting relationship between profile and induced drag. At low speeds induced drag is high and profile drag is low, while at high speeds profile drag is high and induced drag is low. This is an important consideration to keep in mind.

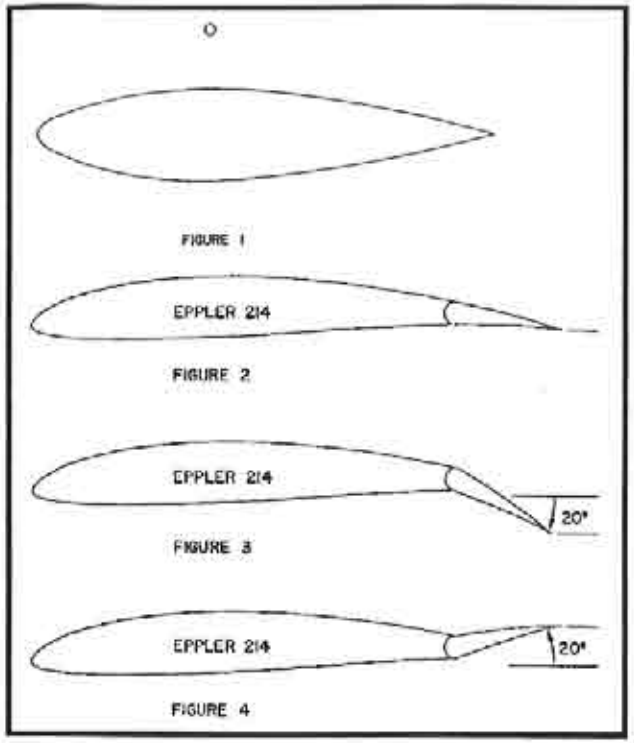
To give a comprehensive example of profile and induced drag, consider a wire and an airfoil moving through the air together (Figure 1).

The airfoil has greater friction drag but less form drag than the wire; the airfoil's overall profile drag is less than the profile drag of the wire. This holds true even when the airfoil's thickness is up to 10 times greater than the wire's diameter. As expected, both the wire and the airfoil will experience increased profile drag as their velocity is increased.

Technically, the wire's induced drag is always zero because it is not capable of producing lift, no matter what its angle of attack. The induced drag of the airfoil, on the other hand, can change markedly as angle of attack is increased and the section begins generating lift.

Taking profile and induced drag together, you can see there are certain circumstances (low speed and high C_L) where the airfoil's overall drag may be significantly higher than the wire's. Yet in high speed flight the airfoil would have significantly less overall drag.

Now let's get back to turning our sailplane. In turning, our sailplane rotates upon all three geometric axes: the sailplanes banks, pitches, and yaws. As evidence for this, consider the control actions required for a coordinated turn. We must bank the 'plane with ailerons (roll) and gently apply up elevator (pitch) and rudder (yaw) to bring the 'ship around. But there's a problem. We certainly don't want to fly with the fuselage yawed to the relative airflow as this is a high drag condition. Yet it seems we need to apply more rudder than necessary to get the 'ship turning in a coordinated way.



Since the rudder creates large amounts of drag as well, we want to eliminate moving this "barn door" more than is absolutely necessary. So we begin looking for reasons as to why such inordinately large rudder movement is required. This quest leads us back to aileron movement, and profile and induced drag.

Most are familiar with the Eppler 214 airfoil, and it serves as a good example for explanation. In Figures 2, 3, and 4 we see the E 214 with no aileron deflection, then downward deflection, and finally upward deflection.

With no aileron deflection, the E 214 has a certain amount of profile drag. As the aileron is deflected downward, both profile and induced drag increase. Profile drag increases due to the hinge line and abrupt contour change, while induced drag increases due to the increased lift generated. The overall drag of the wing with aileron deflected downward is greater than the wing with no aileron deflection.

But what of the overall drag as the aileron is deflected upwards? Profile drag will again increase due to the irregularities in the surfaces, but since the wing is now generating less lift, induced drag will be reduced. The overall effect is for the rising wing (aileron down) to have more drag than the falling wing (aileron up). The sailplane therefore tends to yaw toward the rising wing, directly opposite to what we want!. This action is termed adverse yaw, and it takes a large rudder movement to counteract it.

Aileron Differential - Some Possible Adverse Effects on Performance

A common solution to the dilemma of adverse yaw has been to modify the control linkage so the aileron's deflection is always proportionally greater when moving upward. This so called differential is effective at inhibiting the drag increase of the rising wing through reduced downward aileron movement, while increasing the drag of the descending wing through increased upward aileron movement (Figures 5 and 6). Adverse yaw and the required large counteracting rudder movement are thus both greatly reduced, giving an overall reduction in total drag.

There has been a tendency among tailless enthusiasts to set up their swept 'wings with differential in the aileron

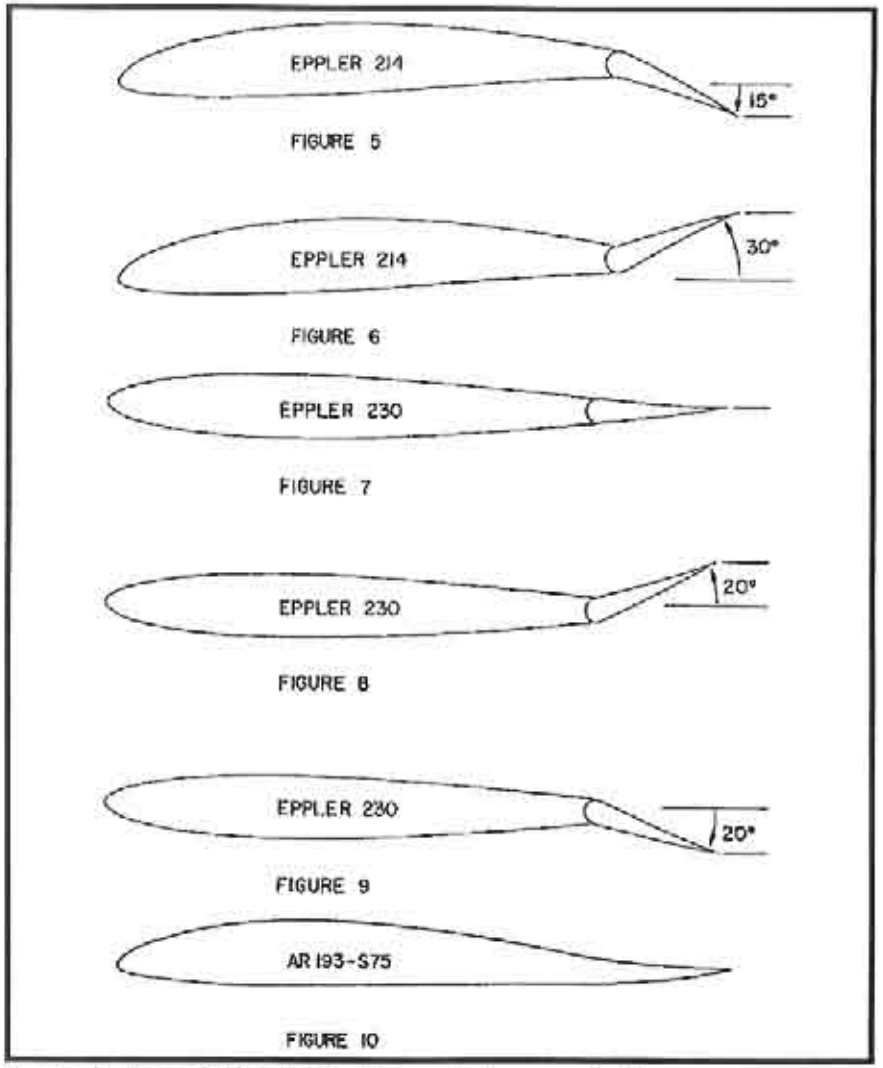


FIGURE 5

FIGURE 6

FIGURE 7

FIGURE 8

FIGURE 9

FIGURE 10

function, just as with their tailed 'ships. It is our opinion this is an incorrect action, and there are two reasons for our making this statement.

Since the elevons, combining aileron and elevator functions, are behind the CG, the first thing which comes to mind is the obvious change in pitch forces which result from aileron function differential. This is because the upward moving elevon, with its greater deflection, applies a significantly larger down force than the upward force generated by the opposite aileron.

But there is another factor which is not so clearly seen - the effect of aileron movement on the induced drag of the wing tips.

On a swept wing tailless, the wing tips are applying a down force on the aircraft structure during flight. This is directly opposite to what is happening at the wing tip of a conventional sailplane. When thinking about the wing tip's induced drag, we must therefore visualize an inverted airfoil.

Looking at Figure 7, note the shape of the airfoil; such reflexed sections are commonly used on swept wing tailless. These sections, looking very much like inverted normally cambered sections, do not begin developing upward lift until their angle of attack is substantially positive. The wing tip's induced drag is thus related to its downward lift. This means an upward deflected aileron near the wing tip of a swept wing tailless (Figure 8) is producing more induced drag than the same aileron deflected an equal amount downwards (Figure 9)! Adverse yaw should therefore not exist, and aileron function differential will do nothing but harm in this situation.

In the case of a plank design, the wing tips are not generating a downward lifting force. Rather, the entire wing uses a reflexed section. (See Figure 10 for a typical example.) While the reflex produces the downward stabilizing force necessary for flight, the airfoil itself produces a relatively strong upward lifting force.

Raising one elevon therefore increases profile drag over and above the drag ordinarily created by the section's reflex, but induced drag will decrease because of the overall reduction in lift. How these two forces balance out is dependent upon control surface deflection angle and specific airfoil. Aileron function differential may therefore be needed in some circumstances, but watch for a pitch up as aileron function is applied.

As an example, Jim Marske's Pioneer II-D (schematically shown in Figure 11) utilizes 2:1 aileron differential. Since the quarter chord line sweeps forward, however, the ailerons are so close to the CG their deflection does not affect pitch significantly. In plank designs with no quarter chord sweep (Figure 12) or slightly rearward sweep (Figure 13), the ailerons will be proportionally more distant from the CG, and pitch will be more greatly affected as the moment gets larger.

In a thermal turn, with elevons deflected slightly upward, the plank is flying with effective washout at the wing tips, while the wing root is generating near maximum lift. A centrally mounted elevator does not allow this beneficial situation to occur, and this explains why the best performing plank designs utilize elevons rather than a central elevator and outboard ailerons.

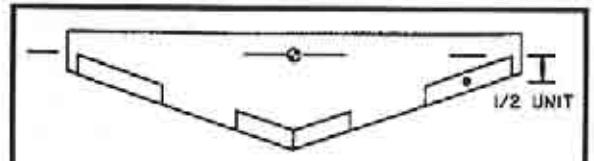


FIGURE 11

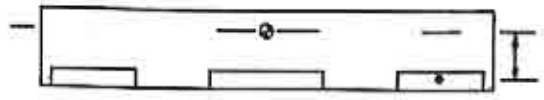


FIGURE 12

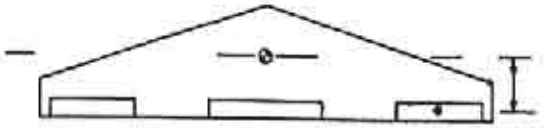


FIGURE 13

Since most flyers are now moving to computerized transmitters, with a servo driving each aircraft surface, it is becoming increasingly easy to experiment with aileron differential. If you are flying a tailless design with a computer radio, try reducing the amount of differential you are using. You might just find a substantial performance increase. We would appreciate hearing the results of your experiments! ■

Flying in Wind and Weather

...By Martin Simons

13 Loch Street, Stepney,
South Australia 5069

U.S.S. Fartherstill

Are there still some doubts about turning in the wind? Examine Figure 17. The U.S.S. Fartherstill is a vast aircraft carrier. All available funds were used in building the ship, and none was left for full-sized aeroplanes. The vast interior hangar amidships is used as an indoor model flying hall. This enables naval spokespersons to answer awkward questions. "Be assured, at this moment, fifty fully serviceable aircraft are on board U.S.S. Fartherstill and are operating at very little cost to the taxpayer. Information concerning the specifications and performance of the aircraft involved is classified and it is not in the national interest to describe them. Any more questions?"

All the hangar doors, hatches and windows are closed and the air conditioner fans are shut down so that there are no draughts within.

While the model contest goes on the ship gets up steam and departs on a cruise. It has very efficient stabilisers so even when the sea is a little rough, no rocking is detectable by the modellers below decks. Within the hangar where the models are flying, there is a quantity of air, and it is in this air that the models operate. They are trimmed to fly in perfect aerial circles to avoid hitting the hangar walls.

The air in the hall is moving as a whole, a mass of air in motion relative to the sea. A wind is also a mass of moving air. The fact that in this case the air is enclosed by the walls of the aircraft carrier does not alter the physical laws governing the situation, but the model fliers now are moving along with the air and so they can understand more easily what their models are doing. If there were any mysterious effects of kinetic energy or momentum caused by the general passage of the air of the sea, the model fliers would notice these. No such strange anomalies arise. Even though the air is moving just like the wind does, no changes of trim or control whatever are required to fly turns and circles.

If anyone still hesitates, it is not necessary to have an aircraft carrier to prove the point. A ferry or river steamer, a train compartment, a bus, truck or tram, any moving vehicle with cabin space enclosing a sufficient parcel of air, will do. Flying small model aeroplanes inside such spaces is quite feasible if you don't mind being made to dismount at the next stop. Children can, and sometimes do, fly paper gliders in airliners at 40,000 feet flying at 550 knots. If correctly trimmed, the models fly towards the nose or towards the tail of the moving aircraft, equally easily. They are not torn to shreds and buffeted hugely as they turn to fly 'upwind' and 'downwind' in the moving air. It is easily shown that the motion of the air as a whole creates no trimming problems or out of balance forces whatever in turning flight.

It happens that while the Fartherstill is sailing, there is a wind over the sea of 20 knots and the ship happens to be going at 20 knots, at exactly the same speed and direction as the wind. On deck, since the ship and the air are now moving along together, there is no breeze. Flags hang straight down from the masthead. The captain, in a mischievous mood and knowing that some elderly modellers are confused about the effects of the wind, slyly opens the roof of the hangar and, using the huge hydraulic lift, raises the entire model contest slowly up to deck level. Emerging thus into the open, the grey beards, to their surprise, feel no

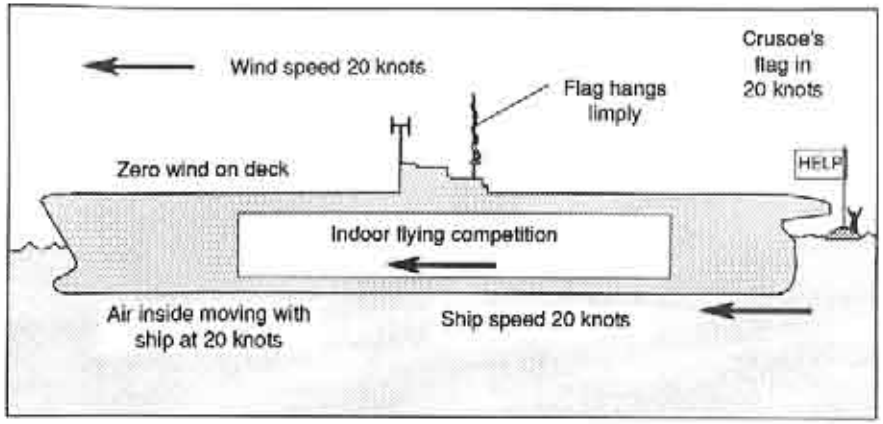


Figure 17 Flying in an aircraft carrier

more wind than they did below decks. All is calm where they stand. Their models can be trimmed exactly as before, to fly circles in the air (and so they avoid going over the side). They are flying in a 20 knot wind! But because they are travelling with the air, they have a good understanding, at last, of the way their models behave.

(Some few years ago, after I had used this argument in another magazine, I heard from Bill Hannan that in his U.S. Navy days he did actually fly models both inside and above decks on a navy carrier. It works exactly as my imaginary story indicates.)

To Robinson Crusoe standing on his island as the ship charges by, the scene will look very different from the way it does to the model fliers who are going along with the wind. Crusoe, having been stuck since 1719 and not having with him his collected edition of Isaac Newton's works, might think that trimming the models to fly towards the bow, 'downwind' from his point of view, would be very different from trimming them to fly towards the stern, 'upwind', as he sees it. He might expect to see them pitching up and down as they turned this way and that. Of course this is quite wrong and any instructions he might shout (apart from "Save me!") should be ignored.

A large mass of air moving relative to the surface of the earth is a wind. All the same conditions apply in a wind as would apply inside the moving hangar of the carrier or on the deck of a carrier which is moving along exactly with the wind. The only difference for us is that we stand on the land like Crusoe, while the model is flying in a body of air which moves along.

The only way to fly correctly is to think of the air flowing over the aeroplane and the forces generated by that flow. That is what the professional pilot does.

Tethered flight

One cause of the old fallacies may be that older generations of model pilots were brought up with control liners before reliable radios were available. It is probably already clear that a control-line powered model differs in all these respects from free flight or radio controlled aircraft.

The control-liner flies a circle which (neglecting relatively small movements by the pilot) does not drift, like the balloon basket or carry the air along like the U.S.S. Fartherstill. Forces are communicated from the ground, via the pilot's handle and the lines, to the model. It is not necessary to bank the model to turn, because the required lateral acceleration force comes from the lines. The model is compelled to follow a circular path over

the ground irrespective of the wind.

The wind blows **through** the flight circle but the model is tethered, so it cannot maintain a steady airspeed. Controls have to be used to correct for upwind, downwind and cross wind segments of the flight. On the upwind side the crosswind tries to blow the model in towards the centre. If this is sufficient to make the lines go slack, control is lost. To prevent this, control line models frequently have offset fins or rudders to yaw them outwards, or some other means is used to keep the lines taut. (Inertia - centrifugal force - may be sufficient if the model's speed is fast enough.) On the downwind part of the circle the model picks up speed relative to the ground (not airspeed). When turning into wind as the model continues round the circle, because of the extra velocity gained on the downwind side, the airspeed does rise. If uncorrected, this will create extra lift and the model will surge up. To keep it flying level, some down elevator is required. On passing round again downwind there will be a corresponding loss of airspeed, lift will be reduced and the model will sag if not checked. And so on.

The mistake so often made is to think of models flying free of the ground, as if they were tethered. ■

Figures 15 & 16 below reflect corrections. Please see RCSD, June, 1992, page 7.

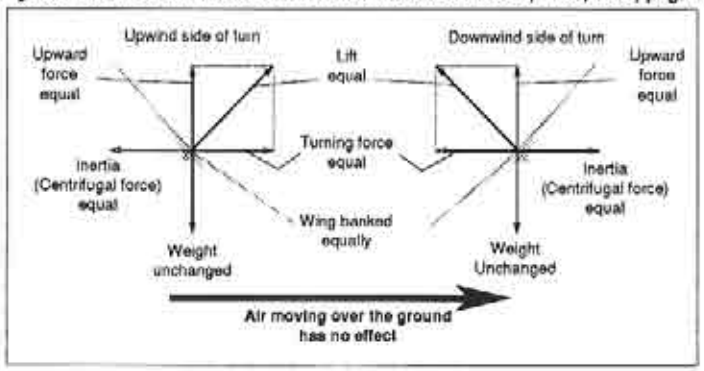


Figure 15 The forces on an aircraft in a correctly flown turn

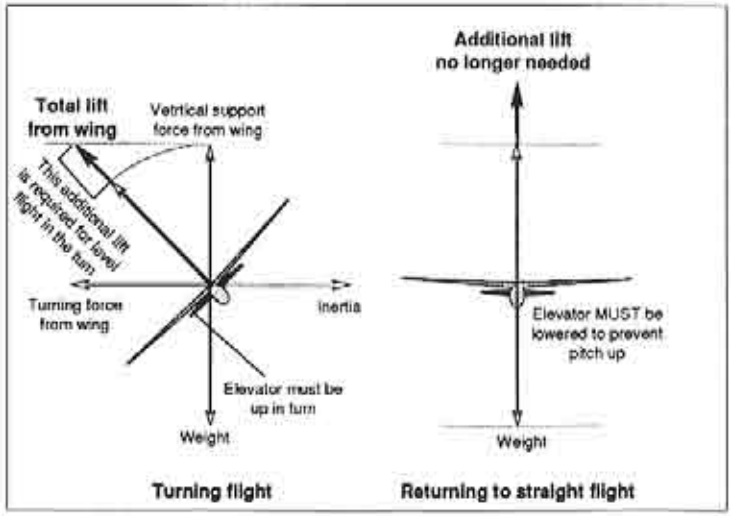
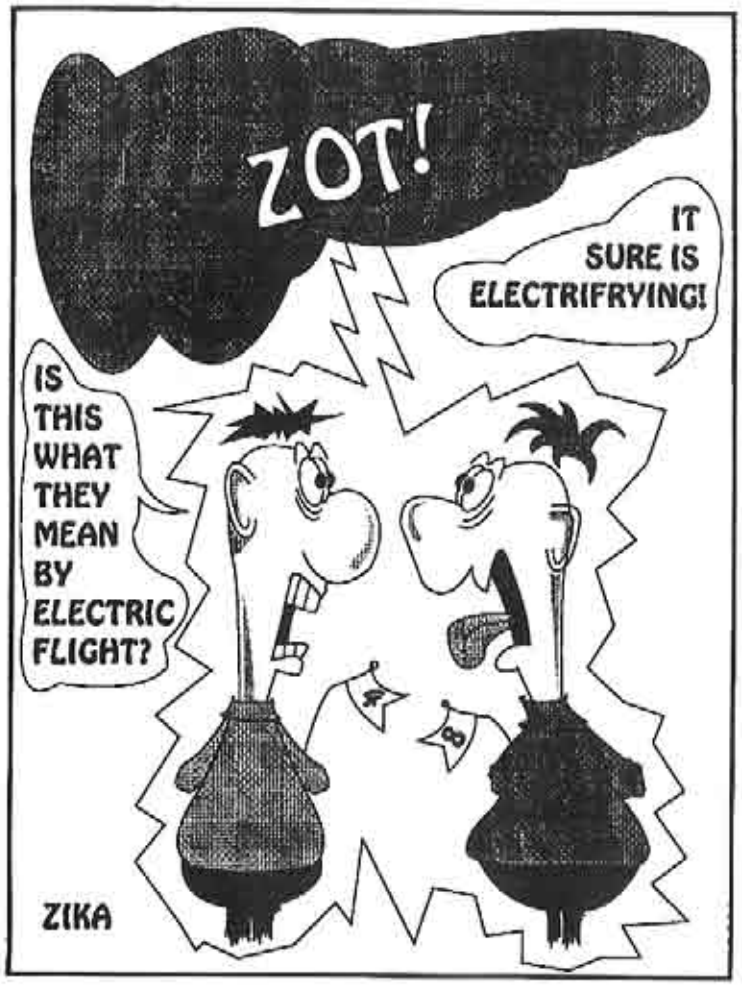


Figure 16 On leaving turn, elevator must be lowered: nothing to do with the wind direction



LIFT OFF!

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

Chuperosa HLG

A few months back I said I was working on a design to electrify a Chuperosa for Mel Culpepper of Culpepper Models and Sal DeFrancisco of Northeast Sailplane Products. The idea was to produce a kit for the flyer that did not want an expensive high tech electric sailplane. Well, it took a little longer than I thought, but the result was worth the time and effort.

Over a year ago, I converted a polyhedral Chuperosa to electric and found that it flew very well. In fact, I still fly it today. See RCSD September, 1991 for a picture. Both Sal and Mel knew this and asked if I would go a step further and help develop an aileron version with a more appealing and functional look to the fuselage. (The first one I did a year ago just had the nose of the hand-launched Chuperosa cut off and a motor installed - not very pretty.) Not knowing what I was getting into, I said, "Yes."

For any of you thinking of designing and building a prototype, be prepared to build more than one plane. You will never know whether you have the right combination of weight, power, airfoil, moments and so on until you have tried different versions. In my case, counting the early Chuperosa of last year, and the new versions of this year, I've built 6. The advantage to this is that the consumer will get a plane that has been thoroughly tested. It was very important to Mel and Sal that, before they offer a kit to the public, the very best combination of design, flying characteristics and quality of material was tried and proven. It was nice to see their concern on the quality of the finished product before putting the kit on the market. Unfortunately, this is not always the case. Over the years, I've built a few planes that made me wonder if they were ever flown before they were produced.

Building prototype models doesn't come without some risk. The first electric prototype I built folded the wing on the first flight. I tried to build the wing too light. (The kit will come with carbon fiber to reinforce the wing.) On another one that I built, I could hardly install or remove the batteries. (The kit will have a hatch on the bottom of the fuselage for battery maintenance.)

After all the building, crashing and rebuilding, I think that the end result makes a fine intermediate electric sailplane of high quality at a reasonable price. The final Chuperosa E will use the SD7032 at the root transitioning to a SD7037 at the tip. The wing will also be an aileron version. All up weight will be in the low to mid 30 oz. range. The Chuperosa E was designed to use an Astro Flite .035 motor on six cells. On my prototype I used the Astro Flite .035 on six 600ma batteries and a Futaba receiver speed controller combination.

Construction is straight forward for anyone who has sheeted a foam wing. As with all Culpepper models, the instructions and plans are excellent as is quality of the wooden hardware. One neat feature is that the Chuperosa needs only three channels to operate the ailerons, rudder, elevator and motor. The ailerons and rudder are coupled by small Sullivan cables. What this does is to reduce the weight and save the expense of buying a more sophisticated radio. Personally, the next one I build will have a servo for each aileron. I want to experiment with differential and, maybe, try spoilerons.

Flying the Chuperosa E should be no problem with some aileron experience. Make sure to follow all the instructions and pay particular attention to keeping the plane light.

If you are looking for a good performing, small field, inexpensive electric plane of high quality, try the Chuperosa E.

Call Sal at Northeast Sailplanes for availability and price. I believe the price will be about $79.95 and available in about a month. Northeast Sailplane Products, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482.

Flite Lite Update

As you will read in the press release in this issue of *RCSD*, Mark Allen of Flite Lite Composites has sold his business to Ron Vann. After about two years of talking with Mark on almost a daily basis, especially during the development of his electric planes, when I was doing some test building and flying for him, it's going to be strange not to hear him answer the phone. I do think that this is going to be a very good move for everyone. Mark, Ron, and Flite Lite can only benefit from this move. Mark will spend his time designing and testing prototypes in both sailplanes and electric sailplanes, while Ron will be doing the manufacturing and distribution from his new facilities.

Mark told me about some of the new planes he will be developing. Watch for them in future issues of *RCSD*. Ron is already working on having all Flite Lite planes in stock with plans and instructions for immediate delivery. The three month wait for a Falcon is, hopefully, now over.

I, and I'm sure any of you who have dealt with Mark and Ron, wish them the best of luck. Flite Lite Composites, P.O. Box 311, Windsor, CA 95492; (707) 838-9020.

Gliders of Knottingham

I have been getting *Silent Flight* magazine since it first came out in the autumn of 1991 and can highly recommend getting it. *Silent Flight* is the English version of *RCSD*, dedicated to only gliders and electric power gliders. To order *Silent Flight*, get in touch with Owl Publications. (See ad in this issue of *RCSD*.) In the Spring 1992 issue of *Silent Flight*, I saw an article on a new hand launch plane by Graupner called the Benny that also has an optional electric power pod. I wanted to find the Benny, but could not find one in this country. Just when I was about to give up looking, I noticed, in the ad on the back cover of *RCSD* for Gliders Limited, that the Benny was listed. Having heard of the horror stories about trying to order planes from a foreign country, I almost didn't call. But I did, and I'm glad I did! Gliders Limited service was very fast, friendly and professional. I do not know about dealing with other foreign countries, but dealing with Gliders in England was easy and in some cases easier and faster than dealing with some companies in the U.S.A.

Brian Scott, the owner of Gliders and a top English pilot, made placing my order easy. All you need to do is call or FAX Brian with an order and give him a credit card number. In my case, I first called to get a list of items that Brian handles. I then FAXed him an order and in less than two weeks I had the Benny and the electric power pod delivered to my door.

Get *Silent Flight* and look through their ads. I think you will find many items that are not available in the U.S. If you see something you like, give Brian a call and I think you will be surprised to see how easy it is to deal internationally.

When I finish the Benny, I will do an article of the results in *RCSD*. I also received from Gliders a Robbe Arcus and will report on that, also.

Good Flying!!! ■

Soaring With Ballast

...by Bob McGowan
Fremont, California
(This article originally appeared in the Silverado Soaring Society newsletter, Spring 1992, Napa, California. ED.)

Adding weight to your sailplane will give you a great advantage during certain weather conditions. Most experienced pilots recognize this fact but many still hesitate to add the lead even in the face of 20 mph winds. There must be a little voice in their subconscious saying "heavy planes sink...light planes float". There's some truth in that, but the reality is that anything floating in a 20 mph wind is going to be landing in the next county.

This is how ballast works to help you: Increasing the weight of your sailplane causes it to fly faster. It's like rolling a volleyball and a bowling ball down a hill. The heaver bowling ball will gain more speed and win the race. A ballasted sailplane will make its downhill glide faster than it could dry (unballasted). In theory, the added weight would not effect the glide slope (within a reasonable range) - This means you will cover the same amount of ground, only faster. Here is where the "light is right" crowd say, "Ah ha! Covering the same ground faster means you'll be on the ground sooner." No one can argue that fact, at least not a calm day with only light lift and mild sink. Throw some strong sink into the equation and a slow ship could be on the ground before it escapes a big patch of sink. As the wind goes up, the advantages of adding lead really becomes apparent. You have the penetrating power to search for lift up wind. Even more important than that, after you've found a thermal and have drifted downwind with it, you'll have that extra speed potential needed to penetrate the wind back to the field.

Knowing how much ballast to add and when is a big problem. Prior experience is the best way to decide. When you're out sport flying and the wind starts to blow, don't pack up; ballast up and experiment. If you don't have personal experience to draw on, you can always ask your buddy what he did for his flight. If he says, "I added a pound," beware; he could be trying to confuse you with useless information. You need to know wing loading (ounces per square foot of wing area). If he tells you in these terms then you have a useful observation. Ask him if it was too much or not enough. Of course, to put your buddy's comments to use in your pre-flight decision, you'll need to know your own plane's wing loading dry and have a chart handy that will tell you the wing loading at various ballast amounts.

Every plane will react differently to ballast; every pilot flies with varying degrees of aggressiveness. This must also be considered as you analyze the information acquired from your buddy. Let's say the wind is blowing about 10 mph. If your game plan is to come off tow and hang with your nose into the wind then you might as well be dry. On the other hand, if you're a little more aggressive and figure you would drift downwind with a thermal if you were fortunate enough to stumble upon one, you'd be wise to carry weight. If you're the type that plans to put the nose down and really search, then you need to carry enough weight to get you moving significantly faster than the wind speed.

Every plane handles the weight differently, so you need to experiment and find out how yours will react (or find a buddy who flies the exact same design). If your plane is on the light side, experiment by adding a small amount of lead even for very light wind conditions. Not only will it make you a little faster, it will also help keep you on track as you get hit by wind gusts on landing approach. Of course, the stronger the wind, the faster you need to fly. The faster you need to fly, the more lead you add. Eventually you will reach a point where the plane's glide ratio does start to noticeably deteriorate. Ballast beyond this point is usually fruitless. Draggy floater types will reach this point at a lower wing loading than the slick high performance ships. Once you determine this point, you'll know the complete window of loading available to you.

I know; I keep beating around the bush and you want real numbers. You want to know exactly what wing loadings will work. I'm probably going to regret this, but for the sake of our rank beginners who are probably still completely in the dark, I will risk embarrassment and give my opinion of some rough ranges to start experimenting within. Keep in mind that I really don't even know the exact answers for my own plane... There's still a lot of guess work involved. A Gentle Lady type two meter plane will probably only benefit from ballast up to perhaps 9 oz./sq. ft. With a light plane like that you must consider structural integrity as well as aerodynamics; a stronger two meter with a faster airfoil like a Sagitta 600 will probably fly well up to about 12 oz./sq. ft. A big ol' Paragon with its draggy high lift airfoil should probably not be ballasted beyond about 11 oz./sq. ft. A polyhedra Sensor 117, maybe about 13 oz./sq. ft. The new breed of ships such as the Falcon 880 or Legend may benefit up to around 15 oz./sq. ft.

I hope I've convinced you to try a little extra weight. Now you need to figure out where to put it. Ballast, usually in the form of lead, needs to be secured directly over the center of gravity. Anywhere else and you are changing the trim of your airplane as well as ballasting. There are enough ingenious ways of mounting ballast to fill another article. Let me just say that the main thing is to make sure it will not shift during takeoff or hard landing. AMA competition rules state that the ballast must be inside, but for practice you can always tape it on externally.

To make a noticeable difference in the way your plane flies you'll need to increase the wing loading in increments of about 1 oz./sq.ft.; any smaller than that won't change things significantly. Unless you really build heavy, you should probably consider adding some ballast in winds above 8 mph.

Go give it a try! ■

Ten Reasons You Shouldn't Ballast

...by Ray McGowan

1. It's heavy to carry in your tool box.
2. You could get lead poisoning handling it.
3. It could break loose and change your C.G.
4. In a crash it smashes everything on its way to Terra Firma.
5. People will ask how you penetrate in windy weather; that could be embarrassing.
6. Lead is getting expensive and hard to find.
7. It's just another thing for lazy people like us to figure out.
8. It could help break wings; I don't need extra excitement.
9. Extra work to install ballast box or tube, and I am in a hurry to fly, not build.
10. You might win a contest and get pushed up to Expert Class.

F3J, I believe it should be for the "birds"! And a lot more fun doing it that way!

...by Alvin Sugar
121 Lewisville Ctr., Suite 237
Lewisville, Texas 75067

Now that F3J is an official event, how does one go about correcting the rules to make it really interesting? Let me give you a detailed analyses of my experiments in low altitude launching so that you can see where I am coming from.

There are two thermal universes available to the RC sailplaner 700 ft. AGL down, and 700 ft. AGL up. Please understand the 700 feet is not an exact number but the center of a band of numbers that is effected by weather conditions and the typical change in altitude that occurs by the exposure to lift for a three minute period. This is the area where small thermals poop out. It also is the base for the large thermals to grab your machine and go for it. Occasionally this diffusion band does not exist and lift works from the ground up. Soaring birds run around in the lower universe like kids scampering on monkey bars, whereas full-size sailplanes stay in the upper world for good reason. It is amazing that man's ego won't allow him to accept his earthbound plight and when the knowledge of flight is acquired he reaches for the stars instead of the closer world of the birds. Thermals are one reason for the altitude split, the other is wind gradient. Windspeed doubles in the first 2000 feet of altitude so a constantly changing universe is required to handle this situation. High tech sailplanes are right at home at the upper altitude; their sheeted foam wings are spectacular in performance. As they get lower to the ground a little more flap is nice, however things get heated up when down to 200 feet AGL...time to enter landing pattern.

When I flew Nordic glider, it was at the very start of interest in America. 100 mtr towline was used to make three minute flights; that was the task. When that became easy, the launch was reduced to 50 mtrs. After my tantrum subsided, I improved my design to discover that the experts were right! I did get my share of some "hardware", though physically impaired ...too fat, and learned to love this event. Now the stage is set for heresy! My 10 foot Mirage, with its thick semi-symmetrical turbulated spar airfoil, and geometry of 15 to 1 AR for an area of 6 square feet will turn tighter and sink less than my Nordics of yesteryear, and still make it home in winds up to 20 mph. Now playing with dihedral, moment arms, stab and rudder areas to properly damp the wing for frantic short time thermal search I have developed a primitive model for the universe that I am seeking...100 mtr LAUNCH!! Now this is intriguing because I'm controlling this sailplane that now can work lift much better than a brainless Nordic Glider (I hope). If the size of the sailplane is restricted to 6 square feet and the geometry is left to the designer I can see the future directions of design evolution. Picture a 2 1/2 pound sailplane with an aspect ratio of 20 to 1 built by a master, not me, that utilizes a FX 63-137 or SD 7062 in a bagged wing that incorporates inboard ailerons that work in harmony with the tip dihedral to accomplish the roll rate necessary. With the structure lightened to handle the lower launch forces, that would be the ultimate low launch machine that would make me drool with desire.

America initiated classification of size by wingspan. This is probably the reason evolution followed the path of low aspect ratio sailplanes. Area is needed to lighten up the loading and improve Reynolds number. Airfoil perfection became important thus geometry had to compromise in order to gain a peak in machine performance that became tighter and tighter until we have lots of look-a-likes. My outlook is very different; I am saying that geometry of the design has a greater effect on performance than airfoil perfection, and that airfoils should be used like gears on a car for a pilot to choose his desired performance after he has accomplished his geometric program of efficiency that matches the universe he intends to utilize.

May I make this simple suggestion for a launch system that would benefit everyone? Instead of dimensioning the launching equipment, put a maximum force limit on the launching devices other than hand tow (i.e., 15 lbs force) and dimension the launching surface. 100 meters, 328 feet, or 131 paces if totally crude, will be the length and limit of mobility on the launching surface. One can use a stretched out high start, a winch, hand tow with a second helper, or hand tow by the flier, without a helper...whatever pleases him/her. Remember, if you hand tow, you are not allowed to operate beyond the limits of the 100 meters. This means if you think your team can find lift in less than 30 meters, use 70 meters of line and circle tow to your hearts content...within the limit of work time, of course. Picture this scene: 6 contestants on the launch field watching their thermal sensors in the sidelines. The start horn blasts, and the launches start when each of the contestants become confident of their chance to max out by reading bugs, drifting fluff, birds antics, or their thermal sensors reaction to the air. All their sailplanes are in the air before the horn sounds again announcing the end of the round. The spectators are now watching a contest where the action is much closer because of the 100 meter launch, and become more involved with the jousting that occurs with the experienced glider guider wrestling an invisible thermal who's effects are noticed as the sailplane gains altitude. This is the energetic world of soaring that I have learned to love. Yes, breaking out into the upper air, and climbing over 2000 feet is fun, but that should be treated as "dessert".

Let me end on a philosophic note. In the upper air the full-size sailplanes will always be king; however, once you tangle with the mighty hawk in his world, and win (!), you realize that man with his aerodynamic toy is the MASTER, though handicapped by being earthbound. ■

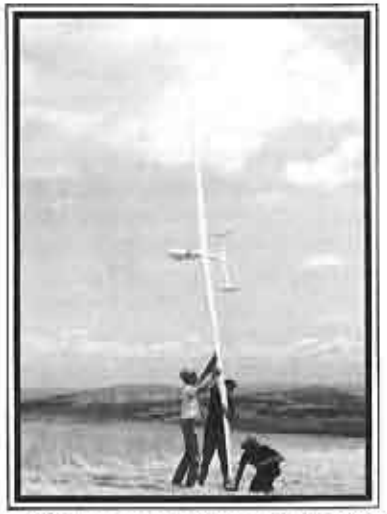
Ridge Writer

...by Wil Byers

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

The Slope Scene at the Washington Fun Fly

Hal Weber, Darryl Ford, Ed Mason and Larry Decoux display their B-29 that also carries the now famous X-1. This model has flown exceedingly well. It uses a Selig-Donovan 6060 airfoil. The X-1 flies well also, but is quite fast. The model needs about 20 mph of wind to stay aloft.



The biggest model of the event was Gary Brokaw's Austria "Elephant" with a wing span of 25'. It weighed 29 pounds and had a wing loading of 18 oz./sq. ft. It wasn't able to fly on the slope, but it did winch launch successfully a couple of times. It was both spectacular and very realistically scale in the air.

Gene Cope's Lear 77 power sloper (PSS). Unfortunately, there was not enough wind to fly any of the PSS ships at this year's Scale Fun Fly. However, the Lear does fly super, though.

Eric Eiche here displays his museum quality Fafnir. He also built this model from his own plans. The model is built of balsa that was stained to look like Birch ply. It has a wing loading of 16 oz./sq. ft. The pilot of the model was built so that his head would turn when the rudder was moved.

Steve Hinderks came with one of the most unique models of the event. It was a small emerald green Toucan. Model has a span of 40.7", weighs 16 oz., and has a wing loading of 14 oz./sq. ft. It uses an E168 airfoil. This kit is available from Steve at 307 Canham Rd., Scotts Valley, CA 95066; (408) 438-8066.

Pete Marshall displays his highly modified P-51 Dago Red. This model grew out of a Penetrator. Goes to show what can be done with a model to make it scale-like if someone wants to. (Below)

Ken Stuhr loves the Northrup YB-49. So, he scaled down the model to 72" in span. It was built utilizing foam cores that were sheeted with 1/64" plywood. Finish was silver monokote.

Jeff Breece flew his Northrup Trainer in the light lift that existed. His model replicates a 1931 vintage trainer. It has a span of 72" and is built of balsa and spruce.

Doug Chaney (L) and Patrick Kelley (R) shown off Doug's Tucano. This model was very impressive. It uses a SD6060 airfoil, has a 74" span, and sports a 32 oz./sq. ft. wing loading. They may kit this PSS model in the future.

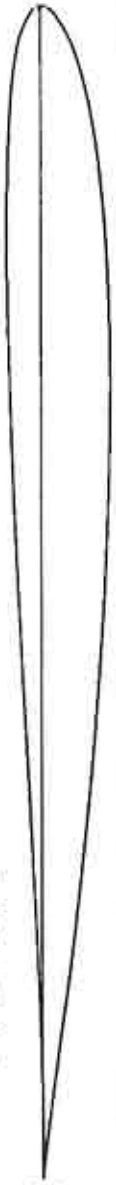
Greg Neveu is launching his Graupner Discus 4m into very light lift. It has 1162 sq. in. of area and is available from Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37027.

Randy Holzapple flew his Schweizer 1-26. Built and rebuilt from plans, it has flown in all of the scale fun flys and still looks new.

John Raley's PWS-101 was built from Martin Simons plans which are available from B^2 Streamlines. Note the fellow sitting in front of the model having a brew!

SD8000

NO	X	YU	YL
1	0	0.000	0.000
2	1	1.456	-1.112
3	2	2.091	-1.591
4	4	2.998	-2.113
5	6	3.635	-2.429
6	8	4.120	-2.639
7	10	4.510	-2.782
8	15	5.204	-2.979
9	20	5.628	-3.024
10	25	5.874	-2.978
11	30	5.986	-2.870
12	35	5.990	-2.716
13	40	5.903	-2.527
14	45	5.736	-2.311
15	50	5.496	-2.070
16	55	5.189	-1.812
17	60	4.818	-1.544
18	65	4.387	-1.274
19	70	3.897	-1.005
20	75	3.347	-0.742
21	80	2.735	-0.494
22	85	2.060	-0.275
23	90	1.338	-0.098
24	95	0.612	0.014
25	100	0.000	0.000



Airfoil of the Month

The SD8000 section has become quite popular with the models used for racing and those that demand penetration. It is therefore well suited to slope ships. This section is not, however, the choice of proficient aerobatic pilots. On the other hand, if you want a section to carry a load of ballast and to do some high speed cruising, it is not a bad choice at all. ■

Pete Bechtel of Windspiel Models is launching his 1/4.5 ASW-20 from Fiber Glas Flügel Unlimited. This model and its bigger brother, the ASW-20 1/4 scale, fly exceedingly well, even in light air. They also thermal like homesick angles on the Quabeck airfoil. Span is 3.6 m, area is 59 dm^2, aspect ratio is 22, and the wing loading is about 65 gram/dm^2.

Eric Eiche's beautiful Kranich 1/4 scale model. Eric built his model using plans that were scaled up from a 3-view. He found the 3-view in a book titled "Vintage Sailplanes" by Martin Simons which is available from Kookaburra Technical Publishing, P.O. Box 648, Dandenong, Melbourne, Victoria, Australia.

Construction & Flying - The Reiher

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

February 22, 1991

The Reiher wings are coming along slowly!*?*!!—!! Those scale dive brakes are a real pain in the you-know-what to get set up right! All this has to be done before the top sheeting is fitted (the bottom sheeting has to be fitted first) and then the top brake has to be glued to the arms so that both top and bottom brakes open the same amount, and also close flush together. Not easy!! However, the satisfaction of achieving this is immense.

As you can see from the photos, a building jig is essential if you wish to build the wing panel in one piece instead of two. This makes for a far stronger wing and also duplicates the curve of the full-size bird. However, it poses a few problems. The spars have to be steamed (over the spout of the kettle) to shape before-hand as does the sheeting. In the photo, the top sheeting is pinned in place after having been steamed, but is **not glued** at this stage. Once pinned in place, the sheeting is liberally wet with ammonia. (That's why I'm doing this out on the lawn!!) This is done several times to ensure complete saturation before allowing it to dry for 24 hours.

After it has dried, the top sheeting (the bottom can be done in one piece) is trimmed to shape along the centre of the main spar and then glued in place. Incidentally, I use one of the aliphatic base glues that doesn't set too brittle for this job. Also, the sheeting to the tip is done before gluing the top L.E. (leading edge) sheeting in place.

As soon as the sheeting is glued and pinned in place, the wing is pinned to the board. (It has to be packed up on 1/4" thick strips to clear the aileron linkages.) Once more, the top sheeting is saturated with ammonia. This will relieve all the stresses and leave the wing true. Other than fitting the top dive brake, the rest of the wing construction is fairly straight forward.

When I finish the wing panels, I'll build the tail feathers and work out a method of attaching them to the fuselage.

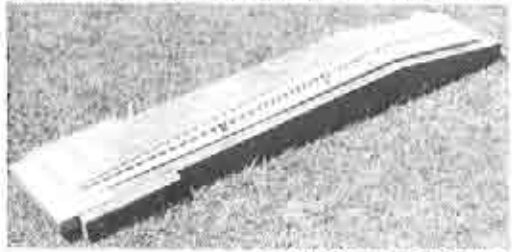
I bought the Ace Micropro 8000 retro-fit kit for my Ace Silver Seven Tx, but ran into some problems with the programming. I finally tracked it down, after a couple of calls to Ace, to a broken connection internally in the aileron pot!! The break had been intermittent and I finally tracked it down when it went permanent. I had to pack the unit off to Ace, as I couldn't buy a suitable pot here.

June 5, 1991

"Reiher" Tail-feathers

Well, I've finally found time to do some more building on the Reiher!

I started on the tailplane/elevator thinking that a couple of days, at most, would see it completed so I could progress to mounting the wings on the



fuselage. Ha, ...Ha!

It took over a week to build the complete set of tail-feathers and fit them to the fuselage! Once again, the plans showed incorrect geometry for the hinging of the control surfaces!

The hinge line shown on the plans does not allow for the fact that the **spars taper from the root to tip** and, consequently, the radius of the hinging point changes accordingly. The spars of the tailplane and elevator taper from 5/8" (approximately) deep at the centre to 1/4" at the tip, but the radius of the hinge line is shown as 5/16" at the centre and **the same at the tip**, instead of 1/8". Fortunately, I discovered this before it was too late and managed to rectify it on both the fin/rudder and tailplane/elevator construction.

Then, I found another problem! The width of the fuselage at the rear was almost twice that of the rudder king-post! Naturally, Stupid didn't discover this until **after** he'd built the rudder! So, out came the trusty razor saw, one of my most-used tools!

I cut out the moulded-in platform and replaced it with a new 1/8" ply one of the correct width. (See sketch 1.) This was glued in place with 24 hour epoxy while the fuselage sides were firmly clamped in on it. The lot was allowed to set thoroughly. This, of course, applies to the G.R.P. fuselage that doesn't have the fin incorporated in the moulding.

Anyhow, the rear end is now completed and the next move is to install the control runs. I'll use a closed loop system for the rudder and a push-rod for the elevator.

June 23, 1991

I have it in the back of my mind that I might not have put on paper the problem I had with the tail-feathers on the "Reiher", so here goes.

I guess that when starting out, designers of aircraft - both model and full-size - in the past had two options:

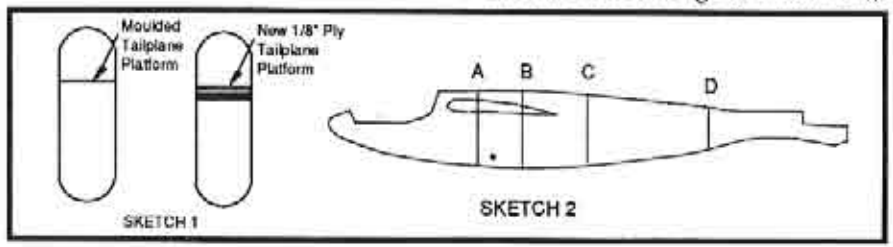
1) Lay out a detailed set of plans of the proposed design, build from them and modify the drawing later as faults/problems were found and then rectified.
2) Lay out a rough sketch or two, build the aircraft, and then do the detailed drawing.

Well, I feel that the designer of the Reiher must have opted for system 2! Fortunately, after getting caught with the dive brake geometry, I was suspicious and, lo and behold, the hinging geometry of the sailplane/elevator and fin/rudder are shown incorrect!

For example, the rudder is 5/8" wide at the base, which means a hinge centre 5/16" in from the front of the rudder post at this point. However, the plan shows the hinge point for the **top** of the rudder 5/16" in from the front of the rudder post - **the same as for the bottom** instead of 1/8" in from the front of the rudder post! (The top of the rudder is only 1/4" wide.) The same applies to the elevator hinges so, "Let the builder beware!"

Well, "Ol Stoopid" did it, again!!! One of the most finicky jobs is setting up the wing joiners accurately, and those for the Reiher are no exception!

After carefully fitting a couple of 1/8" ply bulkheads by the "cut and try" method in the rear of the fuselage (See sketch 2.), I



set to fit the wing rod tubes in the fuselage.

In the sketch, C and D are the rear fuselage bulkheads that stiffen the rear fuselage where it is likely to be handled as well as supporting and stiffening the control runs (Sullivan make for the elevator, plastic tube for the antenna, and plastic tubes for the closed loop system for the rudder). They are glued in place with 24 hour epoxy. Bulkhead B is for the rear wing joiner tube and was done first, after being carefully lined up with the wings in place. After this was dry, the front one was fitted and set in place and then epoxied with the wings fitted.

Well, my workshop is **very** cluttered and, with the 129" span wings in place and the fuselage standing on its tail and leaning against the wall hence, room was at a premium! This is where I then had an attack of Stupidity!

After knocking the set-up over 3 times during the day, I decided that it was O.K. to carefully remove the wings as the epoxy, by this time, half set.

Then, when I went to reassemble the wings next day, surprise, surprise!! The bulkhead had sagged 1/8" before setting and I had to destroy it to remove it and then fit a new one!!

Moral: There are NO SHORT-CUTS!!

Anyhow, the wings now fit and only have to have a 3/16" thick false balsa rib glued to the fuselage fairing to be sanded to the correct angle to make the wing/fuselage junction nice and flush but, before this happens, the **whole** fuselage has to be lightly sanded with 320 grit wet & dry paper to remove any traces of release agent and give a good surface for the paint to key to.

At this stage, I decided that the model needed a full-length pilot, so I bought a D.G.A. 1/6th scale pilot - another mistake!

I was most disappointed with the pilot kit, as I found the instructions for making the pilot and his clothes very difficult to follow and, in some cases, misleading. My wife is very good at sewing and even makes all her own dresses, etc., but even she could not follow the directions and the part-finished result was so disappointing that I packed it up and sent it back to the manufacturers with a few comments and suggestions. (It took me the best part of 3 days work to get to this stage!) I hope to eventually get a reply and will comment on that in the future.

Reiher rudder under construction. Note 1/16" sheet balsa core (to stop warping) and 1/32" bamboo edging. Tail mounting of the "Reiher" (above), has velcro strips to hold fairing in place.

July 28, 1991

The Reiher is now ready to have the radio installed, the control horns finished and the canopy done. Then I can cover and paint it.

October 10, 1991

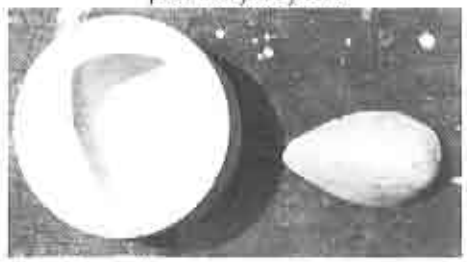
I'm back on track again with the Reiher and am now trying to sort out the canopy fitting and attachment system. When I get that done, the bird will be ready for covering and painting, but I always like to take a photo or two of the "bare bones" of nice models before I cover them.

November 8, 1991

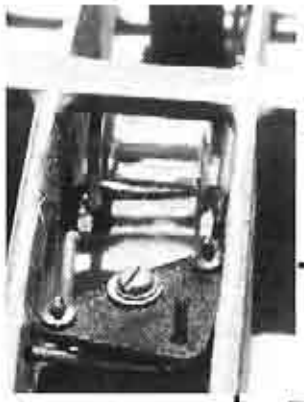
Yahoo!!! The Reiher is finished, at last!! It looks bloody beautiful, too!!! It will be test flown on the slope at Catherine Hill Bay in two days time!! I'll hold off posting this until after that and will send photos of the flight, later. Now for the final chapter of the kit review.

Cabin area with radio gear and removable pilot and false floor.

Dive brake linkage.

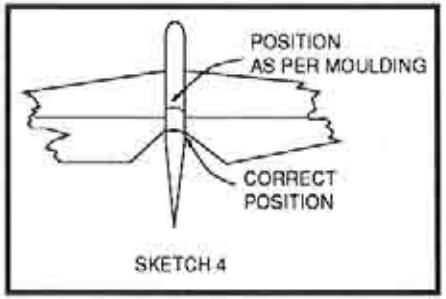


Plastic "plug" that was moulded in the nose of the "Reiher" and the female mould (plaster) made from the "plug" into which the moulten lead was poured to make the nose weight.

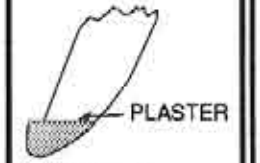


Blue tubing is "snake" tube for aileron pushrod.

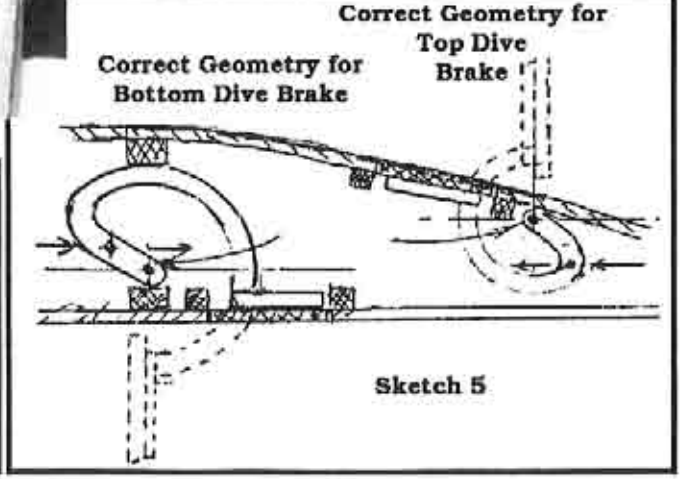
Final assembly of the components and the installation of the radio and servos was straight-forward but, because of the short nose moment, I decided to mould the nose-weight in order to get it as far forward as possible. I applied a liberal coating of petroleum jelly to the **inside** of the nose, mixed up some casting plas-



SKETCH 4



SKETCH 3



Sketch 5

ter, poured it into the nose and let it set with the fuselage propped up at an angle. (See sketch 3.) When the plaster was thoroughly set, I removed it and left it in the sun for a couple of days to thoroughly dry out before coating it with petroleum jelly and using it as a pattern to make a female mould in casting plaster. This mould **must** be thoroughly dried out before pouring the molten lead into it! I left mine in the sun for a week and in the workshop for further 3 weeks before pouring and **still** had a slight bubbling of the molten lead due to water in the mould converting to steam!! I do not recommend drying out initially in an oven, as this will crack the mould, but this could be done after a couple of weeks normal drying out.

The resultant lead weight was then epoxied (24 hour) in place after scraping the inside of the nose to expose the glass fibres so as to get maximum adhesion. This amount of lead is more than necessary, but can fairly easily be removed with a 5/16" dia. drill and rotary burr to get the correct balance.

However, there is one final criticism!

After final assembly (fully painted, too!!), I found that the tailplane saddle (My G.R.P. fuselage, as previously mentioned, did not have the vertical fin moulded integral.) was too far aft and should have been a 1/2" further forward so that the rudder hinge line was in line with the edge of the elevator cut-out. (See sketch 4.)

However, this is more my own fault for not thoroughly checking the dimensions from the plan before finalizing the position of the tailplane. A little bit of judicious carving has "faked" it nicely, though.

The model is set up for my Ace Micropro 8000 (See Nov., 1991, *RCSD.*) utilizing coupled aileron/rudder (switched), dive brakes on the throttle stick (and full brake on the throttle preset button) coupled to elevator (switched) and elevator. All primary controls are set up for dual rate and the ailerons have differential set in them on the internal bellcranks. If I were doing it again, I'd install 2 micro servos in each wing driving direct onto the aileron and dive brake so as to be able to utilize the Micropro 8000 aileron differential facility and eliminate the installation of servos in the fuselage behind the pilot.

Another modification I've made to the ailerons is to give the inner ailerons (the ailerons are split) more movement than the outer by about 20%.

The model, as is usual for me, has been covered with polyester chiffon and doped before painting. (See Nov., 1990, page 22, *RCSD.*) The aileron hinges are polyester chiffon strips ironed on over heat-activated adhesive and work well, giving a complete seal with no gap.

Like I said earlier, I'll give a flying review later.

January 3, 1992

Well, I've flown the Reiher off the slope again and had the same problem as the first time so here's a test flying addition to the review.

Flying the Reiher

After two attempts to fly the Reiher on two different slopes, I've sadly come to the conclusion that, unless the wind is blowing onto the slope at around 20 knots, this model is best left on the ground!

I haven't worked out the wing loading, but it is fairly high and this, coupled with the high aspect ratio tapered wings, results in a vicious tip stall if the model is slowed down too much. On both occasions that I attempted to fly it, the wind was only around 8 - 10 knots and, in attempting to keep it in the air, I stalled it badly each time with resultant breakage of the nose section. This is no fault of the G.R.P. moulding, as no fuselage would withstand a vertical dive into the ground from 50 feet!

I had the controls set up with the split ailerons operated off two separate bellcranks and giving about 40 - 50% more movement to the inner sections than the outer. I also had a small amount of differential, but feel that more would have slightly improved the handling. It did, however, like a fair amount to rudder movement. But, in a stronger wind with the model flying faster, it could be reduced.

I haven't tried it on a winch launch and the tow set-up would have to be a bridle with the towhooks on each side of the fuselage just ahead of the center of gravity and about an inch below the wing. The launch would have to be fast (The wings will take it!) to prevent stalling on the line and I would recommend flat launches in the initial stages until the model is trimmed out and the pilot has developed the right launch technique.

The brief time I had the model in the air, however, showed that it will fly very well in the right conditions providing the air speed is kept up.

Because of the great chunk of lead in the nose to get the balance right, I'd strongly recommend extra uni-directional fibre in the nose to compensate for the cockpit cut-out, as the large lead weight will have a **lot** of momentum and could cause fracturing in a heavy landing. It needs weight up front, anyhow, so why not use some of the needed weight as strength? I **hate** adding weight that contributes nothing to the strength!!

June 29, 1992

I neglected to mention that I did hear from D.G.A. regarding my problems with their pilot kit but, unfortunately, I (and my wife) still am unable to follow their instructions for making the jacket. However, I have no criticism of the quality of the components and other people may be better able than I to follow the instructions for sewing the jacket. ■

Because of the problems that Bruce encountered in the construction of the Reiher, I have rummaged around until I finally found a set of the plans. The plans are actually quite accurate except for the top dive brake. The incorrect geometry for the top dive brake will be passed along to the "author", Mike Smart. In the case of the hinges, only one typical hinge point is shown because of the lack of space available.

The problems Bruce encountered were caused by the fact that the fuselage **does not** match the plans! So, the construction must be modified to account for this deviation as Bruce unfortunately discovered. When I originally made the Reiher mold (Viking Models, U.S.A.), it was constructed based on the outside measurements. I did not discover this until I began analyzing the plans. I did not take into account that the original model was sheeted with 1/8th" balsa wood and that a finished fiberglass fuselage side would be only a few thousands of an inch thick. Because of this, all of the internal dimensions changed, and the original master rudder post would not fit without some modification. Sorry, Bruce!

Regarding flying, it should be noted that the Reiher should not be flown too slow because it does have a tendency to stall as Bruce has discovered in his test flying.

If any of you have a Reiher and have had difficulty making the necessary modifications, Bruce's article should provide sufficient detail to allow you to attack the project, again. For those of you who have finished the Reiher, we would be most interested in your input and modification techniques. Jerry ■

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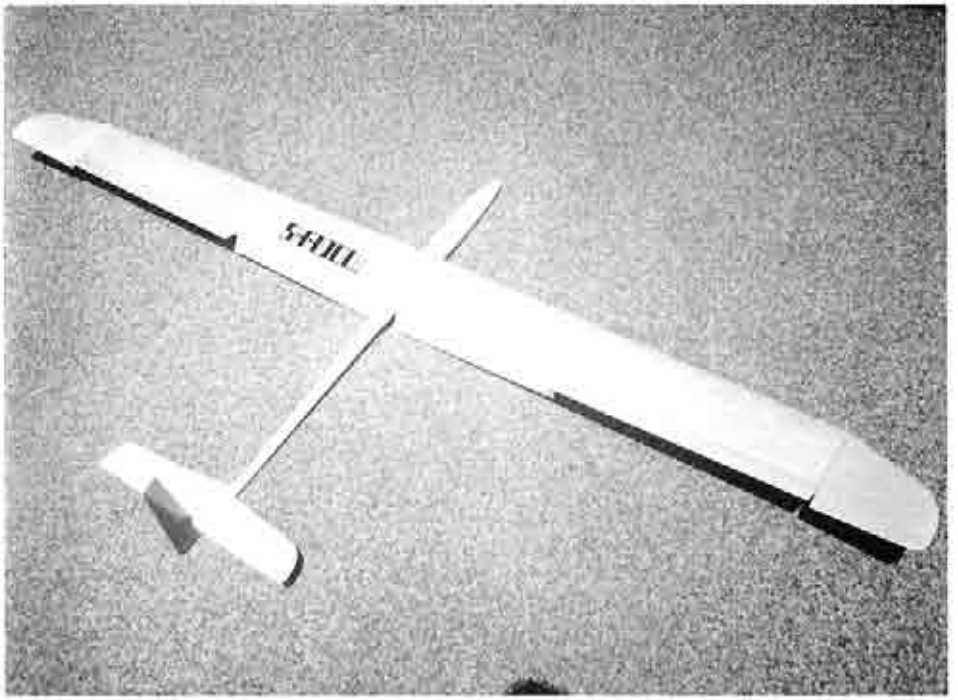

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The MERLIN

...by Charlie Levasseur
82 Healy Crescent, Winnipeg, Manitoba
Canada, R2N 2S1

It's March 31. Maybe I should check the weather forecast. Great! Tomorrow is gonna be warm with light winds. (I plug in the Merlin flight pack and the transmitter.)

It's April 1st. I'm sitting in the office and looking out the window. This is what I have been waiting for all winter. It's sunny and there is very little wind. I go home around 12:30, grab a bite to eat, pull out the high-start, and the Merlin and out I go. Darn it! Forgot my sunglasses. O.K. I think I have everything, now!

Which way is the wind blowing? It's hard to tell. Looks like from the northwest. I set up the high-start, and give the Merlin a hand launch. A minor trim adjustment is made to the elevator. O.K. Let's launch!

After three or four uneventful flights I look up to see an eagle circling overhead. Of course, it's right in the sun. As I'm walking and pulling the chute back in a muddy and wet field I'm thinking, "A guy's gotta be nuts to do this. Good thing I got my rubber boots on."

The launching mode switch is on. Check rudder, elevator, flaps, ailerons... O.K. Let her go! Good Launch! Now, where is that eagle? Oh, yes! I'm in lift! Keep circling, easy on the controls, nice easy flat turns. Hey! I'm going up and up! Man, this Merlin flies nicely! I'm glad that I painted that wing tip fluorescent orange. Still climbing higher and higher.

A two engine plane flies overhead. Sure enough, I'm higher! Wonder how high I am?

I wish Brad, my flying buddy, was here. My neck is getting sore. Hold it! Where's Merlin? Whew! It disappeared in a light mist for a few seconds. Hey, this is scary. I'm gonna bring the guy down a bit. I put on the reflex switch. Boy, look at this thing cruise. Wonder how fast it's going? Still hasn't come down. My eyes are straining. I look at my stop watch. Already 21 minutes! This is what I have been waiting for all winter, and winters are looooooong in Manitoba. I fly to a different area of the sky; the reflex is still on. This bird covers a lot of sky in just a few seconds. This is fun! I'd better lose some altitude again or I'll lose the plane. I flip back to normal flying switch and give Merlin full down flap. Ya! She's coming down. It handles well even with full flap down. The turns are slow, long and graceful. Finally, I can see it well. No more guessing. Well, while I've got the height, I'll try a roll. Crank her right, down elevator for a second, and it's right side up, again. The roll is slow and smooth, but it's not a NINJA for roll rate. Let's do a loop. Wow! This is fun! I'm at about launch height, now. So, I just mess around with the controls: lefts, rights, steep banks, etc.

Time to bring the Merlin in for a landing. Funny! It's not behaving normally with the flaps down. As it gets closer, I see why. I inadvertently flicked the crow switch on. Oh, well! I set it down for a smooth landing right near the picnic table. I check the timer. 34 minutes! Not bad for Merlin's first day out in 1992! I could have stayed up there much longer.

I catch my breath and find myself wondering if I should go out again. Naw! I'll savour this one for awhile.

I wind up the high-start and bring everything in. Back to the office and a quick phone call to Brad. "Brad! Guess what? I put the Merlin up there soaring like an eagle!" Brad thinks this is an April Fool joke. "No! I'm serious!" I give him a blow-by-blow account. I wish every day was April Fool if it were going to be like this one!

Building the Merlin

I had ordered the ready bagged wings. They are incredibly smooth and perfect. I modified the elevator control linkage in order to avoid cables rubbing against each other. Otherwise, the instructions are clear and easy to follow for someone who has built a few kit planes.

I filled the underside of one wing tip with Bob Violet pin hole filler prior to painting the outboard panel fluorescent orange. Believe me, I'm glad that I did! The Merlin is hard to find when it is way up there.

I have had calls from New Mexico and Mobile, Alabama about the Merlin. I cannot say enough about it. One word of caution: the Merlin is NOT for beginners. Things happen much faster than with a polyhedral ship. I'm glad I have some experience slope soaring with aileron ships, as it tunes up the reflexes.

I must congratulate Frank Weston for his ingenuity on many aspects of the design of the Merlin. Frank keeps things simple, yet every consideration is taken in its design. The wing foil is most efficient, minimal weight, maximum strength, T-tail for aerodynamic efficiency, narrow but strong fuselage, sharp trailing edges, and everything that is required to make a sailplane perform at its peak. Yet, Frank has a knack of keeping things simple and functional.

If you want to know more about the Merlin, call me at 1-204-256-6679 any time after 6:00 P.M. C.S.T. or write to me at the address above. Better yet, order one from WACO in Maryland.

Some Facts on the Merlin

Plan Form:	Multi-taper
Airfoil:	WA001
Span:	100"
Weight:	48 oz. unballasted
Manufacturer:	WACO, 944 Placid Ct., Arnold MD 21012
Designer:	Frank Weston

Servo set-up: 4 Airtronics in the wings; 2 J.R. in the fuse.

My Transmitter: J.R. X347 PCM set up for a glider. Elevator, flap and aileron mixing switch set up for three modes: (1) Launch, (2) Reflex for flying fast, and (3) Normal flying mode.

My opinion on the performance: Best standard plane available in North America.

Thanks go to the people at Hobby Dynamics for helping me to set up the JR X347 transmitter to suit the Merlin and to Bachman Performance Products in Canada for setting up the Elevator Flap switch to maximize the flight requirements.

I honestly believe that with a good pilot the Merlin will compete with any of the high performance sailplanes available and come out on the winning side. To me, "This is the sailplane of the nineties!" ■

International Postal Competition

...by Kale Harden
Palm Harbor, Florida

The International Postal Competition for sailplanes is now in its tenth year. In 1982 I was visiting my daughter in Brisbane Australia. While there, I visited a hobby shop and inquired about sailplane clubs in the area. As a result of the inquiry, I was invited to a "Barby" at Martin Vels' home. He was the president of the Brisbane Model Soaring Club and it was a club meeting. My wife, Audrey and I had a great time and as we socialized I noticed that their club had about the same number of members as did the club to which I belonged in the States (now the Pelicans). It occurred to me that we might hold a postal contest between the two clubs and so I suggested this. The idea met with an immediate positive response from their club members. So - in accordance with the KISS principle we drew up a set of rules right then and there. We would fly 6 minute duration as prescribed in the FAI rulebook, fly on the same day and then exchange the results by mail. So, in March 1982 we did this and the Pelicans scored a very close victory. Incidentally, all club members could fly in the competition but only the sum of the best five scores would represent the team as the team score. We enjoyed it so much that we decided to do it again in September. We have continued to do this for the last ten years.

International Postal Challenge September '86 - FSV Versmold / F.R. Germany, 06.09.1986 Left to right: Guido Hechler, Hans Jürgen Unverferth, Uwe Lünstroth, Rainer Gockeln, Michael Gockeln, Reinhard Werner, Ralf Flottmann, Rudi Wichette, Alfons Gabsch, Heiko Wellenbrink, Alex Bergmann, Andreas Haming. Kneeling are Horst Wehmann, Dieter Perlick (who holds an expermental model with some weird looking tail feathers called "tailplane", I think), Stefan Eggert. Still asleep - and thus not in the picture - is Dietmar Köker.

Swiss team - the youngest and the oldest.

Swiss team.

Shortly after commencing the postal contest, I ran into the late Dan Pruss and described to him what we were doing. He thought the idea was good and so he asked me to drop him a note including the major particulars. This I did and he printed the note in his soaring column in MAN. Wow — within weeks I had inquiries from several different countries around the world wanting to know if their clubs could participate in the Postal. Since that time we have had 13 different countries post scores in the IPC, not all at the same time, however. The largest number to compete in one contest is 8 and the average is around 5 or 6. We have restricted the teams to one per country.

Chile - March 1992.

Member of the Swiss team.

U.S.A. Postal - March 1992. (L-R) Wargo, Harden, Schrader, Berry, Dezik, Bingham, Sheridan, Strommer, Schoenstein, Good, Gunsaullus

Bob Wargo, Europa R-E-S, U.S.A. team

We settled on the spring-fall format so that countries in the southern hemisphere would have an equal shot at the good weather with us northerners. Recall that their seasons are just reversed from ours, so summer contests are not acceptable because it would be winter in the opposite hemisphere.

Over the years we have changed the

Scotland team, July 1991 Algebra 4m - 4 metre, open class (kit design), 4 metre span, Selig 3021, loading: 11 oz./ft² - 16 oz./ft², rudder/elev./brake.

tasks for the IPC. We began with 5 rounds of 6 minute precision and that task has been included in every contest. In 1984 we included a speed task ala F3B. We alternated the speed task with the distance task for the next 5 years always including the duration task. We are now back to duration only and we had seven countries compete in the March 1992 IPC.

Most of the competing clubs have 15 to 40 members and 7 to 20 actually compete. We have had inquiries from other countries besides the 13 who have actually participated but they never posted scores for various reasons. For example the Checkoslovkian team actually flew and mailed their scores but the scores never reached us. This was at a time when the cold war was still in full force and we have learned since that the postal inspectors in that country intercepted the results and would not forward them. Perhaps they suspected some sort of spy activity???

We have had some of the better known names in soaring participate in the postals. For instance, Dr. Walt Good has flown in nearly all of them. Leon Kincaid was the president of the Pelicans when the first contest was flown and he has flown in quite a few. John Gunsaullas has flown in a large number of them and Brian Agnew flew once. Overseas, Garry Jordan from Australia, a perenial member of the Aussie F3B team has flown in most of them. Brian Sharp from Scotland, Sean Walbank from England, John Lightfoot from South Africa, Rudiger Krauss and Reinhard Werner from Germany have all participated.

Weather has decided the outcome of most contests as one might expect. Although we try to all fly on the same day, that is sometimes not possible and so we have established a rain date. Sometimes teams will fly on the rain date instead of the primary date. There has been no one team which has dominated the others in terms of scores although some teams are always near the top. The German team was especially good when we were flying speed and duration as the primary emphasis in that country is on F3B type events. For the first few years, the German team flew only TAILLESS models. And they did quite well with them although they no longer fly them in the IPC. ■

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

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

Reference Material

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

BBS

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

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

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

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

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

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

Contacts & Special Interest Groups

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

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

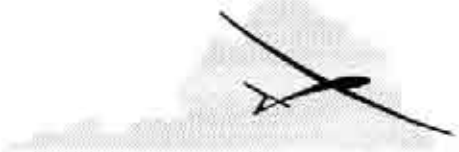
Canada - Southern Ontario Glider Group, "Wings" Program, dedicated instructors, Fred Freeman (416) 627-9090 or David Woodhouse (519) 821-4346

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

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

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

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



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Vintage Sailplane Association
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Introduction to the Auto-Vac System

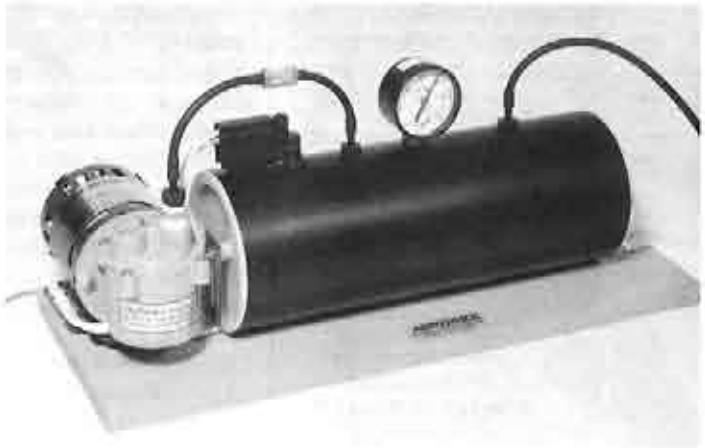
...from Aerospace Composite Products

Aerospace Composite Products has developed a fully automatic vacuum bagging system that eliminates the need for constant monitoring during the vacuum bagging process. The Auto-Vac system is unique in that it is completely self-monitoring, eliminating the need to run the vacuum pump continuously. The switch senses the vacuum in the system and activates the pump only when the pressure falls below a pre-set point. Since the pump runs only on demand, the user no longer needs to be concerned with its running continuously for 24 hours or more. In addition, wear and tear on the pump and electrical costs are greatly reduced. The switch is fully adjustable from 2 Hg to 24 Hg of vacuum. The large capacity reservoir prevents frequent cycling of the vacuum pump, even when there's a leak in the system.

The Auto-Vac kit comes completely assembled, mounted on a wood base, and ready to use. Included in the kit are the E-Z Vac II electric pump, rated at 24 Hg, adjustable vacuum switch, vacuum gauge, large capacity reservoir, check valve, neoprene tubing, E-Z Vac connector, two Quick-Lock seals, nine feet of 18" wide bagging tube, nine feet of 15" wide breather cloth and a complete set of vacuum bagging instructions.

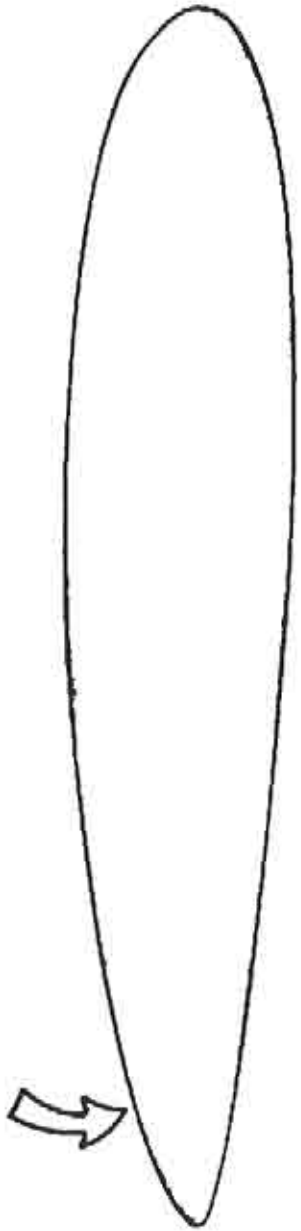
The Auto-Vac kit is available through your local hobby store or directly from Aerospace Composite Products, at $198.00 complete, plus $7.00 for shipping and handling. The kit is also available with 230V pump at $220.00. Inquire for overseas shipping charges.

Aerospace Composite Products carries a full complimentary line of vacuum bagging products, including a new vacuum bagging video. ACP manufacturers and stocks an extensive inventory of composite materials to meet all the modeler's needs. For more information regarding the Auto-Vac system or other products, contact Aerospace Composite Products by calling (714) 250-1107, FAX (714) 250-0307, or writing to P.O. Box 16621, Irvine, California 92714. ■



Bill Kubiak's Template

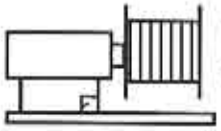
This template has many uses. It can be used to develop fairings and fillets, as well as an assist in designing and smoothing "quickie" or LAR (looks about right) airfoils. But the big surprise is the marked section matches the contour of a standard 2" spinner!



Glue the full sized pattern to a scrap of 1/32" plywood using rubber cement, 3M 77, or some other temporary/removable adhesive. Cut out the pattern with scissors, leaving a small amount of material which can then be sanded away. Pulling the edge along a flat sanding block while rotating the template will give a smooth snag free edge.

Enlarging the pattern on a photocopier is a simple task, and a set of three (100%, 122%, and 150%) makes a great addition to your box of sketching tools.

For those interested, Bill's original template is now decades old and still going strong. It started life as a special "french curve" to assist with the drawing of pump performance curves. ■



Winch Line ...by Gordon Jones

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

Composite Wings - Part 1

The technology in our hobby has changed dramatically over the past several years. It was once thought that a high tech airplane was a fiberglass fuselage and a set of balsa covered foam wings. This has changed as we have began using more and more space age materials in more varied applications. Today, we think nothing of adding Kevlar and carbon fiber to strengthen fuselages and wings. The advent of a practical vacuum bagging system has brought on the expanded use of fiberglass covered wings. In addition, this has even speeded the process of sheeting wings with wood products.

Constructing vacuum bagged fiberglass wings is a relatively straight forward process once the concepts and techniques are clear. I know that I studied the process from several different angles and asked a great many questions before I attempted the first wing panel. Over the next several issues I will try to pass on what I have learned throughout the past year or so, and maybe save someone else the trouble and some of the problems that I ran into during the learning process. And by the way, the learning process in this arena never stops as new composite products appear on the market.

As with everything else in our hobby there are a number of techniques that come into play during the bagging process. Every modeler has building techniques that he is comfortable with and at ease performing. The same is true with glass bagging foam wings. While some of the techniques will be totally new none are hard to learn or perform. If you have sheeted wings with wood (balsa, obechi or veneers) the techniques are very similar with only the materials changing. If you are new to this process, it is not at all hard but does require a huge learning curve.

First, let's look at the glass bagging process from a construction standpoint. The steps involved are really not that numerous and some you have already performed in balsa and wood sheeted foam wing construction. In constructing a set of built-up wings you make the ribs, build the spar assembly, sheet the wing and cut out and finish the control surfaces. This makes it sound simple I know, but these are the basic processes involved. In constructing a glass bagged wing you will use many of the same construction techniques although they are used somewhat differently. In the following list it is assumed that an airfoil and planform have been selected and that a set of foam cores of blue or grey foam are available. (NOTE: White foam will not withstand the pressure of vacuum bagging at the pressure required.)

You will note that some options are listed in various steps and these will be discussed later.

- Selecting the composite materials (many options are available).
- Preparing the foam cores with the spar assembly (several options are available).
- Preparing the leading edges (a couple of options here).
- Final sanding the foam cores.
- Cutting the mylar to the wing contour.
- Cutting the composite materials to the wing contour.
- Preparing the vacuum bag.
- Performing the layup.
- Setting the vacuum and aligning the wing.
- Trimming the excess flashing from the wing.
- Cutting the dihedral angles in the root to match the fuselage.
- Sanding the leading edges and tips to shape.
- Cutting out the control surfaces (a couple of options here).
- Facing the control surfaces.

As you can see the list looks different than one for sheeting a wing with a wood product, and there are a number of different options for accomplishing the same task during construction. Most of the steps involved do not really take that much time per se. In fact, it takes about the same amount of time as building a wood sheeted wing. (Some will say less and some will say more.) Naturally, the first wing will seem to take forever but this is normal with any new process.

Next, let's look at the materials that will be required to construct the wing. The basic material for any composite wing is fiberglass cloth. Glass cloth is available commercially in hundreds of different weights, weaves, strengths, and working properties. Very few of these, however, are suitable for the requirements of high strength and light weight. Even fewer are suitable for the hand-layup techniques employed in our hobby. In addition, a couple of different types are available as well: E-glass which is the normal fiberglass cloth and S-glass which is 30% stronger than E-glass. To add to the confusion there are other materials that are also used in wing construction such as carbon fiber, Kevlar and Spectra.

Kevlar and Spectra are being used to strengthen fuselages as well as wings. Both provide impact resistant strength to the structure, but Spectra does not provide as much torsional strength. Kevlar is used to make composite hinges on fiberglass wings, a technique that I will discuss later. Carbon fiber cloth is used as a base material in some glass wing applications for increased strength in all areas.

There are two types of fiberglass cloth: bi-directional cloth and uni-directional cloth. Bi-directional cloth has half of the fibers woven parallel to the selvage (the woven) edge of the cloth and the other half at right angles to the selvage, giving the cloth the same strength in both directions. Bi-directional cloth is used primarily for the needed sheer and torsional stiffness over an area. Both cloth types are available in fiberglass cloth of E and S types, and in varied types of carbon fiber cloths as well.

The other essential part of composite construction is the resin used to adhere the glass cloth, Kevlar and carbon fiber. Just as fiberglass products are extremely varied, resin systems also differ greatly in their working properties. There are two basic types of resins available: polyester resin and epoxy resin. Each type has its own applications and is superior to the other in certain respects.

Epoxy resin has a lower viscosity than polyester resin and does not attack foam making it the primary choice of modelers today. It is available in many viscosities and cure times which provides numerous options for the builder. This resin is used in home-built aircraft applications a great deal and this has provided some pluses for the model builder. Initially there were some problems with sensitivity to some types of epoxy, just as there have been problems with the fast cure epoxy glue we use. The manufacturers have now produced newer epoxies (both resin and glues) that do not cause a chemical reaction.

There are more epoxy resins available which is a good news - bad news story. Most are excellent for our applications; but there are some that do not fulfil our requirements. If you are going to use an epoxy resin check with another modeler or the manufacturer prior to purchase to ensure that you are getting one that will fill your needs. Some epoxy resins will not work well on foam wings because they are somewhat brittle, but provide excellent fuselage adhesion, and just the

reverse is true in other cases.

The application you are planning will determine the pot life of the epoxy you use. These range from about 40 minutes to 2 hours in length. The cure time of the resin also varies and strict attention should be paid to the instructions concerning cure times. In most cases, if you find an epoxy resin that works well in one application it will work well in most others. A few of the most popular brands in use are West Systems, Safe-T-Poxy, and EZ-LAM.

In addition to the cloth and resin you will need a vacuum pump and bagging material. These include a pump that will sustain a good pressure, bagging material or bags, some form of wicking material to assist in evacuating the air from the bag, and either putty to seal the bag or you can use some bag clips, and hose to connect the bag to the pump. There are several companies that will provide the pump, bags and numerous other bagging goodies (hoses, bag clips, and wicking materials); Aerospace Composites and Composite Structures Technology (CST) are the main names that come to mind. Both have complete set-ups, and both have quality products. The set-ups from each are a little different and both have a slightly different line of products available.

Other items that will be required include Mylar for the outer layup (This smoothes the fiberglass and resin out to a great finish.), the wood products for the spar assembly, latex gloves for working with the resin, and mixing cups and the like. Not really a long list but as in sheeting wings with balsa or obechi you want the material on hand so you don't have to run to the store while the resin hardens. During the building process we will touch on all the materials and provide a better description of each for its application. ■

Spirit 100 - The Saga Continues

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

Rumor has it that Spirit 100s are prone to wing folding; in some cases even under a gentle launch. Two potential culprits have been suggested:

- The transition from plywood to balsa spar webbing located too close to the wing root, and
- Undersized balsa shear webs which allow the spar to be constructed with gaps in the webbing (thus concentrating stress in the spar caps).

The combination of the two, e.g. a gap on both sides of the spar between the ply and balsa webbing, should make for some interesting aerial effects.

If you've just unplugged your sealing iron and stepped back to admire your 4-color handiwork, don't despair. Pete Young of California offered what sounds like the best post-construction fix:

> "Entering from the bottom of the wings, remove the two rearward facing shear webs from the bays just outboard of the plywood web. Fill the previously hollow spar cavities with hard balsa. Glue in place. Fit and glue new balsa shear webs over the now filled cavities. Replace the monokote."

For those who prefer an even simpler fix, plus a little more uncertainty in life, instead of opening up the spar, laminate ply webs over the existing balsa webs in those bays.

In either case, make sure the webs are butted tightly to the ribs on either side and glued solidly in place. No gaps.

For new wings, extend the ply webbing say 2 bays out on one side of the spar and 3 on the other. (The staggering makes the load carrying transition less abrupt.) Cap the spars with carbon fiber. Leave NO gaps in any of the spar webbing! Make the spar "air-tight".

Are these fixes guaranteed? Only the Great Spirit knows.

Other problems, minor by comparison, but not without pain when encountered, were reported by Lee Cornelius of Vermont:

- The exit point for the spoiler tubes are critical. If not positioned right, they can interfere with the front wing bolts.
- If you follow the recommended building sequence and install the elevator and rudder pushrod tubes before drilling the holes for the wing bolts, there's an excellent chance of drilling right through the tubes. Avoidance is best. Set up the wing mounting before installing the tubes.
- The wing mount bolts need to be shortened or they will tighten down on the pushrod tubes.

Pete and Lee, thank-you on behalf of the world-wide community of Spirit 100 owners, soon to be owners, and wish-they-were-owners, for your sage advice. (P.S.: Pete sent a color picture of his Spirit. I'd be afraid to fly a plane that looks that good.) ■

Servo Installation

...by Mike Stump
Cadillac, Michigan

With more sailplanes being built using servos installed in the wing, the mystery of how to install and wire servos needs to be addressed. This was a process that I feared attempting until I had been walked through it in the installation of gear in my first 2 METER DUCK. Since then I have built systems in wings of several more sailplanes and have become comfortable with these techniques.

The following guidelines can be used to install flap and aileron servos in your wings using one, 4-pin DEANS connector for each wing. Although this type of installation fits the use of a programmable radio with proper care in installation, this will allow the use of a basic 4 channel radio to control sailplanes like the DUCK, FALCON, and LEGEND. (A basic radio will not allow flap/elevator mixing or coupled aileron rudder. I recommend investing in a programmable system for your performance sailplane.) We will assume for purposes of this article that we are using an Airtronics Vision or JR X-347 type radio. The tools and parts you will need for installation are: solder iron, electrical solder and flux, heat shrink tubing (several sizes), 6-8 ft of 20-22 ga. 3 conductor wire, and (2) 4-pin DEANS connectors.

The first step in installation is to determine your method of installing the servos in the wing and make your cut-outs accordingly. I cut holes 1/4 to 1/2" larger than the servos at the proper location in the bottom sheet and remove all foam from the core in the hole. These servo bays are then lined with vertical grain balsa sheet, but before the sides are installed a run for the servo wires needs to be made. I heat the end of a 36" long piece of 1/8" music wire and melt a hole along the bottom of the core from the root through the flap bay out to the aileron bay. Now, sheet the sides of your servo bays and leave openings for the servo wires to enter and exit where needed.

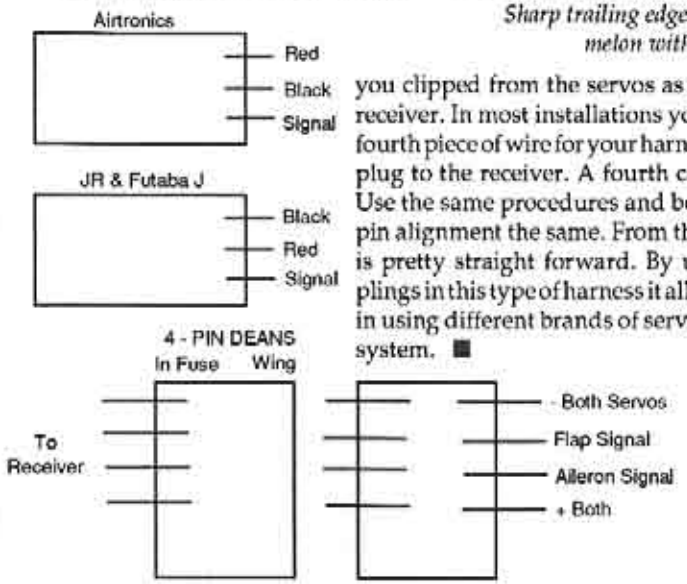
Measure the needed three-conductor wire for the aileron (outer) installation and feed through to the servo bay. I generally tape the wire to the end of a long piece of 1/16" music wire and use the wire to guide the strands through the wing to the outer bay. Using three strands of different colors is a must to make proper wiring much simpler. As an example I use: RED = +, WHITE = SIGNAL, and GRAY = - (GROUND). Clip your connector from your aileron servo leaving around 2" of servo cable. Slide a length of heat shrink (small diameter) over each cable that will be long enough to cover all uninsulated areas. Tin ends of both leads, then solder together. Slide the heat shrink over joint and shrink tight using a heat gun. If your flap bay is close enough to the wing root you may be able to wire to the DEANS connector directly with the servo cable by leaving a longer length on your flap servo.

Use the illustration of the 4-PIN DEANS PLUG diagram as a guideline for wiring. Solder both ground (-) leads together, slide a small piece of heat shrink up the lead a short distance, and solder to post. The next post is for the flap signal wire, and the third is for the ailerons. Cover all exposed conductors with heat shrink. The last post receives the pair of Positive (+) wires. Now use a larger size of heat shrink to cover the back of the complete plug assembly and pull everything firmly together. All the electronics in this wing will run positively and reliably from this 4-wire set-up.

New 2 meter Duck with prototype wing. It flies very well. I'm not sure whether to name it the Merganzer or the Loon.

Sharp trailing edges? Troy Lawicki cuts melon with Duck wing!

On the fuselage side use the plugs you clipped from the servos as your plugs into the receiver. In most installations you will need to use a fourth piece of wire for your harness from the DEANS plug to the receiver. A fourth color is helpful here. Use the same procedures and be careful to keep the pin alignment the same. From this point installation is pretty straight forward. By using soldered couplings in this type of harness it allows some flexibility in using different brands of servos than your TX/Rx system. ■



Flying In The Heart of Dixie Part 2

...Cliff Smith
Athens, Alabama

Last August *RCSD* printed what I thought was a once-in-a-lifetime event: a two hour flight from a hand toss with a 118" Paragon.

Well, sometimes lightening can strike twice in the same place. On September 7, 1991, I was at our usual flying site on Redstone Arsenal, just west of Huntsville, Alabama. When I arrived at the field some of our regular fliers were setting up the winch. Lars Ericsson was hand tossing his Bob Martin Pussy Cat, so I quickly assembled my Paragon and joined him on the field. We must have made about a half dozen throws when I was able to center some "good" lift. This air really picked up my Paragon quickly and I remember thinking that this was probably a good day to be on the field. I started my watch and followed this thermal back until the Paragon was so high and far downwind that I thought it would be good to bring it back and practice my landings. Well, by the time it came back over the field, it had gained even more altitude and was really small. It was about this time that I thought I would see just how long I could keep this plane in the air. Several of the fliers on the field made jokes about me being able to catch a good thermal from another hand toss, referring to my first two hour flight. It was turning out to be a very hot day; several of the fliers were able to get their LSF IV ONE hour flight on this day.

After logging the first hour in the air, I was really beginning to think that I might be able to have another 2 hour flight. At one hour and 45 minutes, my Airtronics PCM Vanguard radio started making a dreaded noise - the low voltage alarm started to sound. At first I thought I would just dump the spoilers and get

down as quickly as possible, but then I realized that I had my other transmitter. With a little quick help from Sam Fara, I was able to program my fail-safe and transplant my other battery into the transmitter.

It was about 3:00 on September 7, 1991 when I landed with a time of 2 hours, 3 minutes and 42 seconds. I would never have believed it could happen twice! Again, I owe a BIG thanks to those that helped on that hot afternoon. ■

Ron Vann Buys Flite Lite Composites (FLC)

...News Release from Mark Allen

Great news for FLC customers! On July 1, 1992 Ron Vann became the proud owner of Flite Lite Composites. Mark Allen is staying with FLC as designer and consultant.

Ron has been building and flying R/C planes for 20 years, 15 of which has been in R/C soaring. In 1985, Ron and Mark co-designed the Eliminator which won the coveted best design award at the ISR. (The Eliminator was the first design, first plug and first mold that Mark Allen made.) In the contest itself, Ron finished second right behind Joe Wurts. In the past, Ron's time for contest flying has been very limited. However, in the few contests that he has flown in he has always been at the top.

1986	Team F3B Selection Trials - 6th
1987	ISR - 2nd
1988	ISR - 2nd
1990	ISR - 2nd
1990	Miglito Slope Race - 1st (Beat Daryl & Joe in fly-offs.)

Ron has been a very big part of Flite Lite in the past 3 years doing much of the prototype building and flying. A new highly efficient production facility has been constructed in Windsor, California. Under Ron's leadership, Flite Lite Composites should continue to provide its customers with the best kits and add to that the best service. The new address for Flite Lite is: P.O. Box 311, Windsor, CA 95492; Phone/FAX (707) 838-9020 8:00 A.M. - 4:30 P.M.

For those of you wondering what Mark is doing, he has just finished his 3rd electric design and is now starting work on a complete new line of sailplanes. All of these should become future Flite Lite kits. Check our ad in this issue for information on the hot new Electric Falcon. Mark will also be doing custom building of FLC kits on a very limited basis. ■

Schedule of Special Events

Date	Event	Location	Contact
Aug. 8-9	TNT	Houston, TX	Julian Tamez (713) 540-3944
Aug. 15-16	Contest Soaring	Montreal, Quebec	Etienne Dorig (514) 465-1113
Aug. 22	MASS Soaring Unlimited	Memphis, TN	Bob Sowder (901) 757-5536
Sept. -	F3B Team Trials	Carson, CA	Steve Addis (310) 835-7631
Sept. 12-13	CASA 10th Annual Open Soaring	Gaithersburg, MD	Steven Lorentz (301) 845-2311
Sept. 27	World Postal 2m (July, 1992 Issue - invitation)	Everywhere	Steen Hoej Rasmussen Denmark
Oct. 3-4	CSS Pumpkin Fly	Cincinnati, OH	Chuck Lohre (513) 731-3429
Oct. 4	Unlimited Thermal AMA & LSF Regional	Kirkville, NY (Syracuse)	Dave Zinteck (315) 656-7103
Oct. 24-25	M.A.R.C.S. Symposium	WI	Al Scidmore (608) 271-5500

OLDTIMER RALLY IN GERMANY

...from George Siposs
Costa Mesa, California

Next year's contest is slated for the middle of June on the Waku. You can easily fly to Frankfurt via one of the many airlines from the states; rent a car and within 3 hours you can be on the hill. There will be other contests run for oldtimer planes, with oldtimer rules, albeit, most will have tiny R/C gear inside them to keep the flight tidy. Vienna, Austria is also planning a contest and they expect modelers from Czechoslovakia, Poland as well as Hungary to attend. The main organizer in Germany is Friedhelm Mink, Meschede 12, D-5778, Im Wiesengrund 9, West Germany, or you can write to: Antik Modellflugfreunde Deutschland, Sitz 7170, Schwäbisch Hall, Postfach 103, West Germany.

With all the slick new designs and quick-assembly kits around, there is still something in old time model airplanes that makes our hearts beat faster. To experience this I recommend a sure cure: visit the Wasserkuppe, the Mecca of model gliders. ■

Classified Advertising Policy

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

For Sale - Business

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

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

CARBON FIBER, first quality, 100 ft. 12k tow...$9.95. Send certified check or money order plus $2.00 shipping and handling (UT res. add sales tax) to: DISCOUNT COMPOSITES, P.O. Box 13, Bountiful, UT 84011-0013.

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

For Sale - Personal

VMC "Hands Off" retriever, fully refurbished from factory, paid $319.00, no reasonable offer refused. Contact Bill at (818) 876-0602, California.

Copy of Graupner "CIRRUS 75", fiberglass fuselage, ailerons, air brakes, 2 ea. Futaba S 133 in the wings, NEW...$180.00; Graupner "ELECTRO PINK", ready to fly, NEW...$160.00; Graupner "ELECTRO UHU", ready to fly, like NEW...$80.00; Robbe "ASW-24" with canopy, cockpit, NEW...$110.00. All prices do not include shipping. Call Peter ZAK, (305) 687-7706, 8-5 EST, Florida.

SCALE for sale: 1/4 scale MINIMOA w/P.C.M. radio...$1095.00; 1/4 scale HABICHT w/7 channel receiver & servos...$950.00; 1/4 scale ASK 18 w/7 channel radio $795.00 or $695.00 w/o radio. Contact Gary Brokaw at (509) 928-8416 or (509) 928-7474, Washington.

Dodgson PIXY, good condition w/ A.F.A.R.T. Modified Futaba radio. First $225.00 takes it. Gary Brokaw: (509) 928-8416 or (509) 928-7474, Washington.

Graupner UHU Electric sailplane w/ speed 600 motor & power switch 20, new condition, looks & flies great...w/ BEC $110.00; Northeast Sailplanes SPARROW slope soarer, built & ready to fly. Just add radio gear. New condition...$75.00. Call Jack (215) 547-4243, Pennsylvania.

Competition Products PHOENIX ...$200.00; Great Northern G-110 ...$35.00; Sig NINJA...$40.00; Dynaflite APOGEE...$30.00; VORTEX with glass fuse & SD7037...$140.00. All kits NIB. Prices do not include shipping & handling. Contact Tom after 7:00 CST at (414) 367-2419 Wisconsin.

How To Have Accidents Without Really Trying

...by Martin Simons
Stepney, South Australia

I broke three models in two days at the Waikerie Scale Thermal Soaring meeting, February 29th, March 1st 1992. To achieve so much in such a short time may sound quite difficult. Actually, it is easy, so I think it would be a good idea to tell people how anyone at all can make a good impression. (Three impressions, in my case, several inches deep.)

This first crash

My Kirby Kite is eight years old. It is a true scale model, 1/4 full size, gull wing, strut braced. The span is 3.6 metres with scale wing sections (Göttingen 535 tapering to symmetrical tip). I think it is rather pretty. (My Plans are available from the English magazine, *Radio Control Model World*. Advert.)

When winch launching large scale models it is best to take off from the ground. Put the model down, line up into wind, prop up the wing tips, hook on and tread on the winch button. Since the glider begins in the straight and level attitude it picks up flying speed before it can leave the ground.

The Kite climbs perfectly well with elevators neutral, but that is so dull, isn't it? This time I tried to get a steep climb by raising the elevators quite soon after take off. The result, immediate stall and cartwheel into the ground. Hurrah! Both wings broken and the fin and rudder came off. It is easy! Anyone can do it!

The second crash

My new ASW 24, which was built from a Gelhard kit (I never build from kits. What, never? Well, hardly ever!) is to the scale of 1 to 3.5 and span 4.3 metres, weight 6.5 kg. It had been flown quite a few times before the Waikerie weekend without any trouble, and I had flown it successfully on the Saturday. No excitement at all! Relaxing and peaceful, you might say. Soon change that!.

On Sunday, when it was raining, I completed a successful aero tow and was flying steadily, not really doing anything but heading into wind, when the model rolled violently over, emerged half inverted and diving, and went into a series of loops, finishing with a half roll and vertical dive to the ground.

Severe damage to one wing and a badly crumpled glass fuselage resulted. The radio itself was working perfectly afterwards.

Once again, for this kind of thing, no real effort is required. After all, nothing you do will make any difference. I do not know exactly what happened, so it may be rather hard for me to repeat the display. Yes, my key was on the board, and no-one else had a transmitter on my channel. It was suggested that the rain got into the electrics but I don't think so.

I don't give up easy. Many people would have packed up and gone home at this stage. Not me!

The third crash

My PWS 101 is a 6.5 kg, 4.75 metres span 1/4 scale model of a famous gull winged Polish sailplane of 1937 vintage. It has the authentic wing section (Göttingen 549) and the structure is as close as possible to the original. At Waikerie in 1990 and 1991 it won first prize in the vintage class. It flies perfectly, soars easily and has never given the slightest hint of trouble on winch launching. (Plans from B^2 Streamlines. Advt.) The only accident I ever had with it before was when a powered model ran into it from behind, two years ago. That was exciting, but even with a damaged outer wing and a jammed aileron, the PWS remained well mannered and I landed it safely. (The power model was hardly marked.) It really does take a little ingenuity to crash such a well behaved model, but I managed it!

I prepared for a winch launch. Put the model down, prop up a wing, hook on and away we go!

I have seen it happen at least three times before to other people, so I knew how to have this type of accident. The winch line goes from the hook on the model, off into the distance, over the turn round pulley and back to the winch. The returning line can be called the ground line or drag line.

Alert crash experts will note that the ground line doesn't stay on the ground. Under tension, it lifts.

This is the exciting bit. The model moves forward, drifts fractionally to one side, **the wing tip slips under the drag line**. A boring pilot, who sees what has happened, can prevent the fun by instantly stopping the winch and keeping the model on the ground, or, if it has already taken off, landing it at once straight ahead.

The expert crasher delays corrective action. I think the PWS was about twenty feet, or maybe more, off the ground when I saw I had succeeded in getting the drag line well and truly over the port wing. The model rolled over and dived vertically into the ground.

Both wings were damaged (though the spars were not broken) and the fuselage smashed. My little dummy pilot had his head knocked off and would have lost his legs, if he had had any. Silly dummy, did you say?

It is amazing that a model can actually lift the drag line up so high under tension, but my PWS is a big glider and there is a lot of lifting force when it begins to climb, especially if the pilot is really trying.

The drag line made scratch marks along the wing for about a metre, moving inwards from the tip toward the root. Isn't that interesting? Someone who is even better at this than I am, had the line actually sawing its way through the wing, before the model rolled over.

Pilots who do not like this kind of thrill, put the model on the ground for take off well clear of the drag line. If there is any cross wind at all, they move well out to the downwind side. If there is any chance of a tip slipping under the drag line, they do not launch. What a lot of spoilsports. Such actions totally prevent this sort of accident.

However, you can still arrange to have a similar crash if the model wing slips under the line of another winch! It doesn't have to be your own! You can do it by launching from the ground with other winches along side. Try it some time. Or get someone like me to demonstrate!

Now I am busy having a lot more fun, repairing three large scale models. I think this fun will last for several months! Oh joy! ■

World Postal Score Sheet (See *RCSD*, July 1992, pages 34-35)

Start No.: | Name: | RC No.: / Channel: | Timekeeper:

		3 min.	landing	4 min.	landing	5 min.	landing	6 min.	landing	7 min.	landing
1	time										
	points										
2	time										
	points										
3	time										
	points										
4	time										
	points										

LANDING TABLE / TIME TABLE

0 - 50 cm = 150 p	251 - 300 cm = 75 p	3 min. = 180 p	
51 - 100 cm = 135 p	301 - 350 cm = 60 p	4 min. = 240 p	
101 - 150 cm = 120 p	351 - 400 cm = 45 p	5 min. = 300 p	
151 - 200 cm = 105 p	401 - 450 cm = 30 p	6 min. = 360 p	
201 - 250 cm = 90 p	451 - 500 cm = 15 p	7 min. = 420 p	

Number of participants: Total points:

Winnerpoints: Average:

Your placing: © S.M.S.K

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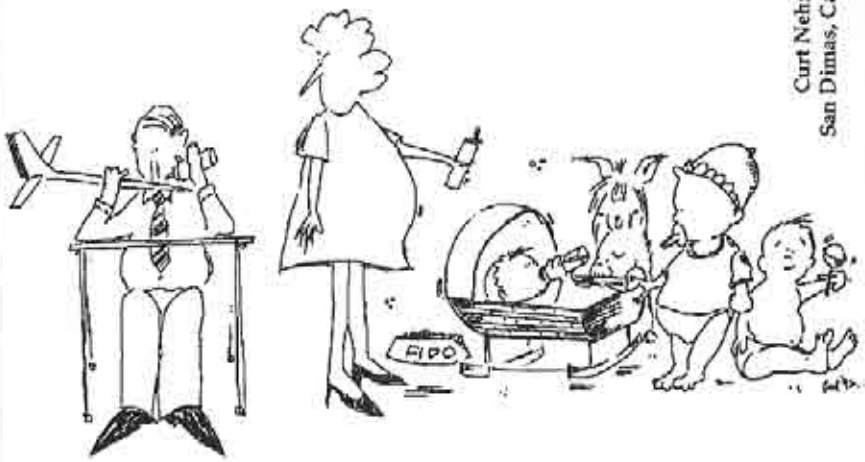

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