R/C Soaring Digest

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The Cliffs of Torrey Pines

Story on page 20

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

Pitch Trim & Stability

Ed Jentsch of Rockville, Maryland, has written to say, "Thank-you for reprinting Frank Deis' article, "CG, Elevator Trim and Decalage". As a novice to the sport (art) of RC soaring, I found it very helpful in understanding, finally, the topic of pitch trim and stability.

"However, when I read, in Part 2, how to trim a fixed-stab plane, I broke into a cold sweat. Altering a plane's stabilizer angle after the fact is akin to major surgery. Changing the angle of the wing, by comparison, is indeed easier, but still not for the light-hearted if one wants to retain a neat, aerodynamically clean plane.

"Why not make use of Frank's experimental findings in Part 1 that the optimum decalage on the vast majority of planes is 1 - 3 degrees and build this value into the plane during construction? Then, the only variable left to deal with, and one that's easier to change, is the CG. This may not wring the last one percent of performance from the plane, but it should yield adequate results for most sport flyers." (Good point, Ed.)

My Winch

Mike Kohkohl of Smithtown, New York, has built a winch. He says, "As a long time sport flyer and high-start user, I have managed to avoid acquiring a

winch, until now. The photo is of a winch I built last year. It is aluminum construction (It's lite!), has a 35cc two stroke motor (It's powerful!) with centrifugal clutch, and a large capacity muffler (It's quiet!). The foot lever throttle makes it easy to launch small or large gliders. No more tap, tap, tapping your toe on the electric winch button! (This is starting to sound like an advertisement!!) I have also had the chance to use the winch with great success in conjunction with an electric retriever."

Stabs & F3E

Curt Nehring of San Dimas, California dropped us a line with the following tip. "Had a problem holding the stabs on my Pantera. Great solution is "SEX WAX" available for 75¢ at surf shops or beach-type clothing stores at the mall." Curt also provided us with a copy of the F3E fund raiser letter which appears in this issue and says, "The tee-shirts (Hanes) come in all sizes and are $12.00 plus $3.00 S&H. I did the logo (F3E) and it's in red, white and blue with the pilot's names, etc. It's a bit different than what's on the letter. The shirts are white." Although the letter doesn't mention that the shirts are available, for those of you interested, please contact the U.S. Electric Flight team for more information at 15173 Moran Street, Westminster, CA 92684.

Hundred Minute Club

Lee Murray is looking for some help. He says, "Bob Johnson showed me a logo for the 100 minute club that we could use some help with. We need an inexpensive decal produced. His design is blue background, red border, and black printing. He is thinking about making them available for little or no charge depending upon our costs. He showed me the color version he created on his Macintosh. He thinks he can produce the color separations there, also.

"I looked at my resources but this is a little more complicated than what my resources can do if done right. This is two or three color printing plus lamination and die cutting. Perhaps some reader might be in the right place to help?" Lee can be reached at 1300 N. Bay Ridge Rd., Appleton, Wisconsin 54915; (414) 731-4848.

HUNDRED MINUTE CLUB

Looking for a New Subscriber

We received a request for a new subscription from California. The post office sent the first issue back marked "no such street". Well, we checked and they're right. If you know R. Mende please let us know. The address we have is 2123 48th St., Concord, California 94524. Thanks!

Sad News

We received the following letter from Michael Selig, University Park, Pennsylvania.

"I have bad news that your readers might want to know. David Fraser was killed in a plane crash. His wife was with him, but she survived with serious injuries and is improving. Fraser-Volpe Corp. has prepared a card in memoriam. One is enclosed." (In this issue.)

"As mentioned in the card, a scholarship fund is being established. The Fraser family and Fraser-Volpe Corp. will make the initial contribution to this fund. The fund is named the David B. Fraser Scholarship for Science. Eligible recipients will be selected from any student applicant who is pursuing studies in either science or engineering. Memorial contributions to endow the fund may be sent to the David B. Fraser Scholarship for Science, c/o Mr. Jonathan Fraser, 1335 Slayton Drive, Maple Glen, PA 19002." ■

In Memoriam

...Prepared by Fraser-Volpe Corp.

David B. Fraser, 53, our President and Co-founder of Fraser-Volpe Corporation died Sunday, February 16th, in a plane crash while attempting an emergency landing at Wheeling-Ohio County Airport near Wheeling, West Virginia.

His wife, Elizabeth, was injured in the crash but is recovering.

Mr. Fraser was born in Winnipeg, Canada, and was a graduate of McGill University in Montreal with a degree in physics. He became a U.S. citizen in 1983. From 1963 to 1972, he was chief scientist and vice president of Dynasciences Corp. in Blue Bell, which developed and manufactured optical devices.

In 1972, Mr. Fraser and Joseph B. Volpe Jr. founded Fraser-Volpe Corp., which specialized in developing stabilized binoculars and sights for guns.

Mr. Fraser held two patents on mechanisms for steadying prisms and lenses in viewing instruments and gun sights, making the devices clearer and more accurate at greater distances.

Mr. Fraser was a member of the Society of Photographic and Instrumentation Engineers, the Optical Society of America, and MENSA, a society for the mentally gifted.

Among other activities, he played Scott Joplin ragtime tunes on the piano, could identify just about every aircraft, spoke French, and could name the ingredients of scores of prescription drugs.

Mr. Fraser was an avid birdwatcher and animal expert who knew the gestation period of most animals.

He earned his pilot's license in 1961 and purchased his first Mooney aircraft four years later. He logged over 3,000 hours as a pilot.

He was also a sailplane enthusiast and a member of Freedom's Wings International, which helps handicapped people experience the joys of gliding.

He flew radio-controlled sailplanes, and through contacts made in flying clubs became involved in research on airfoils (wings, rudders, tails of aircraft) at Princeton University.

As a result of that work, Mr. Fraser co-authored a book, "Airfoils at Low Speed", which is now a standard reference for sailplane designs.

Besides his wife, he is survived by his son, Jonathan, a daughter, Laurie, and his mother, Elizabeth.

Memorial contributions may be made in Mr. Fraser's name to Freedom's Wings International, 732 Bustleton Pike, Richboro, PA 18954. The family is establishing a scholarship fund in his name to support students in aeronautics. ■

on the Wing

B^2

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Olalla, Washington
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A recent issue of the *Journal of Aircraft*, published by the American Institute of Aeronautics and Astronautics, was devoted to optimization of aeronautical systems through multi-disciplinary approaches.

The most interesting article for us was one directed toward actively controlled fiber composite wings[1]. Although the article itself was very heavily mathematics oriented, several charts and diagrams provided basic information of use to model builders. What follows is not a review or condensation of the article, but rather a description of a derived design methodology/philosophy which is suitable for both tailless and conventional RC sailplanes.

Constraints

Any design process begins with a determination of the constraints imposed on the eventual design. All of our models must conform to the majority of FAI regulations for RC sailplanes. From the start, then, we know the wing loading must be over 4 oz/ft^2 and under 24 oz/ft^2. We also know the mass of our completed glider must be below 5 kg (176 oz). Other constraints include the minimum nose radius, a ban on telemetry, and a requirement that all model controls be actuated from the ground, but not all of these are adhered to by AMA regulations. (Thermal sniffers and electrostatic stabilizers can be used in AMA competition.) Additionally our design may be constrained by certain AMA regulations regarding span, or local rules may define a maximum number or type of control surface.

Design Approach

The main thrust of all of the articles in the *Journal of Aircraft* is that the entire design approach needs to be based on a multi-disciplinary process in which each segment to be optimized affects all other segments. This implies that while we will of course endeavor to maximize overall sailplane performance, our method of achieving this goal will simultaneously encompass structural, aerodynamic, and control systems, while always remaining within those previously defined restraints. As we explain these systems in detail, through example, we will outline their relationships.

Structure

Overall size, in our opinion, should be the designer's first consideration. As a pertinent example, we have recently been giving greater thought to winch power versus sailplane size. This came about because our two meter 'wing, the Blackbird, with 1250 in^2 of wing area, can not really take advantage of the power available from our winch. Even very strong zoom launches do not tax its capabilities. At the other extreme, our XC version of the Blackbird (2300 in^2) overloads the winch to an extreme degree. What we need is a 'wing with about 1700 to 1800 in^2 of area. We feel this would allow most efficient use of winch power, while at the same time improve performance compared to the two meter version. If you are designing for contest flying prescribed by AMA regulations, such manipulations of wing area may not be possible to a large extent due to wing span limitations and the desire for optimum aspect ratio. For FAI events, however, such size optimization is both possible and desirable.

Of related interest is flying weight (mass). This is because mass and size are usually positively related, and because required lift is directly related to mass.

Mass also has an effect on other performance characteristics, such as sink rate and speed.

Sailplane structure also includes overall planform (tailed vs. tailless, tapered vs. constant chord wing, sweepback, etc.). The stresses imposed on the wing panels will vary depending on whether or not there is a fuselage, and other distribution-of-mass factors, so spars must be sized for strength and located where the strength can be put to best use. It should also be kept in mind that structure may also be influential in drag reduction as we'll describe in more detail in the next section.

Aerodynamics

The portion of the design process devoted to aerodynamics was really introduced in this article when we spoke of the lift necessary to support the mass of the sailplane. Airfoil choice is dependent upon camber, which dictates the amount of lift generated. Lift can be augmented, always with some penalty, through use of various control surface movements. Flaps, as an example, change the camber line and thus influence lift, but with the penalty of higher drag. It is through control surface deflection that local aerodynamics are changed.

Also influencing the sailplane's aerodynamics is wing shape. Lowest drag is achieved with some small amount of sweepback of the quarter chord line, for instance, and the lift distribution can be tailored to specific requirements through transitioning of airfoils and careful attention to taper.

Consideration must also be given to overall drag. The shape of lifting surfaces is certainly important, but the wing-fuselage junction, empennage configuration, hinge design, and other factors must also receive careful attention. Of recent interest to modelers is the measurably lower drag of foam core wings when compared with that of open framework structures. The smooth ridge free skin of the foam core wing creates smaller and less numerous vortices.

Control

Velocity, glide angle, and other important variables are easily examined as the sailplane is traveling along in a straight line. But our goal when installing RC gear is to have an aircraft capable of turning and having its altitude, attitude, and speed varied according to our input. We wish to have control of the sailplane during its flight, and hopefully with as little degradation of performance as possible. So we install a rudder, elevator, ailerons, flaps, spoilers, airbrakes... anything which we feel will allow us some added degree of control and which we hope will allow us to go up more easily and come down safely and effectively when desired.

Control surface deflection will always have some aerodynamic effect, and that effect will always be transferred to the aircraft's structure. Many of us forget this relationship during the design process. We must not only consider the loads imposed upon the servos and control systems, but also the stresses which are imposed upon the aircraft as a whole. Steeply banked turns place tremendous loads on the conventional tailed sailplane's wing center section. While the servos may easily handle the aerodynamic load generated by the deflected control surface, the spar and spar-fuselage connection must also remain intact.

Integration of the Three Systems

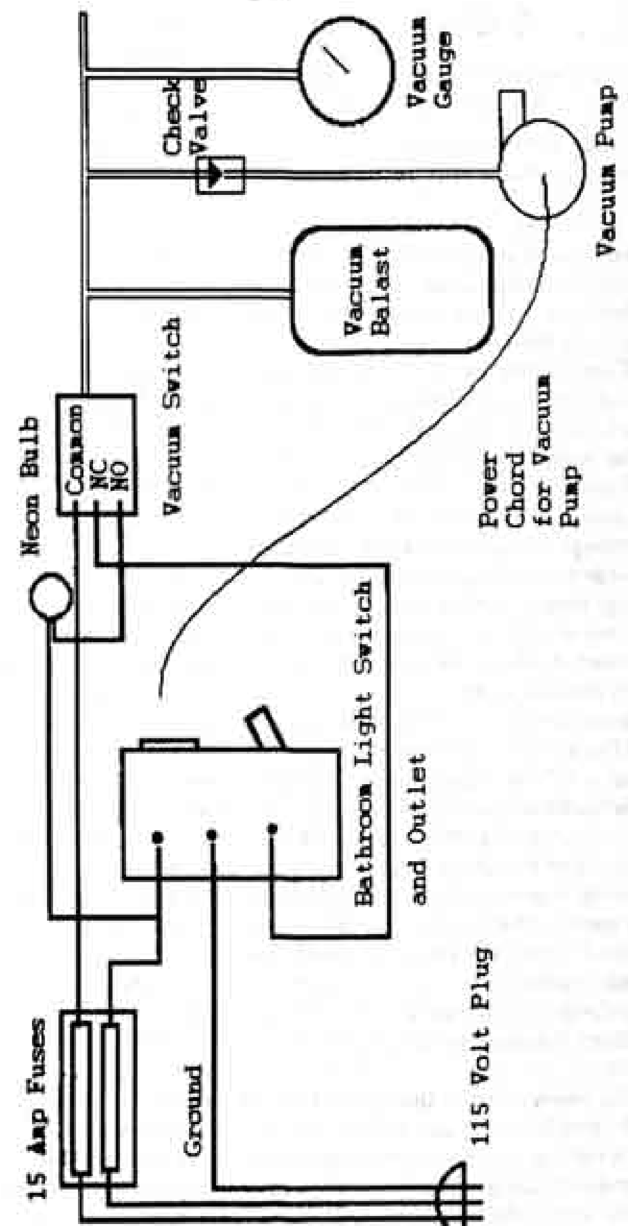
It should be evident from the above that structure, aerodynamics, and control are interwoven to the point of being inseparable, and a change in one aspect of the design process affects all three realms. While our primary design goal is always the maximizing of sailplane performance, it should also be obvious that an immense number of design objectives must be met in the process. Improved glide angle, quicker turns, increased roll rate, greater velocity, or better thermal performance may be classed as design goals. But such things as control of wing flex and twist, freedom from flutter within the prescribed speed range, dynamic stability, effective control, maximum lift with minimum increase in drag, and retention of spar integrity under expected g loads are also inherent considerations within the design process. It is the successful integration of the three disciplines, structure, aerodynamics, and control, which produces the optimum sailplane for a particular task.

By developing a more complete understanding of these three disciplines, their interrelationships and the design process better sailplanes can be produced.

[1]Livne, E., Schmit, L.A., and Friedman, P.P., "Towards Integrated Multi-disciplinary Synthesis of Actively Controlled Fiber Composite Wings", *Journal of Aircraft*, Vol. 27, No. 12, December 1990, pp. 979-992. ■

Vacuum Fitting

In the April issue of *RCSD*, Lee and Jim Murray, Appleton, Wisconsin, had an article called "Vacuum Feed-Through Fitting" (page32). Lee has sent a drawing of the vacuum system and says, "...I find it works well."



Flying in Wind and Weather

...By Martin Simons

13 Loch Street, Stepney,
South Australia 5069

Up in a balloon

Understanding the facts requires no mathematical formulae, but those whose minds are set over this matter, are not easily convinced.

Consider Figure 13. The model flier in this diagram is in a balloon basket and is controlling a powered sailplane from here. Balloons, having no motive power, drift as if they were part of the air at their altitude. Turbulence can rock them about, but the people in the basket feel no breeze pushing them. Flags flown from balloons hang limply down even when quite strong wind is felt by watchers on the ground. It takes a flow of air to move a flag. The airspeed is what counts and the balloon has no airspeed so the flags do not flutter. (If the balloon is rising through the air or descending, there will be some flow vertically, but we will suppose the balloon is maintaining steady height.) When the balloonist looks down, the ground is seen passing underneath, at the speed of the wind. Airspeed is zero, ground speed equals wind speed. The shadow of the balloon can be seen moving along steadily but there is no breeze ruffling the hair of the people in the basket.

The model flier in the basket (after a little trouble with launching) controls the model to fly steady circles round and round with the basket at the centre of the circle. The model is set for a steady rate of turn, at constant bank, airspeed and power. Once established in this pattern, no trim changes or control movements are necessary unless turbulence requires some corrective action. Since the balloon drifts along with the wind, the entire system, basket, pilot, and circling model move laterally relative to the ground but the aerial circles remain perfect. Indeed, any change by the pilot would immediately spoil them.

From below, confused observers might not realise that the aeroplane was going round and round at perfectly steady **airspeed** with the basket as the centre of its circles. The **ground** speed of the model **would vary** in the inevitable fashion - slow upwind, faster downwind, and drifting somewhat sideways on the cross wind portions of each turn, i.e., making a cycloidal pattern.

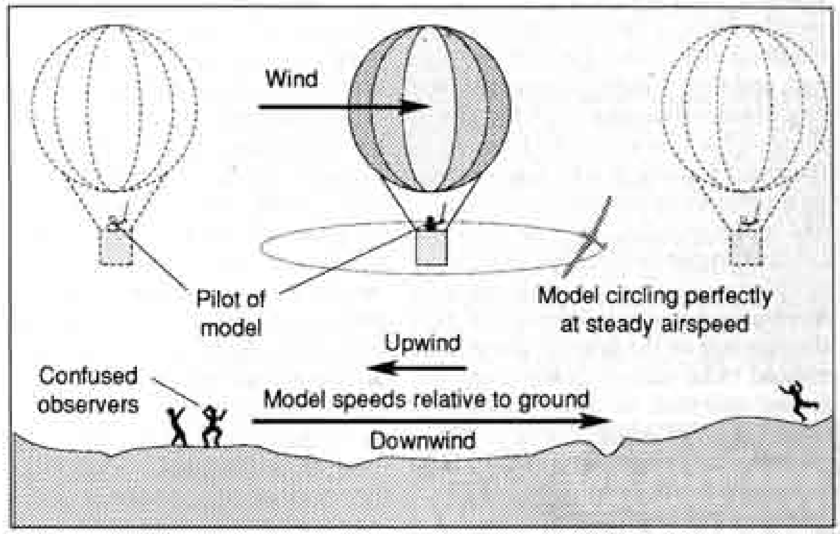
If the grounded persons shouted up to the balloon and said "You should compensate for the wind!" the balloonist would call back "There is no wind up here."

They might reply "But you are not flying perfect circles!" He would say "Yes I am, **relative to the air** and **it is the airspeed that counts**, not the confused thinking of you people on the ground! **Do not judge the airspeed by observing the speed of the model over the ground.**" There is no effect whatever from the general motion of the air. The model flies steadily round and round, does not surge up and down, does not lose height as it turns downwind, does not surge up as it faces the wind.

Its wing section likewise makes no difference to this. If the model has a Clark Y profile, it might be capable of flying more slowly than one with a thin symmetrical section. But any flyable model aircraft whatever can be trimmed to fly in steady circles and that is what the balloon based pilot is doing.

Suppose that the balloon basket pilot quickly, without altering any of the controls, could hand his transmitter down to someone on the ground and require this person to continue to fly the aerial circles

Figure 13 Flying a model from a balloon



correctly. The new pilot's best plan would be to retain without change all the control positions previously established, because to alter them would be to upset the circles and, very likely, collide with the balloon instead of circling round it. Merely changing the place from which the pilot controls the model, does not change the reality of the forces involved. (Of course, after a short time the ground-based pilot would find the model going along with the balloon out of sight, and would have to stop circling to bring the model back - but that is another story.)

Flying perfect aerial circles

Stability is the ability of an aircraft to return automatically, given a little time, to its trimmed attitude despite turbulence. To set the trims of a model sailplane is simply to move the controls, elevator, rudder, ailerons etc., to a certain desired position and hold them there. This can be done by means of the small sliding trimmers on the transmitter, or merely by holding the control sticks manually. The air flowing over the model does not know the difference, it reacts only with the control surfaces, whatever their position may be.

Trimmed correctly for a turn and then left alone, a **stable** sailplane will circle steadily relative to the air until the controls are altered. If disturbed by gusts and turbulence, it will, doubtless with some oscillations, strive to keep **a steady airspeed and bank angle all the way round the turn**. Not all successful model sailplanes are stable in turning flight, but most can be adjusted to make them at least partly so, usually by ensuring that the centre of gravity is forward and that the wings have sufficient dihedral. Windy days are usually turbulent too but the stable model can cope with this with minimal interference from the pilot. The best way to fly a sailplane in smooth circles, especially when climbing in a thermal, is to trim it for a suitable angle of bank and airspeed, and then leave the controls alone as much as possible.

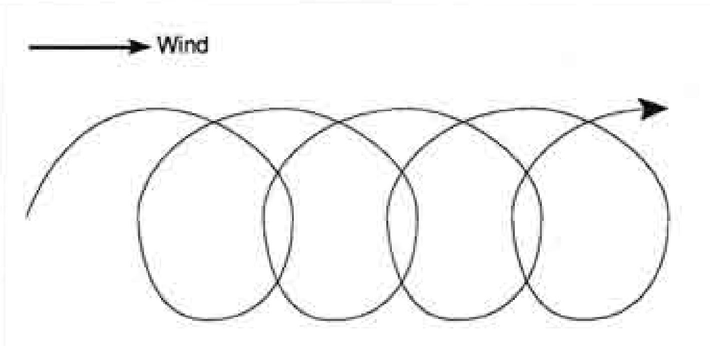
Trying to compensate for the wind, pushing and pulling the elevator back and forth because the ground speed varies, is the best way to fly bad circles and fall out of thermals. I have seen beginners doing this and, sometimes, no amount of instruction will cure them because someone has convinced them that the wind makes a difference. No wonder they cannot keep their models climbing. (Of course, locating the thermal, and then finding its strongest core, requires more than merely circling. Something will follow about this later.) If the the glider is rising, it is best, as a rule, to let it settle down into the trimmed circle and interfere as little as possible. It will continue to gain height. Free flight model sailplanes circle very efficiently in thermals without any actions at all from the operator on the ground. Some experienced radio control model fliers will indeed take their hands off the controls entirely for minutes at a time, touching the sticks only when the sailplane has to be brought down, or returned to the local airspace after drifting away.

It should be clear enough that a circling, stable, sailplane flying 'hands off', has no contact whatsoever with the brains of the people watching from the ground. It does not 'know' the wind speed or the ground speed, because it is in the air. It just continues to fly stable, steady smooth circles with constant bank and airspeed. If upset in a minor way by turbulence it will, given time, return to its trimmed attitude and continue to circle correctly.

But such perfect aerial circles will not and **should not** look circular from the ground. As the model makes circles on a windy day, the pattern traced out **relative to the ground** is cycloidal (Figure 14) and this pattern is what the ground-based pilot sees. There should be no problem with this. As a wheeled vehicle goes past us on the street, we know the wheels are going round their hubs in circular fashion but their motion relative to the pedestrians does not look circular. If a mark on the rim of a wheel is watched from the roadside, its motion is cycloidal but the automobile axle is the reference for the circular motion of its wheels. We do not suppose that, because the motion from where we stand, is cycloidal, that the wheels are not going round properly, nor do we reach for our computers and calculus textbook to prove that the people in the car are having a terribly rough ride. The same with flying turns, the air and the aircraft are the references, not the ground.

Momentum and inertia

So what about energy, momentum, inertia and all that? It is true that if the model is going to land, or hit a tree, or dive onto a rock, then the force which it feels on making contact will be related to the



The pattern made by a circling sailplane in wind is cycloidal

Figure 14 The ground track of a sailplane circling in wind

kinetic energy of motion relative to the object struck, and the momentum on impact. As mentioned in a previous article, we land our models into wind because this reduces the groundspeed for the actual touchdown. Downwind landings are avoided because the arrival will be faster. If, instead of making a smooth landing the model hits a tree or a pole, it will make a great deal of difference if it is moving fast or slow relative to the thing it hits.

Momentum is expressed in terms of velocity and mass. If someone insists on having an equation, when a model with a mass of 4 kg hits a post with a velocity of 5 m/s, the momentum will be $4 \times 5 = 20$ kg-m/s. If the same model hits the post at 15 m/s the momentum will be $4 \times 15 = 60$ kg-m/s and that will matter a good deal as the modeller carries the pieces home. If you are going to hit a post, do it when flying upwind because it will not hit so hard.

Kinetic energy is also a function of mass and velocity. ($K.E = [M v^2]/2$ if you must have it.) So, if the same model as before hits the post going downwind its energy when it strikes will be 450 Joules. The wreckage will look the same, whether momentum or kinetic energy is considered. Hitting the post when going upwind will expend only 50 Joules.

But the discussion here concerns **the model in flight**, not landing or crashing. The flying model gains its support entirely from the air, not from posts on the ground. **All forces arising on the model when it is flying must be measured relative to the model and the air it is flying in**, not in relation to the ground. This applies to **lift, drag, mass-inertia, centrifugal and centripetal forces, momentum, kinetic and potential energy** and of course **velocity, i.e. AIRSPEED.** (Gravitation is effectively constant and is not affected by the wind. If it were we might all shoot off into space every time the weather changed.) The supposed upwind/downwind effects vanish because the ground speed does not affect the flight equations.

Correctly trimmed and correctly handled models **do not** pitch up when turning to face the wind or lose energy when turned out of wind. Gliders turning into the breeze over level ground **do not** suddenly gain quantities of free energy, nor do circling models suddenly lose this energy when turning downwind, dropping an equivalent height. This sort of thing simply does not happen! ■

The RnR Products NOVA A Slope Soarer's Delight

...by Steve Condon
San Diego, California

I'd seen the pictures of the Nova a number of times in the various magazines and had taken a good long look at the spec sheet on it, but had never actually seen one in person. I decided that slope racing would be a fun way to challenge my flying skills and figured a plane that was designed for racing was the way to go. The Nova was one of several choices on the market, and after some lengthy consideration I placed the order for it. Looking back at it now, I find that this model is an exceptional value for only three hundred bucks.

RnR Products really provide great service to their customers. I talked to Rich Spicer on the phone to nail-down exactly what I wanted; sent off a check to cover the $295.00 for the kit along with a few bucks for Uncle Sam, UPS and a little more for wing servos and a complete hardware package. Within five weeks, a rather large box arrived and I was ready to get to work on the Nova.

I immediately went through the kit upon its arrival and found everything in perfect condition with all parts accounted for. The workmanship on the molding of the components is very nice. The blue foam core wing with fiberglass molded skins comes in two pieces and spans a total of 96" when finished. The halves of the wings are amazingly stiff. It takes considerable effort to make one of them bend at all! The wings are permanently joined with three plastic ballast tubes (to hold lead shot loaded through holes on the bottom of the wing at the end of each tube) and a couple layers of 2" wide fiberglass tape.

The stab is very impressive. It is hollow core molded with Rohacell and fiberglass - the same as the Synergy. It has a short foam core in the center which holds the pre-installed tubes for the stab rods. All you have to do to finish the stab is carefully sand the flash from the leading edge (the TE is trimmed by RnR — arrow straight and paper thin) and cut it in half with your razor saw. If you work slowly and meticulously it might take you 20 minutes. Nice!

The fuselage is quite easy to complete. The radio installation is simple and very well engineered to accommodate the Nova's no-canopy set-up. The wing has a 15-pin sub-D connector "umbilical chord" that mates to the other half coming from the receiver. Soldering-up the wiring harnesses and the servo leads must be done with care, but it's not really that difficult.

The rudder is made from balsa T.E. stock and does require some shaping. I put a 1/8" X 1/16" piece of spruce on the very T.E. so I could sand it to a nice razor sharp finish. This also helps it resist hanger rash.

The new Nova attracted a lot of interested onlookers both on the ground and in the air.

The Nova looking "ready to rock" on its first outing with its big brother Synergy III in the background.

The most work on the Nova is assembling the wing. If you've built a few planes with the servos in the wings, the process will be familiar to you. The wires for the servos are already in the wings and all you have to do is cut the hatches out, remove the foam, channel the pushrod slots, and wire up the servos. It is important to heed the warning in the instructions not to cut too deep when cutting out the hatches. The servo wires are right against the bottom skin which made it easy for me to cut through two of the four. No big deal, it just made for some tricky soldering. FYI, the wires come in from the front side of the servo compartments.

All told, it took me five days to build the Nova. I didn't keep exact track of the hours it took, but including all of the finishing details I probably spent around thirty hours on it. I'm one of those slow and meticulous builders, so I imagine if you just "power" through it, you could probably do it in half that time.

The best thing about the Nova is flying it! This thing is a slope flyer's dream come true. It tracks extremely well and is so smooth you'd swear you were flying on rails. Probably the most impressive flight aspect of the Nova is the way you can whip a pylon turn in a very tight radius and accelerate out of it. Having the camber coupled to the elevator is a big plus.

My first flights with the Nova were in "the real thing" since I finished it two days before the Torrey Pines Gulls slope race. To me, this is testimony of a truly well-designed ship. I set-it-up like the instructions said, and it flew exactly like I thought it would. When the Nova is in speed section and flying "on step" it is extremely competitive on the straights, and when you dial-in your pylon turning technique you can "lay 'em to waste" in the turns!

Another nice aspect of the Nova is its durability. I got in a mid-air collision in one race and came out with only minor cosmetic damage. The other guy wasn't so fortunate. (Sorry, Ken!) A fellow flyer referred to the Nova as "built like a brick ____house." Seeing Richard Tiltman's Nova go down on the cliff after a radio glitch and come away with no damage certainly made a believer out of me.

The most fun I've had with this ship was a few days ago when I had the sky to myself at Torrey Pines (a rare occasion) with a full load of ballast and over 20 knots of wind. I put that thing through every aerobatic maneuver I could think of along with a few ballistic beach runs at well over 150 clicks followed by screaming vertical flight with rock solid performance.

After that flight I decided that the true meaning of "RnR" has nothing to do with Richards or Rolls Royces, but that what these guys *actually* produce are pure *"ROCK AND ROLL"* PRODUCTS!!! ■

Winch Line
...by Gordon Jones

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

Building a Winch

I guess it is about time that I took the title of this column to heart and did a little on winches. This is a subject that is becoming more and more asked about by our readers, as well as others who want to either build or buy their own winch. The winch has outpaced the High Start as a means of launching in most parts of the country today and increases in popularity as time goes by. I will offer a listing of the basic requirements for building a winch with sources for most of the parts along the way. However, the building will be somewhat cursory as you have to decide on the frame/motor, etc.

There are a number of winches that are commercially available today as well as retrievers so you don't even have to go chase the chute. As this is the day of energy conservation I guess this is a proper philosophy even if it does mean a lot less exercise in the long run. Timbs Engineering will sell you a winch like the one used by the World Championship team. In addition, Rohm, Davey Systems, Flight Line Systems, and a couple of others will gladly sell you a built winch for a nominal fee.

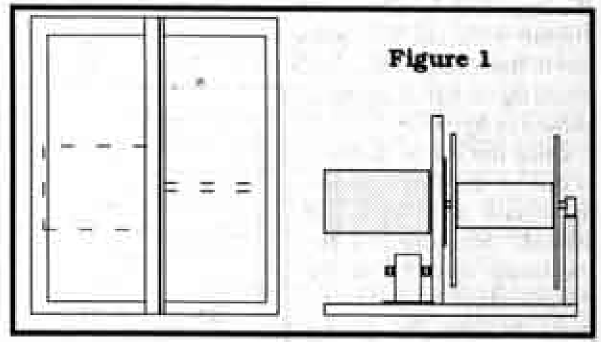
For those on a budget or for the individual who has a tendency to build everything themselves one can build their own winch for a "reasonable" amount of money. It, as always, depends on your budget and inclination to build things. At any rate, for those so inclined, I will go through the basics of building a winch with a few drawings illustrating wiring and so forth to give you an idea of what you will need and where you might obtain the parts.

The first place to start is a parts list of the items that will go into making the winch. I will try to provide options along the way to make things even more confusing just to spice up the decision process somewhat. Most of the following can be purchased anywhere in the country or in the case of the drum, available from a couple of sources.

1. 12 V Starter Motor - Ford long shaft or GM metric
2. Drum for winch line
3. Starter solenoid
4. Foot switch for launching
5. On/Off switch
6. 115V electrical outlet
7. 115V electrical plug
8. Frame for the components (various options we'll discuss later)
9. 12 V Battery deep duty
10. Electrical cables for battery
11. Electrical cable for switches
12. Front bicycle hub with nuts for turn-around assembly
13. Winch line
14. Material for turn-around frame
15. Large spikes to hold the winch and turn-around

The above list gives you the basic parts needed to construct a winch. Next, let's look at where we will get all this material. I will not give costs as they vary from place to place but suffice to say the most costly items are the battery and drum. In addition, I did not put all the small hardware items for the frame in the list as this will vary dependent on the type of frame you decide to build.

The starter and solenoid can be obtained from several sources: a junkyard, an auto parts supply store or from an automotive electrical rebuild shop. The junk yard is probably the least desirable source as you don't know the history of the starter motor or solenoid. An auto parts supply store or an automotive electrical rebuild shop are the best sources because you will at least know what you are getting and a guarantee is usually available to boot. This takes the worry



out of the purchase and is less time consuming. Plus you can shop around for the best price.

While on the subject of starters, there are a couple of schools of thought on the starter motor. The main stay for many years has been the Ford long shaft, but some folks are using the late model metric GM motors as they provide an internal resistance breaking action that alleviates backlash to a great degree. I have used both types on winches and they work equally as well.

The foot switch and on/off switch can be obtained from most electrical shops or the old standby - Radio Shack. Regarding the foot switch; try to get a sturdy one that will take some abuse so you don't have to replace it very often. The same goes for the on/off switch; get one that will last a while. Plus, you can get most of the electrical cable while you are there. The other electrical stuff you can pick up at one of the home supply houses that are becoming more prominent today with the fix-it-yourself craze going on.

The battery and battery cables can be picked up at one of the low cost outfits like K-Mart, Wall-Mart or the like at a reasonable price. While you are there see if they have bicycle parts and pick up a front hub for the turn-around. If they don't have bicycle parts try to find a bicycle shop or a used bike at a garage sale.

The most difficult item to create or obtain is the drum. If you have a friend that is a machinist you can probably have one made for you, or you can buy one from Doug Boyd, 29700 SE Davis, Estracada, OR 97023 or Bob Harman, 10424 Golden Willow Dr., Sandy, Utah 84070. Usually you can ask around your area and find a source; if not try Doug or Bob. One more source for winch drums is Soaring Stuff from Albuquerque, NM. Another item that is somewhat hard to find is winchline; Doug says you can get it from Fishermans Marine Supply, 901 N Columbia, Portland, OR 97217 (#18 Powers braided white 1 lb. spool - $7.95); our club here orders from Brownell Line Co, Modus, Conn. 06469 (#24 braided gold nylon 1 lb spool), or you can find some in the larger hardware speciality stores around.

As you can see, the laundry list of parts will only take a couple of stops for most of the required items. You can also look at the June 1976 issue of *Radio Control Modeler* magazine, the June 1986 issue of *Model Builder* or the *RCM* "Sailplane and Soaring Manual" for additional sources of information. *Model Builder* has the plans available if you want to go that route (plan # 6862) (Note: this is called a 2-Meter winch, but it will work for other planes as well.) The illustrations will provide an idea of the different sizes and lengths.

The first step is to determine what type of frame you will use. I have seen everything from elaborate metal tube frames to a plain wood frame to hold all the pieces. The frame described in *Model Builder* is of the metal tube variety and is light weight yet strong. It does, however, require welding which will increase the cost. The wood base described in the *RCM* "Sailplane Manual" is made of wood and would require much less in the way of special tools and is cheaper.

We have both locally and they all get the aircraft in the air. The choice is yours; but the bottom line is that both work. The wood frame winch layout is shown in figure 2.

Once the frame decision is out of the way, get the materials and let's get started. Measure and cut the frame material to the proper sizes to hold the parts, or have the cutting and welding done. First, the starter motor must be mounted securely to a mounting plate. The mounting plate may be aluminum plate or of one inch wood. If you decide on wood, make it a reasonable strength hardwood. Remove the starter motor mounting plate from the front of the starter motor. Then, locate the proper position on the winch mounting plate and mark the location of the holes that will be required: one for the shaft and three others for the actually mounting bolts. Next, cut and drill out the required holes for mounting the starter motor. If you are building a metal frame winch, you will also need to drill the mounting holes for the mounting plate in the frame.

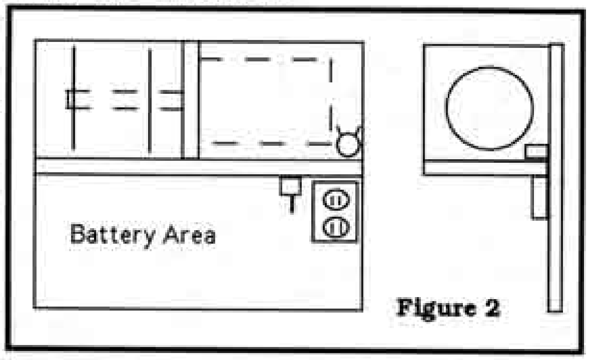


Figure 2

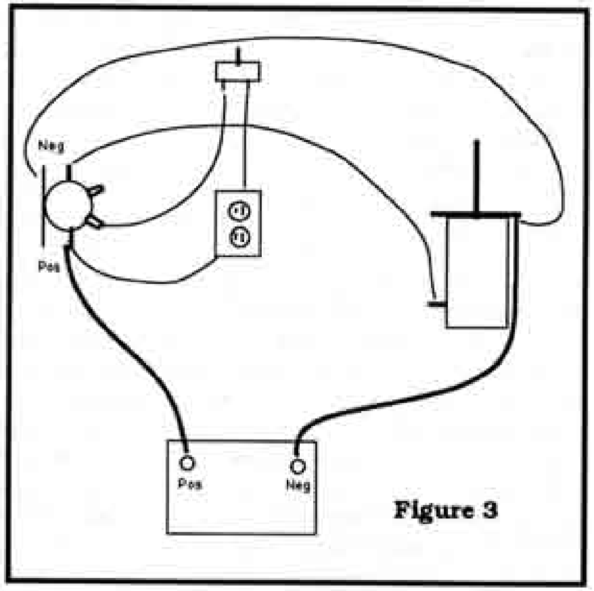


Figure 3

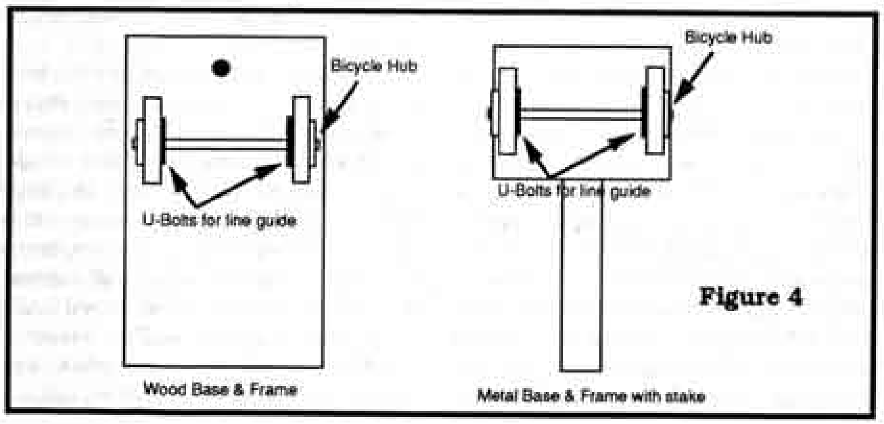


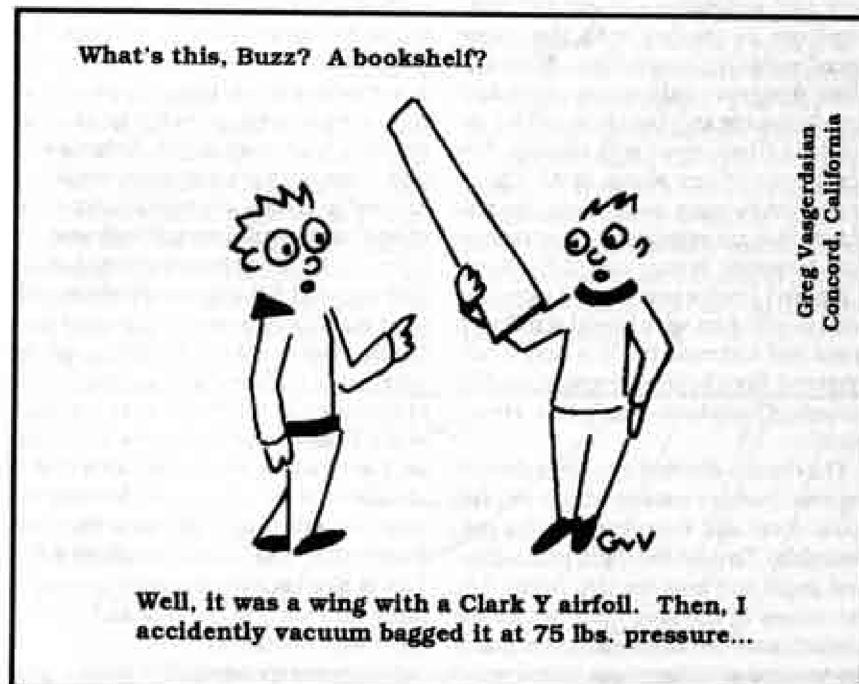
Figure 4

If you are building a wood frame, assemble the frame and then mount the starter motor. If you are building a metal frame, install the mounting plate and starter motor. Next, select the location of the solenoid ON/OFF switch, and 115v outlet box for the foot switch. Attach these to the frame securely in the desired location. Be sure that they are accessible for wiring but not in the way of the winch line or of a brake assembly if you use one.

Once all the major pieces are in place it is time to wire the whole thing together so that it works. Figure 3 is a typical wiring set-up for the average winch. If you do things differently be sure that the wiring is set up correctly. The diagram will give you an idea of the wiring scheme required. If you take a few minutes and look at another winch it will all become clear quickly.

Now, let's look at the turn-around; again there are several different approaches to turn-around design. Some folks that fly off sod farms and the like can use a turn-around that is mounted directly on the ground, while others will need one that sits off the ground and out of the weeds. The two options are depicted in figure 4. Again, if you are unsure, take a look at other turn-arounds and it will become clear quickly.

There is nothing magical about a winch; it only requires the time and energy to put one together. The information above will give you an idea of the parts and pieces involved and to get the juices flowing if you are so inclined. The folks who want plans have a couple of sources now, and those that want to do it themselves have enough information to go off and design their own. If you do have any questions or ideas give me a call. I am always interested in learning new techniques that others may use. That is what this hobby is all about. ■



Tuning the Lateral (Sideslip) Stability

...by Frank Deis
Colorado Springs, CO
Pikes Peak Soaring Society (PPSS)

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

This is usually my last step in trimming a sailplane. From the looks of most sailplanes, very few people go through this step and it has always been kind of a mystery to me as to why pilots quit trimming before they finished. This is the time to tune the lateral stability to the way you like to fly.

The signal most pilots rely upon to tell them that the sailplane is near good or bad air is that it turns by itself. It is fairly common for a sailplane to need some adjustment in this characteristic because very few sailplanes - in my opinion - come out of the box with the proper lateral stability characteristic. Most sailplane designers only worry about how responsive the sailplane is to rudder deflections. (If equipped with ailerons, they don't even worry about that.) This is important because most pilots like sailplanes that are responsive. Responsiveness, however, is only part of the story.

Figure 1 gives a pretty good picture of what is going on with lateral stability. It is not real accurate, but it is easy to understand. For a better discussion, see Eric Lister's "Sailplane Designers Handbook".

The chart is divided into three distinct regions. Two are instable (dutch roll and spiral dive) and the other is stable (i.e., desirable). To read the chart, pick a dihedral angle and note the two points (i.e., the values of the area ratio) where the dashed curve crosses the dihedral line. If the vertical stabilizer area is too small (i.e., values to the left of the first curve cross over point A), dutch roll is a problem. In my experience this is not very common; however, everyone has thrown a 10 cent glider with the rudder missing and noticed that it doesn't fly. The reason is that it has a dutch roll instability problem so bad that it simply can't fly. Hence, that is what a bad case of dutch roll looks like. If the vertical stabilizer is too big - to the right of point B - the sailplane has a spiral dive instability. If you want to know what this looks like, hold the rudder stick over about half way and watch the sailplane start into an ever steepening spiral as it dives toward the ground. Most pilots are justifiably afraid of these conditions and avoid them both.

Responsiveness is related to the strength of the roll/yaw cross coupling and it is largely a matter of having enough dihedral. Therefore most designers pick a rudder area and dihedral angle that puts them safely up high in the middle of the chart as shown by the points representing specific sailplanes. This is much too stable for my tastes. A sailplane like this will bore right through light lift and never even wiggle. I like my sailplanes right on the verge of being spirally instable. I want very slight disturbances under one wing or the other to result in a noticeable course change. Under these conditions the sailplane will indicate very light lift - be it thermal or wave. A dihedral angle of 6-8 degrees produces adequate roll/yaw cross coupling to give the responsiveness I like. (I increased the polyhedral angle in the tips of my Falcon to increase the roll/yaw cross coupling to my taste - about 5 degrees dihedral.) So, I am looking for rudder area that is about 8 % of the wing area. Most of the time the sailplane will have less area than I want. The Falcon has about 6.8%. This is nice because it is easy to temporarily add vertical fin area and experiment with the effects.

Determine the vertical stabilizer area corresponding to the spiral dive instability curve for your dihedral angle and wing area. For my Falcon this is about 69 square inches. Now calculate the actual area of the fin and rudder and determine the shortfall; I come up about 10.5 sq. in. short. Now, fold a piece of heavy paper as shown in either example in Figure 2, but don't crease the dorsal extension; cut it roughly to size and tape onto the sailplane to create either a dorsal fin or a rudder extension to give the extra area. This isn't very precise, so once again add the area slowly and flight test as you go. Launch the sailplane, trim it for straight and level flight and see what it does. If it will fly 200 - 300 meters in a straight line, increase the dorsal fin area and try again. If it slowly wanders off course (say to the left) and when you correct it, it wanders off to the right (i.e., it wants to turn all of the time but doesn't care which way), then there is too much area and it needs to be reduced some. I like as much area as I can get and still hold a straight course for around 200 meters. Tuned this way, the sailplane goes where I want it to go yet it will veer off course if it encounters very light disturbances. This way I can find light thermals and light waves. Once I have determined the right area for the dorsal fin, I can cut a balsa one and "beat it to fit and paint it to match" and I am ready to go. Alternatively you could build a new rudder to get the proper area and no one could ever tell that you had tuned this characteristic. ■

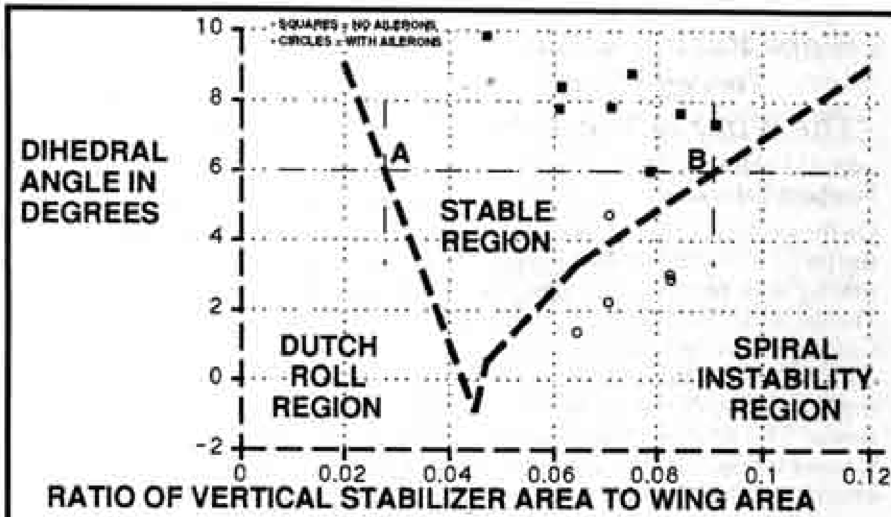


FIGURE 1 LATERAL STABILITY MAP

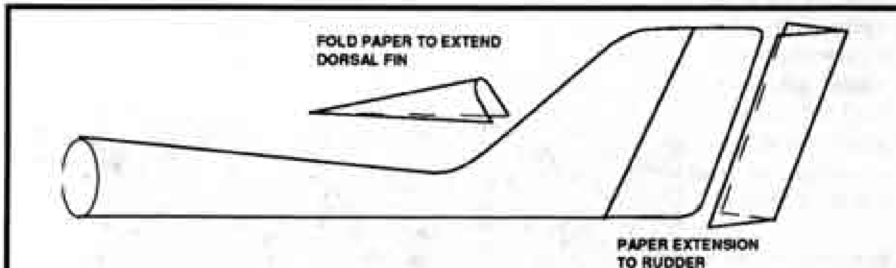


FIGURE 2 TEMPORARY EXTENSIONS TO THE VERTICAL STABILIZER

Slope Racing Action at Torrey Pines "The Wind Is The Thing"

...by Al Valdes and Steve Condon
Southern California

On the weekend of March 14 & 15, 1992, the Torrey Pines Gulls (TPG) hosted their first big slope race in nearly seven years. Thanks to the hard work of numerous Gulls members, the California Slope Racers (CSR), and a little cooperation from mother nature, the race was very successful. This was also the first race of the season for the CSR, and everybody was smiling big when the wind kicked-up for some hot slope racing action. On Sunday afternoon conditions were optimal (18 to 24 mph in the perfect direction) allowing everyone to carry full ballast and generate some serious airspeed! This was a great way to kick-off the season since last year conditions were marginal at most races.

The host club officers did have some anxious moments in the days before the race, wondering if the wind conditions would cooperate. The week before the event was the toughest. There was no wind! At the most it was up around 5-8 mph, but the direction was inconsistent. To say the least, we were worried. A constant 8 mph or better was needed for the races.

Saturday morning we arrived at the cliff with "butterfly" stomachs, and one thought (the same one that kept recurring all week): we need BIG wind for two days. Of course, big wind always means lots of air traffic at Torrey Pines. Fortunately, we have a good working relationship with the hang glider, paraglider and sailplane clubs and we had the cooperation of them and the flight director to keep their activities well south of the race course. The hang and para gliders were only allowed to launch between rounds and the full-size sailplanes weren't out to Torrey, yet. Great. So far so good! Now, where's that wind?!

Our CD, George Joy, and his son Brian were busy setting-up the truck and trailer above the pit area which made a great headquarters and transmitter impound. A number of the TPG volunteers were laying out new carpet remnants in the pits and helping to set up the race course lights with the California Slope Racers' Rich Beardsley and Ray Kuntz. Everything was set; the place looked like a real race course. We were in business now! But wait, something's missing. Where's that wind?!

The racers were pouring in with their planes and the pit area was getting crowded. We got rolling with the registration process, and at 11:00 A.M. Ray Kuntz got the pilots meeting underway

Here we are in the pits, waiting for the wind. It didn't take long.

About the Cover... Start the countdown! A view from the south end of the course as another heat begins with Manny Tau and Rich Beardsley doing the CD duties.

The whole group of participants with their planes on Sunday morning with the breathtaking view from Torrey Pines in the background.

to brief the 41 participants on the rules and such. The wind was only up to about 5 mph, but it was out of the west, the sun was shining beautifully and everyone was ready to race. "Come on wind!" was the prevalent thought. A few guys were searching for a virgin to sacrifice to the wind gods, but came-up empty. Ray and Al walked the course, tested the lights, played the starting countdown tape (complete with some inspiring William Tell Overture mixed in) and got everything in order. Then, right on cue, whaddaya know...the wind started to pick-up! At 12:05 it hit 8 mph due west and steady. It's time to race!

The first heats were a little slow as the wind fluctuated around until it became consistent; it actually got stronger (up to 15 mph) as the day progressed. Thank God.

We ran almost 3 complete rounds on Saturday before the wind started to taper off. There were at least 6 mid-air collisions, including a rather spectacular slice job on Thomas Pils' glass-bagged, V-tail ship. Another plane hit him head-on out of the south turn and sliced through the wing and stab (without slowing down!) like they weren't even there. Nobody was hurt and all downed planes were safely recovered off the face of the cliff. The only incident of the day was when a hang glider flew through the race course heading north below the cliff (perhaps trying to sneak through unnoticed?) during the final ten seconds of start countdown. The start was aborted as our friend on the kite was right in the middle of the danger zone.

Sunday was even better. The wind came-up earlier and got stronger still as the day rolled on until it was up over 20 mph after 2 pm. The wind never let up. YES! Now, this is racing air!!!

Between both days we had several hundred spectators and lots of Torrey Pines Gulls members who got a taste of the high performance end of R/C soaring.

Congratulations to all the winners, especially first-time racers from the Torrey Pines Gulls, Steve Condon and Mark Gumprecht. Steve took first in division two by winning all five of his races flying a brand new RnR Products, Nova. Rich Beardsley, President of the California Slope Racers, had asked Steve to fly in class two to make the matrix even, and besides, it was his first race with a plane that had only one flight on it; what damage could he possibly do? Rich had some kind words for Steve at the awards ceremony where he also made sure Steve knew this was his first *and last* time to race in division two.

Mark came in second winning four of five races flying his incredibly fast, scratch-built "Ripper" with wingeron, elevator and rudder controls and unique formica skinned wings sporting an SD7003 airfoil. Mark accidentally cut a turn in one race which required him to fly an additional lap. He came within a few feet of lapping the competition for the win, but wound-up second. Unfortunately, Mark and Steve never got to race against each other...too bad, it would have been a great race! Third place in division two went to the senior flyer in the Lytle family of slope racers, Jim Lytle.

Division One was won by Rich Spicer (one "R" in RnR Products). The designer of the Nova showed his stuff with the well-seasoned ship that turns on a dime and delivers nine cents change. Second place was taken by Steve Neu who flew very smooth and consistently with a converted F3E ship. Incidentally, Steve will be one of the three pilots on the USA F3E (electric) team representing America at the world championships in Holland this August. Third place in Division One went to last year's California Slope Racers season champion, Richard Tiltman (the other "R" of RnR) naturally, flying a Nova. Richard had some unexpected excitement in one race when a flap servo with a gear problem decided it wanted to stick down. With some cool nerves and great flying he managed to get the flap closed and still finish the race respectably.

The Torrey Pines Gulls first official slope race in all those years was a great learning experience and a lot of fun. This is just the beginning. Slope racing at Torrey Pines is back! The TPG will be hosting several club races (one on May 16 for three classes of planes: 60" and under, unlimited, and a rudder & elevator class) and another CSR race later in the year. In 1993, the club will host the International Slope Race at Torrey Pines. We look forward to seeing you all at cliffside, and please, don't forget to THINK WIND! ■

WRAM Show

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

This year, as in the past, the WRAM Show was held in the White Plains Civic Center in New York. Although the center was full of exhibitors, there seemed to be less new products, and talking to some of the exhibitors I got the impression that there were also less people attending this year's show. I don't know if this is correct because I don't have attendance figures, but it is still nice to see the products that were only pictures in a catalog and to meet the people face to face that were just voices on the phone.

The interesting thing that most of us sailplane and electric sailplane flyers will like is that the booth with the most planes on display was the NorthEast Sailplane booth. Northeast Sailplane had their new catalog at the show and it's bigger and better than last year's catalog. I highly recommend purchasing it because it is full of products, building information and a section on airfoils. You can get one by calling NorthEast Sailplane at (802) 658-9482.

I not only fly electric power airplanes but also non-powered sailplanes, so I have a few pictures of both types of flying. If I missed someone, I apologize. If anyone has something that they feel the sailplane and electric sailplane could use, send me a catalog and I'll pass the information along to the readers.

Good Flying! ■

Stan (L) and Sal of NorthEast Sailplane, 16 Kirby Lane, Williston, VT 05495; (802) 658-9482.

Ninja - SIG Manufacturing Company, Montezuma, IA 50171; (515) 623-5154.

Samurai - SIG Manufacturing Company

Sermos connectors - Anderson Power Products, Cedar Corner Station Box 16787, Stanford, CT 06905; (203) 322-6294. Excellent connectors for electric flight. Also in picture is SR Batteries, Box 287, Bellport, NY 11713; (516) 286-0079. Batteries for everything in RC.

JOMAR Products, 8606 Susanview Lane, Cincinnati, Ohio 45244; (513) 474-0985. Very high quality speed controllers.

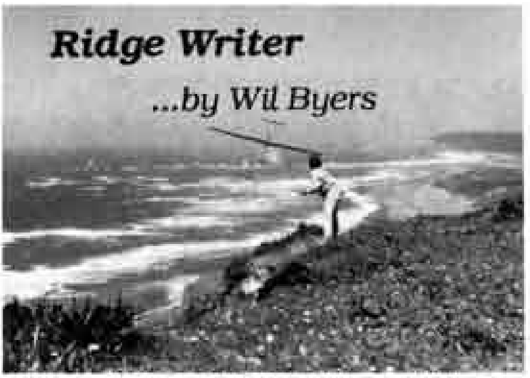
Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444. Lots of sailplane and electric products and a great free catalog.

Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714; (714) 250-1107. All the composite materials you will need to build a strong and light airplane.

Flightec, 21 Juniper Way, Hamilton, NJ 08619; (609) 584-9409. Inexpensive speed controllers.

RJL Control Systems, 8 Wetmore Drive, Denville, NJ 07834; (201) 627-7070. Great source for RCD equipment. Also a service center for RC equipment. Very high quality and workmanship.

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)

There are a variety of landing approaches such as the one discussed last month, but there is one special approach I think well worth discussing in this month's column. It is, what I call, the hover approach, for lack of a better name. The hover landing technique was shown to me in 1977 by my good friend Ken Stuhr. It is a landing methodology that I found and find extremely useful for slope landings. This landing approach can allow a model sailplane to glide down to a landing with zero ground speed and can thereby significantly reduce aircraft damage. Additionally, the hover landing method works exceedingly well in high velocity winds. And, when used properly, it can give the pilot an option of landing a model quite precisely. Lastly, this approach affords the user much more time to judge aircraft position relative to the landing area and correct for mistakes that might otherwise be disastrous.

So, whenever I am looking for a new flying site or considering flying a site different from my standard, I evaluate whether the hover technique will work there. When determining the suitability of any site for the hover landing approach, what are some of the things one must look for in a hill? First and foremost determine if the landing zone is clear of obstructions. And, of course look to see if there are any upwind impediments that might cause the air to become turbulent before arriving at the landing zone. Next, study the lip of the hill to determine how rounded it is, because a rounded crest on a hill is somewhat better for this technique than a sharp cliff type edge. Also, decide if the wind is blowing straight into the face of the hill or if it is coming from some oblique angle that may further turbulate the air moving into the landing area.

A very obvious reason one wants to decide if there are obstacles in the landing area is that most pilots don't want to fly their models into them. However, turbulence is an even greater reason obstructions should be evaluated. Obstructions can and do turbulate the air flowing downwind from them and this turbulated air disturbs a model's flight path as it flies through it. Obstacles may even add lift in the landing zone where one would not otherwise expect it. An example of an object that could add lifting air in the landing zone would be a small building, such that when the air collides with the object it is forced up and over. Thus, when a model attempts to pass through that area of rising air, it is also forced up and must then be corrected for this altitude change. Also, the inverse may be true. In that case the air is falling behind the obstruction and, as a result, when the model passes through the falling air it is forced down. Note also that trees and bushes can create lift or sink and/or turbulate the air in a landing area. So, study a potential landing zone and determine if items in it will impact the air's flow, as well as the way your model will glide through that flow.

Studying the lip or crest of a potential slope site is something we slope buffs all do unconsciously. We cruise down the road observing flying sites and saying to ourselves, "Wow, look at that hill, what a great place to fly R/C gliders. Doesn't it have the most beautiful lip?" Seriously, haven't you ever said that to yourself? Come on, now. Be truthful.

Well anyway, when utilizing the hover technique the air flowing over the lip or crest of a hill can make a great deal of difference in how the model is flown. This is so because the crest or lip can cause the air to change from mostly laminar to turbulent either abruptly or slowly and gradually. This area of transition is quite important because your model will travel through this transitioning air on its way to a landing. It will also ride this air while it travels downwind towards the area of the landing zone. And, at some point along the way, the air will begin to transition from laminar to turbulent. Once the air transition is complete, this turbulent air will then develop into what is normally referred to as a "Rotor". A Rotor is just what its name implies. It is rotating air that tumbles over and over as the wind velocity moves the mass of air molecules past the crest of the hill and pushes them downwind. It is quite important to realize that this mass of air associated with a rotor may be moving up in one area, while at the same time moving down in another, because of its rotating action. So, it doesn't take a rocket scientist to understand that as the model flies through the rotor it is going to get tossed about as a result.

Therefore, the most preferable hill for the hover type landing is one that is rounded at the crest and rolls off somewhat slower than a cliff type site. The crest should also transition into the landing zone gradually and not abruptly. In other words, a hill that has a bump or sharp edge is not preferred over a site that rolls into the landing zone. This is not to say that a cliff site or other terrain will not support the hover technique. It is to say that a rounded slope face is somewhat better. This is so because the abrupt change in terrain causes an abrupt change in the air's flow. In an environment where the terrain changes quickly, as the air flows over that terrain it also tries to change quickly. It that case the air has a tendency to stay attached to it and to then suddenly separate from that terrain. When this happens the air is forced to move adversely, thereby causing a tumultuous change in the air's laminar flow over the hill such that it becomes turbulent. However, when the hill has a more rounded crest the air will transition from laminar to turbulent at a much more gradual rate. It will still eventually transition such that at some point downwind of the lip there is a rotor, but the rotor will not be as close to the crest, nor will the rotor be as violent as it would otherwise. With this in mind, a pilot can study the slope's terrain and better recognize the evils of the wind that a model will have to fly through.

At this point in the discussion, you are probably asking yourself, "What is the big deal with the hill?" Well the reason I have labored to discuss the hill, is because the hill either allows this approach or it inhibits it. When using the hover style of approach a model will fly into the wind after doing a downwind leg and then turn onto a final approach. At that point it is afforded the opportunity to hover in the wind. It will, however, only be able to hover if the wind is blowing sufficiently hard and the air is not too turbulent to prohibit a steady hover.

So, in order to use this technique the pilot will begin by staging the glider out in front of the hill. He/She will stage the glider at an approximate height of 100 feet; of course, this depends on the hill and the model. Next, the glider pilot needs to begin the landing pattern by turning the model such that it is flying downwind and parallel to the final approach leg. I use a rectangular pattern where I fly the model across my chest and then turn it downwind. After flying downwind a distance of approximately 100 to 300 feet the model is again turned crosswind. At this point it flies another leg of the rectangular pattern towards the final upwind leg. Just prior to the model arriving at its upwind and the final leg, the pilot should evaluate the wind direction. A small piece of yarn or string tied to the antenna of your transmitter will assist in this evaluation. Use this wind drift indicator to help line the model up so that it will fly directly into the wind when it completes its turn onto the final leg of the pattern.

Once the pilot lines the model up on final the hover can begin. However, the hover can only be accomplished if the wind is blowing with sufficient velocity to allow it (i.e., the model can hover if the wind is blowing at 25 mph and the model is flying 25 mph). Or, it can hover if any similar situation exists for any model flying and wind speed. This technique can even allow the glider to be backed up if the wind is blowing hard enough and the glider can fly slow enough. In this case, the wind speed must exceed the model's flying speed (i.e., the wind has a velocity of 30 mph and the model's air speed is 20 mph). Therefore, the model could back up at a rate of 10 mph. On the other hand, if the wind is blowing only 10 mph and the model had a minimum air speed of 25 mph, a hover can not be achieved, because its minimum ground speed has to be 15 mph forward or a stall would result.

A special feature of the hover technique is how accurate the landings can be. A pilot can almost spot land the model when the approach is applied properly. If, for example, the model is going to overshoot its intended landing spot the pilot has the option of slowing the model down such that it either hovers or backs up for a more accurate touchdown. An important point here is that, as the model is slowed down and its angle of attack is raised sufficiently, the model's drag will go up, also. Therefore, the glider's sink rate will also normally rise. If the pilot is not observant of this rule they may find that their model not only backed up, but it sunk out. And as it sunk out, it dropped right through that "Rotor" we talked about earlier. More importantly, it dropped through the rotor zone with little or no forward speed, which meant the model had little airflow over its control surfaces once it entered the rotor zone, rendering it with little control. This is a hard concept to understand but, basically, the model has forward airspeed when it is hovering. However, because it does not have forward ground speed, when it enters a region where the air is no longer moving with a positive horizontal velocity the model can be considered to be stalled, which is not good for control.

So, to avoid having the glider blown back over the hill and landing in some undesirable location, pay close attention its changing glide path. Don't let the glider's glide slope change by having its angle of attack change. Just focus it on the landing spot and keep it flying straight into the wind. Also, keep the model's flying speed sufficiently high to allow good control response, but not so fast that it penetrates the landing zone and misses the spot (sounds like a thermal contest). Additionally, the glider's **apparent** glide slope is going to change when it leaves the front of the hill. This is due to the fact that out in front of the slope the air has a positive vertical component while back in the landing zone the air is moving mostly horizontal or turbulated. Don't let this change bother you as a pilot, just adjust for it and glide the model to the landing spot patiently. I say patiently because I have used this technique now for quite some time; however, at last year's Mid-Columbia Cup slope races I rushed a few of my landings. Rushing these landings almost rendered my racer unflyable, but Dave Woods (a racer from England) told me to relax and use the hover, after which the landings became more acceptable. So, you too will not want to rush to get the model on the ground. Rather you will

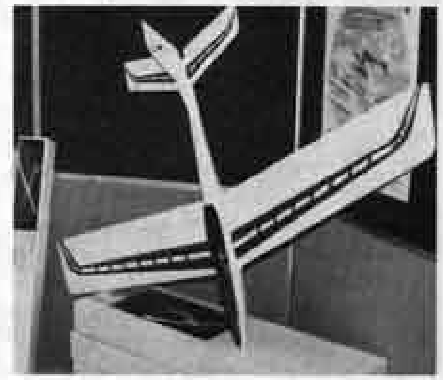
want to fly the sailplane in the hover mode long enough to obtain controlled minimum ground speed landing.

In closing, I highly recommend learning to use this technique. The significant points to remember are:

1. Study the landing zone.
2. Judge the wind direction and velocity.
3. Determine if the hill will support the hover technique.
4. Use a pattern that aligns the model directly into the wind on final.
5. Use the hover technique only when the wind speed exceeds the model's flying speed.
6. Establish a glide slope and adjust for any changes.
7. Be patient and ride the air down to the landing spot. ■

Gary Anderson's 1/3 scale ASW-20 is ready for launch by Ken Stuhr at a previous scale fun fly.

Mike Bamberg landing using a somewhat modified hover technique.



From the Puyallup show...an example of Bob Martin's Coyote, a slope aerobatic kit for the sportsman.

Here, I toss an absolute museum quality Baby Albatross built by Erik Eiche. This scale ship flew exceedingly well.

Shot of Gene Cope's Lear "Glider" Jet on its maiden flight. The model flies and handles surprisingly well. See it at this year's scale fun fly.

Foam and Fiberglass Fuselage Construction

...by John Raley
(Photos by the Author)
1375 Logan Ave. Unit K & L
Costa Mesa, California 92626

In much of my modeling endeavors I've always tried new techniques in fabrication when possible. Some have worked well and others haven't. Once, after having my favorite slope plane sliced in half in a mid air, I built a Quicksilver from Douglas Aircraft with so much carbon fiber and glass reinforcement, it could only be flown in a mild hurricane. I have come to realize that in many cases nothing can beat standard balsa construction, but that still hasn't stopped me from experimenting with new ways to skin the cat. This method of fuselage construction seems to be a lighter, stronger and simpler alternative to the usual balsa and ply skeleton with a patchwork skin.

A few years ago I was buying some balsa at the Hobby Horn and I saw a copy of Martin Simons' "The World of Vintage Sailplanes". After pouring over the pages I knew I had to have a go at building a scale gull wing plane from the 1930's. Shortly after that the *R.C.S.D.* January 1990 cover had a three view drawing of the DFS Habicht and the plans were available from Jim Ealy. This was everything I wanted: 1/5 scale, open cockpit, gull wings, and a sunburst paint scheme. I sent for the plans. When the plans arrived I studied them carefully and then rolled them up into their tube and tossed them into the closet. I find things always look better after they age a little. A few months later I took them out to show Dale Lemmons, friend and long time modeler. He suggested doing the fuselage in two halves using half formers and foam, then glassing over the foam and formers. The foam could then be removed with acetone and the halves glued together. This sounded better than trying to cut little strips of balsa and ply to skin the compound curves of the Habicht. I tried it, and though I made a few time consuming errors, the fuselage came out very good. I have now just finished the fuselage on my second scale sailplane, a 1/4 scale PWS 101. The plans were drawn by Martin Simons and are available through B^2 Streamlines. I picked the 101 over several other sailplane plans I had because of the great detail and because of the construction article Martin Simons wrote on his 101 in *R.C.S.D.*. I decided to use the same technique I used on the Habicht and this time, at the suggestion of friends, I took some photos and notes along the way.

The process is similar to cutting foam core wings. I have seen articles on cutting foam fuselage forms for fiberglassing or balsa sheeting but those were for simple straight backed fuselages. The unique part about this system is that it allows you to make a strong, light weight fuselage, with compound curves. This is not for all fuselage shapes and in strict scale competition may not be acceptable. But if you're contemplating a scale craft, particularly something along the lines of a Minimoa, Kirby Gull or the PWS 101 I'm building, this might be an alternative worth looking into.

Materials and Tools

Most tools and materials needed are already in a well equipped shop. Here is a list of most of the stuff necessary:

Light Ply - Enough to make two profiles of your fuse.
1"x 2" Kiln Dried Douglas Fir - Straight and true, for stiffeners.
Styrofoam - The kind used for Christmas ornaments, and is available at craft stores.
Patch-n-Paint Light Spackle
3m 77 Spray Adhesive
4 oz. and 6 oz. Fiberglass
Epoxy Resin
Hot wire foam cutting bow and power supply
Bondo Brand Glazing Putty

First two accurate lite ply forms of the fuselage profile must be made. I do not include the nose block or fin in this because the nose is easier to form with a block of balsa and is usually hollowed out and filled with lead and the fin can be made with more accuracy, easier and lighter with conventional methods. I tack the two blanks of ply together with a mist of spray adhesive, and then pin the plans on top and punch a tracing into the ply with a seamstress tracing wheel. Trace the profile of the fuse but don't include skids or turtle decks. These can be added later. Cut the form out and sand smooth, keeping the two sheets of ply together to insure that your two final fuse halves will match perfectly. When satisfied, check with the plans for accuracy and mark former locations on each of the ply forms while they are still tacked together. Now you can pull the two forms apart; be sure you have a right and left side marked with former locations in identical places. This is critical: when the two halves are glued together later the formers should match up. The two forms must be stiffened with lengths of 1"x 2" hard wood or the equivalent. Be sure that the stiffeners are warp free and straight or you might get a bowed fuselage in the end. I used 3 pieces of kiln dried Douglas Fir positioned so that the forms would be as flat and true as possible and provide a solid base that wouldn't rock when working on it. (See photo #1.)

Photo 1 - Rusty Hupy holds up fuse profile showing 1" x 2" stiffeners spot glued on back.

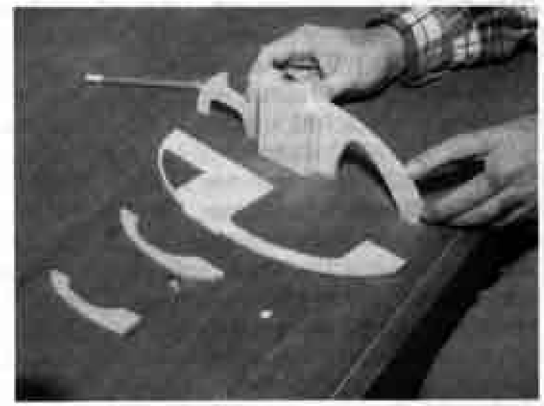


Photo 2 - Formers, including former with wing rod tube installed.

Photo 3 - Hot wire cutting foam blocks to final shape.

Now it's time to cut the bulkhead formers. If your plane is a mid-wing and you are going to have to use wing rods, use a strong plywood to support the wing rod tubes. Again, tack two sheets of ply or balsa together. I make photo copies of the formers instead of cutting up my plans. These I glue on the stock with spray adhesive. Cut out just half the former 1/8" in from the vertical center line to make up for the thickness of the two plywood fuse forms. (See photo #2.) By cutting both sides of the formers together you are assured of a symmetrical section when all is done. The former that the wing rod tubes attach to I made out of one piece of 3/8 birch ply. The tubes were carefully epoxied in place with the proper dihedral; then, 1/16" ID brass tubes were epoxied across the former top and bottom for alignment pins. Then, I sawed the former in half, tacked the halves back to back, sanded the edges until they matched and removed enough material from the center edge to make up for the plywood formers. When all the formers are cut, sanded and marked, match each set to its proper location on the fuse profile; they should match top and bottom perfectly.

Photo 4 - Use CA on the balsa and spray adhesive on the foam to glue form on the plywood.

I have found that the cheap Styrofoam found at craft stores works best for this next part. It cuts easily and sands well. It can be found in 1" and 2" sheets, these can be glued together with spray adhesive to make thicker sheets if necessary. Most plans have the bulkhead formers evenly spaced along the fuselage. On my 101 the spacing was 3" exactly except for a few formers in the nose and tail. The basic idea here is to cut foam filler blocks to fit between the wood bulkhead forms. This can be done easily with a hot wire foam cutter All I did was take my homemade hot wire bow I use for cutting foam wing cores and clamped it in a vertical position on the side of my bench. Foam can then be pushed through using a fence for a guide just like a regular power saw. Cut the blocks to the exact width with a flat side to glue against the ply profile, but leave an inch or so oversize on the curved side. Next, tack the appropriate formers on each side of the block with spray adhesive. Be sure to align the formers properly with their position on the fuse profile form. The foam block with formers attached can then be cut to final size by guiding the hot wire over the forms keeping it in contact with both forms at all times. A smooth, exact cut can be made easily this way with little practice. (See photo #3.) Slight imperfections can be sanded or filled later. Cut all the foam needed for both sides. Remember to make right and left sides, as the two are not interchangeable. After everything is cut and labeled you're ready to assemble. Start with the right or left side and trial fit your foam work to make sure everything fits and is orientated properly. If everything checks out, start with the former that the wing rods are attached to and mark and drill holes for your alignment pins. Glue in place with epoxy so you have time to line up the former correctly with the pin holes and get the former perpendicular. If this former is off or leaning forward or back, your wings

won't fit well later on. Once this critical former is secured you can work your way back gluing foam in place with spray adhesive and formers with CA. (See photo #4.) Any gaps between foam and formers can be filled with thin pieces of foam you can slice off with your hot wire. If your plane has wing fairings and a root rib to attach to the formers, do this now. Don't worry about gaps under the root rib; that will be filled in when the fairing is shaped. Be sure your wing rod holes line up and that the root rib is at the proper angle. The cockpit opening should be framed with hard balsa or spruce stock to provide an edge for the fiberglass to adhere to so you don't chip away the edge while sanding. Make a platform for your fin base or stabilizer, if necessary. Now you're ready to move on to the fun part.

Photo 5 - Light weight spackle works great to smooth out foam and fill in wing fairing.

Give your fillet a good vacuuming to remove any foam bits that are loose. Roll up your sleeves and get out the spackle. Don't be timid here; get a hand full of spackle and start rubbing it into the foam. Fill all the cracks and small imperfections while you fill in the open cells of the foam. (See photo #5.) Fill in around the wing root rib if there is one and shape the wing fairing. Don't try to do this in one thick coat. A short piece of balsa glued in from the trailing edge of the root rib to where the fairing ends on the fuse will help support the shape. Scrape off any excess with a plastic squeegee and let dry. Sand the form lightly with a sanding block wide enough to span a couple of formers. Be careful not to gouge or flatten out the curves. Apply another coat of spackle. Use a straight-edged squeegee wide enough to span two formers. Try to end up with as smooth and even a coat as possible. When dry, carefully sand again. Do this until you are satisfied with the shape and finish. Remember, the fiberglass goes over this and it is much easier to sand spackle and foam than glass and epoxy.

I am not an expert fiberglass man. There are many of you out there that have laid up more fuselages than I'd care to think about. The important thing to remember here is that the small amount of foam you leave on the inside of the fuse stiffens the glass skin quite a bit, so less glass than you might think advisable can be used. I used a layer of 6 oz. and 2 oz. glass over the fuselage from the trailing edge back and 2 layers of 6 oz. and a layer of 2 oz. from the trailing edge forward. This wasn't a hard line. I used as long of pieces of glass as possible to reduce the overlap lines that would need filling in later. The extra glass in the nose and cockpit area is needed for strength and stiffness because the foam will be removed entirely to make room for radio equipment and detailing. The added nose weight certainly doesn't hurt. I use West System Epoxy; they have a fast and slow hardener available and I use both depending on how rushed I am or how rushed I want to be. You'll want to lay up the glass with one batch of epoxy, so use a slow setting hardener. Get all your fiberglass cut and laid out for application. I even mark my pieces so I won't get confused. On some parts I spray a light mist of adhesive on the foam, and then lay on the glass. This allows you to pull and stretch the fabric around compound curves and keeps air pockets from forming between foam and glass. The foam should be just tacky, allowing you to lift and adjust the glass as necessary. When all the glass is down and shining with epoxy, take a roll of toilet paper and soak up the excess epoxy by rolling the roll carefully over the fuselage. When the roll is saturated unravel a few layers of tissue and continue. Do this until all the shiny wet spots of epoxy are gone. Then check the edges to be sure nothing has pulled away. When satisfied let the lay up cure for a day or so.

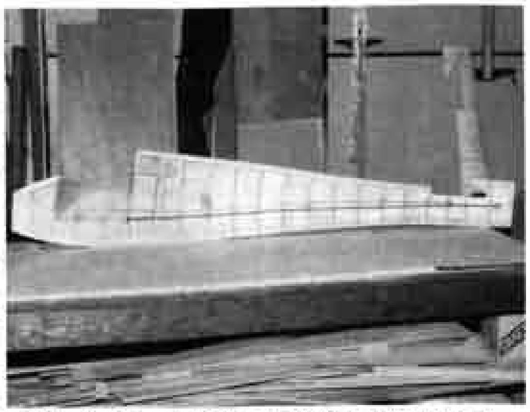


Photo 6 - Completed fuse half with push rods and cockpit interior installed.

Now it's time to remove material. Trim the excess glass off the edges and remove the stiffeners from the plywood back. Draw a line a half inch in or so from the outside edge of the plywood and cut the plywood out leaving the half inch around the edge for the spine and for gluing the two halves together. Leave the plywood wider for more strength where needed and leave it over the wing rod formers or there will be a gap between them when the halves are glued together. Now, remove all but a half inch layer of foam from the cockpit back. Remove all the foam in the cockpit to make room for radio gear. I made a hot wire scoop. A kind of electric cheese cutter if you will. This enabled me to scoop out the foam by running the hot wire across the two formers. This left foam against the fiberglass about a half inch deep (the width of the "C" shaped former). It isn't necessary to do it this way, as any type of scraper will do. I wouldn't use a chemical unless you wish to remove all the foam. I did this on my Habicht and it made the fiberglass very easy to dimple in. I had to add another layer of glass and, of course, more lead in the nose. The foam adds a lot of strength to the structure. It may look funky, but it works. The rest is pretty basic. Get all your interior work done before gluing the sides together. I lined the cockpit area with 1/64" ply to give a more scale appearance. Install all push rods and linkage and a tube for the antenna. (See photo #6.) I made a servo tray that fit from nose to seat back and side to side, with slots for formers so when glued in place along with the fuselage halves the fit was "wall to wall". In the spacious nose and cockpit of the 101 I easily have room for radio, servos, battery pack, lead, and my lunch.

When all interior work is finished you're ready to glue the two halves together. Make sure your plywood surfaces are smooth and clean; insert alignment pins in brass tubes if you're using them and glue together with 30 minute epoxy. Clamp fuse halves together with tape and rubber bands keeping sides flush with each other. Now you have something that looks like a fuselage. (See photo #7.)

Finishing

The fuselage looks pretty rough, but don't panic. The seams are easily filled in with epoxy and micro balloons. I put a layer of carbon fiber tow and then fiberglass over the seam where the skid will go. The best material I found for filling pin holes and lap lines can be found at automobile paint supply stores. There are 2 or 3 good brands available; my favorite is Bondo Brand Spotting and Glazing Putty. It's also made by 3M. It comes in 4 oz. and 8 oz. tubes. The putty is like toothpaste and spreads easily and smoothly. The best part is that it sands very easily. Epoxy and micro balloons will work, but you'll be buzzing all night with your sander smoothing it out. I literally covered my entire fuse with glazing putty and then sanded 90% of it off. Be careful not to go into the glass. After the first coat of glazing putty, only a few rough spots remained. The rest is like any other fuselage; use the primer and paint you like best.

That about wraps it up. I hope some of you give it a try. I'd like to hear any suggestions or questions you might have. Good Luck! ■

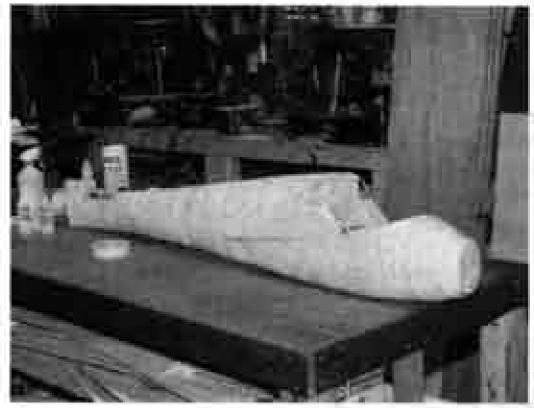
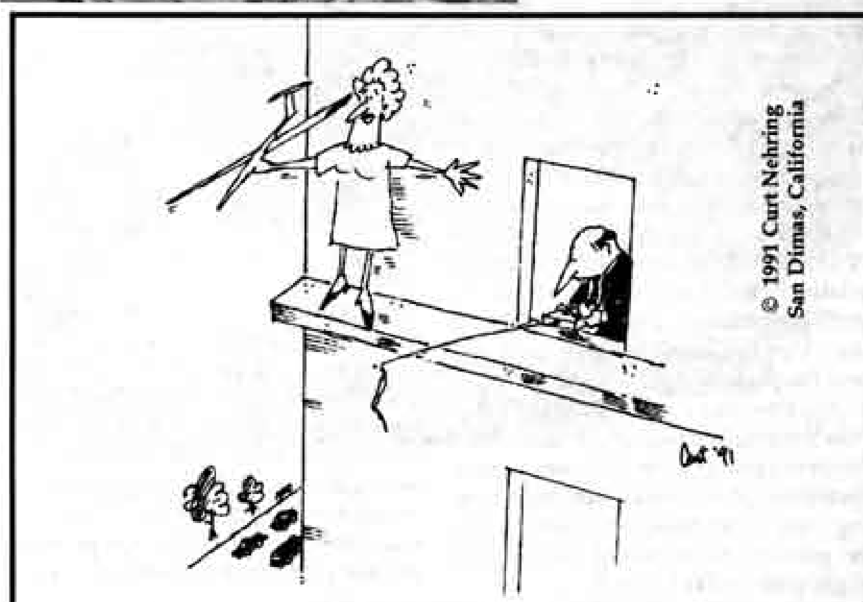


Photo 7 - Fuselage is epoxied together and held in place with tape and rubber bands.



"Now It Can Be Told" Department

...by Pete Young
6592 Belgrave Ave.
Garden Grove, California 92645

(This article originally appeared in *Plane Rap*, the newsletter of the Harbor Soaring Society in Southern California.)

The morning is clear and windless as the Space Shuttle sits on Launch Complex 39 at Kennedy Space Center, poised for flight. Mission Control counts down the final seconds: "TEN... NINE... EIGHT... SEVEN... SIX... FIVE... FOUR... we have main engine start...THREE...TWO ...ONE...ZERO...SRM ignition and liftoff. We have liftoff!" Ever so slowly, yet with increasing speed, the Shuttle clears the launch tower and climbs into orbit on a tail of fire carrying a complex scientific payload - and a glider experiment originated by two Harbor Soaring Society members!! (!) (?)

The origin of this story really started several months prior to the flight during a long series of planning meetings at Johnson Space Center. Chatting with the astronauts designated for this flight, conversation turned to the effects of weightlessness on the human body, behavior of liquids in zero gravity, and on-orbit experiments conducted to date. This is a fascinating subject which is difficult to accurately simulate on the ground, of course. Zero gravity flights on NASA's KC-135 are helpful although relatively short duration, 30 to 40 seconds per attempt. I took some rides on the "Vomit Comet" several years ago, and the plane is aptly named!

Anyway, our conversation shifted to how a normally designed airplane would behave in zero gravity. If air was present, then the airplane would start out "thinking" that everything was normal, yet - no gravity! What would the resulting flight path be like? Why?

THIS IS A TEST! THIS IS A TEST! REFERENCE MATERIAL MAY BE USED!

A. FOR 25% CREDIT, the student will describe, in words, how an airplane will fly in air, but with gravity absent. Full credit for this section will be given for a clear, concise and carefully reasoned response.

B. FOR 75% CREDIT, the student will derive the two-dimensional equations of motion for the situation described above. Full credit will be given for correct and complete solutions. Show all work.

C. FOR 15% EXTRA CREDIT, the student has the option of describing, in words, the "zero-G" airplane's resulting flight path in three dimensions if launched in a climb attitude with a yaw offset.

You May Begin!

Around the coffeepot, our discussions didn't get much beyond "well, it oughta go like this" hands-in-air phases. Even with many hours of high performance aircraft flying time, the astronauts were clearly intrigued by the theoretical aspects of this question. We agreed to do some homework and reconvene at a later time.

Back in Orange County, I happened to mention the problem to OFB Bud Mears - fellow HSSer, R/C and full-scale sailplane pilot, and blessed with extraordinary analytical skills. Starting from first principles, Bud concisely answered all three test questions in elegant fashion. His approach and assumptions were sound and reasonable and the conclusions appeared intuitively correct. Armed with Bud's analyses, I returned to Houston and gave a short presentation to the crew at the next Flight Operations working group. The analyses and conclusions were well received, and clearly the next step was to propose an on-orbit experiment to verify the theoretical results. An experiment proposal and test plan was prepared and coordinated with NASA mission management who - after careful review - "signed off" on the proposed tests. I bought two North Pacific balsa wood gliders which were carefully stowed with the crew's personal effects.

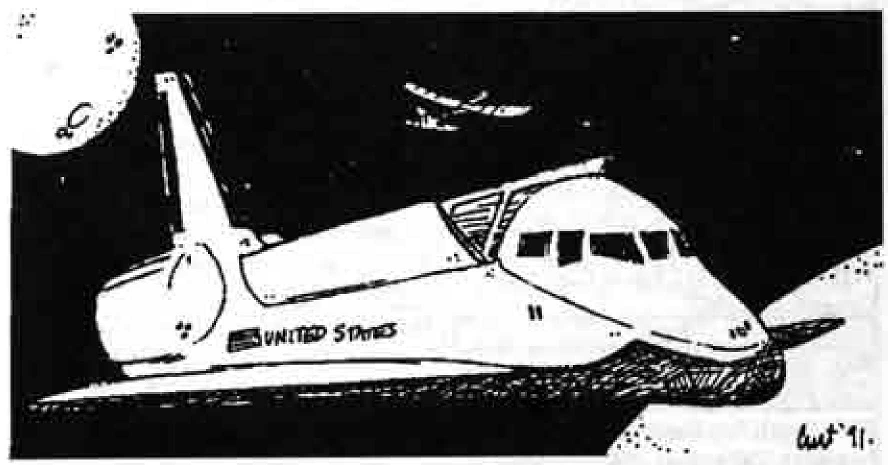
Finally, launch day arrived! As viewed from my position in Mission Control, the flight into orbit was flawless with all major ascent sequences completed normally and on time. For the North Pacific gliders, it was the "mother of all zoom launches"!

On the third day in orbit, the two gliders were unstowed and flight tests commenced! Could this be a world record for hand launch gliders - 18,000.01 miles per hour? What were the results? The flight videos clearly verified Bud's predictions and the crew enjoyed running the tests. Readers are invited to submit their solutions to the Editor, and the best solutions will be published in a later issue!

Tests completed, the gliders were restowed for the reentry phase and an uneventful landing at Edwards AFB. Sure got a lot of mileage out of those 89 cent gliders!

Postscript: The gliders were returned to me several weeks later and are now hanging over my workbench, no doubt dreaming about when they truly "...slipped the surly bonds of earth...". What's next? Well, let's see...is V-dihedral superior to polyhedral in zero gravity? How about a test? ■

Being a bit curious and seeing that Pete is a LTCOL in the USAF, we gave Pete a call. Pete says, "I have not yet received any answers to the mini-test in the article." So, Pete's address is printed above and, hoping he gets some responses back, *RCSD* will provide a free one year subscription to the person whose answers come closest to being correct. Yes, Pete is serious, so go back and read his article, again! ■



Original Soartoon by Curt Nehring

R/C Soaring Resources

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

Seminars & Workshops

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

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

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

Reference Material

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

BBS

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

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

Reference listings of *RCSD* articles & advertisers from January, 1984. Database files from a free 24 hour a day BBS. 8-N-1 Bear's Cave, (414) 727-1605, Neenah, Wisconsin, U.S.A., System Operator: Andrew Meyer

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

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

Contacts & Special Interest Groups

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

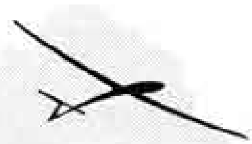
California - Northern California Soaring League, Mike Clancy (President), 2018 El Dorado Ct., Novato, California 94947 U.S.A., (415) 897-2917

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

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

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

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



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LSF

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- NSS IS INVOLVED IN THE ORGANIZATION AND OVERSEEING OF THE SOARING PORTION OF AMA NATS (INCLUDING AWARDS BANQUET)
- YEARLY DUES ARE $15 U.S.A. AND $20 OVERSEAS (SPECIAL FAMILY RATES)
- NSS OFFICERS ARE FROM ALL 11 DISTRICTS

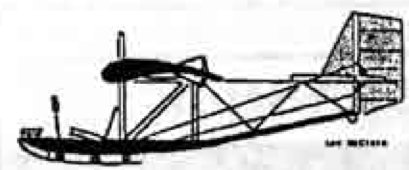
For Information, Contact:
NSS Secretary/Treasurer
Robert Massmann
282 Jodie Lane
Wilmington, OH 45177
(513) 382-4612

T.W.I.T.T.

(The Wing Is The Thing)

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

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



The Vintage Sailplane Association

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

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

NEW PRODUCTS

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

1992 RC Soaring Reference and Catalog

...from Northeast Sailplane Products

Northeast Sailplane Products is pleased to announce publication of their 1992 RC Soaring Reference and Catalog. This year's version is a complete re-write from the bottom-up, and is the NSP gang's best effort, yet.

The '92 Reference features 115 pages of kit information, reviews, tips, and articles from some of the more prominent names in the RC Soaring community. You will also find an expanded accessory section, and a comprehensive airfoil glossary. The NSP RC Soaring Reference is simply the most comprehensive collection of information on RC soaring products in the industry, and is a "must have" for anyone remotely interested in the sport.

"This year we added a great deal more information, but changed the layout slightly in order to prevent additional publication costs. The result is a reference that is much better than the 1991 version, but is sold at the same price. We are pleased with the results," says Stan Eames, co-owner of NSP.

The NSP RC Soaring Reference and Catalog is available for $5 plus $2 for first class shipping. To order a copy, send $7 to Northeast Sailplane Products, 16 Kirby Lane, Williston, Vermont 05495. ■

"Frankly Speaking"

Written by Frank Zaic

...Review by Jim Gray, Payson, Arizona

Even if you don't know Frank Zaic (and who in the aeromodelling world doesn't?), you'll enjoy this fascinating book of stories, quotations, excerpts, comments, poems, and marvelous tales of all kinds. "Frankly Speaking" is NOT a Zaic "Yearbook", but more a book of Years written by a modeler, pilot, designer, draftsman, engineer, photographer, husband, father, grandfather, world traveler and a dozen other things that make up Frank's life. He has seen it all, as a boy with a European background growing up in America, starting a successful model airplane kit business, serving in the U.S. Air Force in Italy with a B-24 bomber group, publishing hundreds if not thousands of plans, and writing the famous "Yearbooks"...and in the process making thousands of friends all over the world. Frank Zaic is a philosopher with an eye for the humor and pathos of life on the planet Earth, and the uniqueness of man's place here.

All of the witty sayings in "Frankly Speaking" are original - from his own fertile mind. Have you ever seen something or heard something and wished you'd said that? This book is full of them! The book is arranged in two major sections - Quotes and Short Stories. The chapters in the Quotes section include: Everyday, Nature, Up at 39,000 Feet, Critique, Springtime, Sneak-Ins, and Late Comers. The chapters in the Short Stories include: Clinging Vine, Emergency Stop, Aesop, Free Flight, JASCA, Relax Number, From My Diary, Living with History, Mysterious Music, Mini Experience, and Trip to America.

Pick up the book, browse through it - don't hurry - just relax and enjoy. I really laughed at some of the sayings such as: "If you call a man a SOB, expect to be bitten," or "If you want to know how really bad off you are, see a psychiatrist," and "You have no idea how many people live in your state until you play the lottery." How true. Each snippet of truth rings a bell of familiarity.

Have you ever wondered how it might feel to be a plant? Read "Clinging Vine" and find out. What was it like in Italy during WWII, and where did that "Mysterious Music" come from? Frank's book will tell you, if you don't know already.

One of my favorites is the remarkable meeting with a young German modeler in 1937 in Buffalo, New York and in Germany...and again, 42 years later, through an article in the English magazine *Aeromodeler*. Indeed, it IS a small world, nicht wahr?

Do you like numbers, numerical relationships, and the weird and surprising results of numerology? Take for example "The Number Nine (9)" in which Frank turns that number every which way but loose...in ways you may never have expected. He says it's addictive, and I believe it.

In summary, here's one of those familiar 5 1/2" by 8 1/2" books with orange paper cover so typical of the many books published by Frank Zaic, yet it's different. In it, you'll find the distilled wisdom of - not models - but a modeler's life: his own!

If your book dealer or model supply store doesn't carry it, write to Frank Zaic, himself, at P.O. Box 135, Northridge, CA 91328 for your own copy. Cost is $6.95 plus $1.50 postage. Tell him I sent you. ■

Sailplane Reactions to Changing Air

...by Wildey Johnson
Boca Raton, Florida

Have you ever asked various people about finding thermals and gotten conflicting theories on how the sailplane will react to lift? If one just observes a sailplane in flight, it is easy to come up with the wrong interpretation of what we see.

Let's analyze several situations to uncover the truth.

Lifting Air (Thermal)

Phase I (Stabilized Flight)

Figure 1 shows the tail of a sailplane in a stable air mass. The plane is flying at 20 knots and sinking at 2 knots (L/D = 10). Another way of saying this is that the aircraft is on a glide slope of 5.7 degrees. The CG is slightly forward of the center of lift requiring a small negative angle of attack (say, -.5 degrees) on the stabilizer. Let's assume that the wing angle of incidence is such that the tail boom is horizontal.

Phase II (The Encounter)

The sailplane has just entered a thermal with air razing at 5 knots. The air is striking the sailplane at an angle of 14 degrees lower and slightly stronger than just before entering the thermal. So the angle of attack has increased by 14 degrees for both the wing and the stab. Figure 2 shows the new air striking the stab at a high positive angle of attack.

Phase III (Attitude Change)

What happens next is the interesting part. Due to the sudden increase in angle of attack both the wing and the stab are generating large up forces. The question is, "Which one (the wing or the tail) will move up faster?" Even though the wing is a more efficient lifting surface, it is held back by the weight of the aircraft. Besides the low mass of the tail, several other factors come into play to help the stab win this battle. Instead of working against the forward GC (as in normal flight), the force on the stab and the nose weight are working together to move the tail up. Also, the drag generated by the stab is working to align the tail boom with the new air direction. Figure 3 shows the tail just after it has reacted to the new air direction. [This is a very simplified account of what happens. In actuality, the tail will overshoot the theoretical situation shown. Also, on sailplanes with high lift airfoils, the plane can be seen to jump as it enters strong lift and then the tail goes up. On my heavily repaired Sagitta, I only see the tail go up.] Notice that the angle of attack for the wing and the tail are the same as before entering the lift. The important thing is that the tail goes up. This is the primary indication to the RC sailplane pilot that the aircraft has encountered lift.

Phase IV (Increased Speed)

Now that the tail is elevated, the sailplane is descending at an angle of 20 degrees through the air mass and the gravitational force driving it has increased considerably, so the aircraft speeds up. [In full size sailplanes the pilot notices this increase in airspeed (known as the Yates effect) more easily than the angle change of the fuselage.] Even though airspeed is increasing, the plane will not lose altitude. However, much of the possible altitude gain (potential energy) is traded for an increase in speed (kinetic energy). This is fine on the slope, but not so good if you are looking for altitude. [This whole fascinating business of flying sailplanes is one of extracting energy from rising air. Slope flyers take theirs in the form of gains in velocity (kinetic energy). Thermal and XC pilots go for gains in altitude (potential energy). Full scale sailplanes have an instrument that registers changes in the aircraft total energy in that it responds to both altitude and velocity changes.]

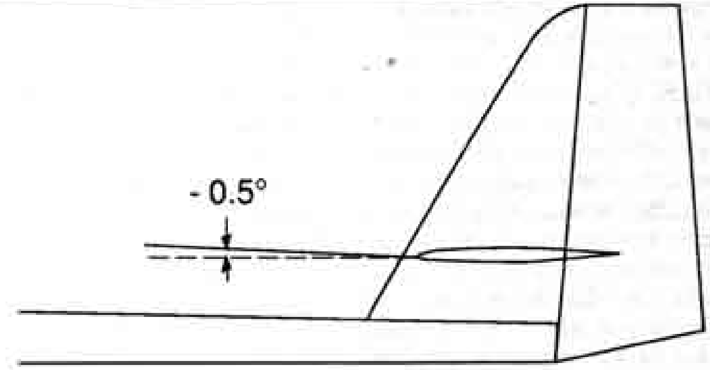


Figure 1 Still Air Cruse

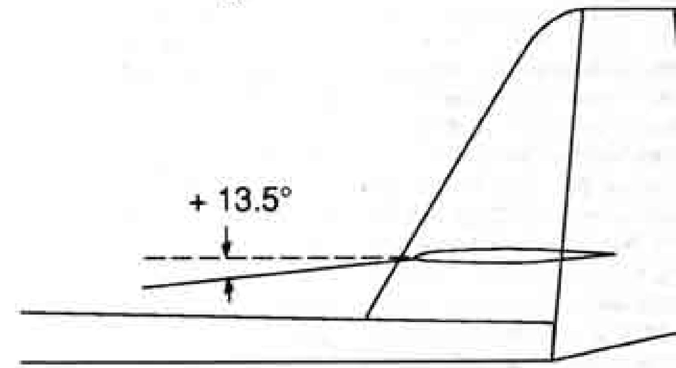


Figure 2 Encounter with 5 Kt. Lift

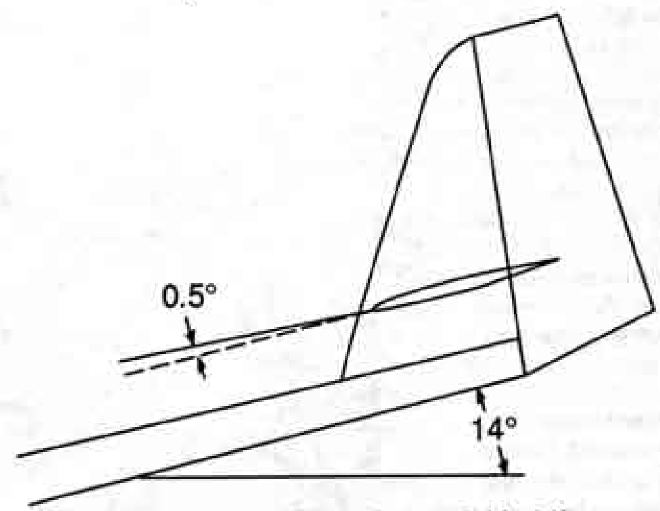


Figure 3 Reaction to 5 Kt. Lift

Phase V (Speed Stabilized)

Since the sailplane is trimmed for a 20 knot airspeed, the increased airspeed in PHASE IV will result in an increase in the down force on the stab, and the aircraft will slow up. It will eventually end up in the stable condition shown in Figure 1, but now climbing at 3 knots.

Figure 4 shows the sequence of reactions when entering a large area of lift. Keep in mind that this is a large area and in the real world your sailplane may not have an opportunity to complete all phases as shown. For example, you may see the tail go up, fly level for a short time, and then continue to descend.

In summary, the important thing for the thermal RC sailplane pilot is that he can go directly into a full climb by applying up elevator as soon as the tail goes up. Also, you need to get the sailplane down to thermaling speed as soon as possible. If you use flaps while thermaling, put them down. This will slow the aircraft to the correct speed and help prevent flying through the lift, requiring a course reversal (XC pilots take note). If you have sufficient altitude, the size of the thermal may be large enough that you don't need to circle. Just slow the plane down to minimum sink speed (or even slower) as you fly through the thermal and you will maximize the altitude gain without circling. Full scale pilots call this Dolphin flight because a Porous like motion is produced by pulling up (slowing) in lift and diving in the sink surrounding the lift. On a good day sufficient energy can be extracted using this technique to sustain flight without circling.

Horizontal Gust

Increased Airspeed

In this situation, the new air will come from a shallower angle as compared to the stable situation of Figure 1. This will force the tail down slightly causing the plane to climb and slow towards its trimmed airspeed. As seen from the ground the plane will appear to slow even though its airspeed is higher than before the gust. You often see the situation where the plane stops its forward progress and moves straight up. The beginning of a stall is likely when the gust lets up. This will depend on how fast you were flying, how quickly the gust lets up, and how nose heavy your mechanical bird is. I have seen people flying Gentle Ladys effectively work these gusts by giving additional up elevator during the gust. I think that this works because the wing is capable of flying at such high angles of attack, and very little is lost in a stall.

The important thing here is if the plane appears to drop its tail slightly, slow up and climb, it has encountered a gust. So if someone says, "When my plan enters lift, it slows up and climbs", that person has confused the effect of a gust with lifting air. The proper action for most pilots will be to add down elevator to maintain the proper attitude so as to avoid getting too slow when the gust lets up. Don't circle in a gust.

Decreased Airspeed

This is straight forward. Because of the reduction in the horizontal component of airspeed, the new air comes more from below. The stab goes up while the wing

Wildey Johnson with his LAZER.

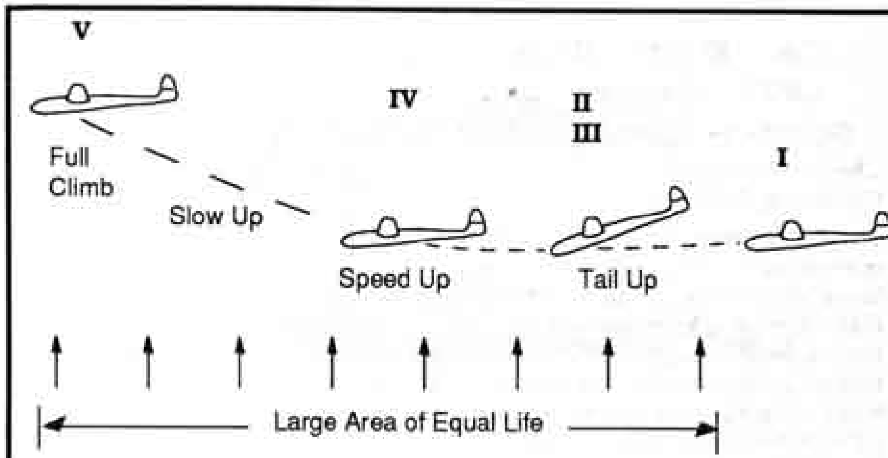


Figure 4 Sailplane Reaction to an Area of Lift

falls and the plane quickly starts to lose altitude. It may even staaalll. Also, the ground speed will drop; however, this may be hard to detect while flying downwind.

So, how do we tell the difference between a high stab position caused by a lull and one caused by rising air. In rising air energy is being added, the plane picks up speed and starts to climb at the same time. Just the opposite happens in a lull.

Descending Air

As the plane enters this air, the angle of attack will decrease, forcing the stab down. The plane will slow and start to drop faster with its tail down. This is just what you don't want. The pilot should dive the plane to move out of this air ASAP.

In most situations, if left unattended (free flight), the sailplane will do just the wrong thing. It will turn away from lift, speed up in lift, and slow down in sink. [Maybe this was why my first 50 flights were so short.] With sailboats and sailplanes alike, the ship is highly sensitive to flow over wings and control surfaces. Also it is constantly entering a new environment. For the pilot who can sense these changes and apply the correct control response in just the right amount, how sweet it is! ■

Wildey Johnson flies RC sailplanes in southern Florida with the Glades Soaring Group and the Thermal Chasers. He has 700 hours in full scale sailplanes. ■

Joe Wurts Wins 1992 Masters of Soaring Competition

...by Don McColgan
Claremont, California

The 1992 Masters of Soaring competition opened on Saturday, March 21 at the Silent Wings Soaring Association (SWSA) field in Covina, CA. Thirty-five top glider fliers braved the Spring rains to participate in sixteen scheduled rounds of tough competition. Due to the rain, only eight of Saturday's rounds were completed and three more on Sunday. To participate in this contest a flier must have achieved LSF level V or level IV and all contest points for level V, hold a national record, or have won a major two day, national, or regional contest.

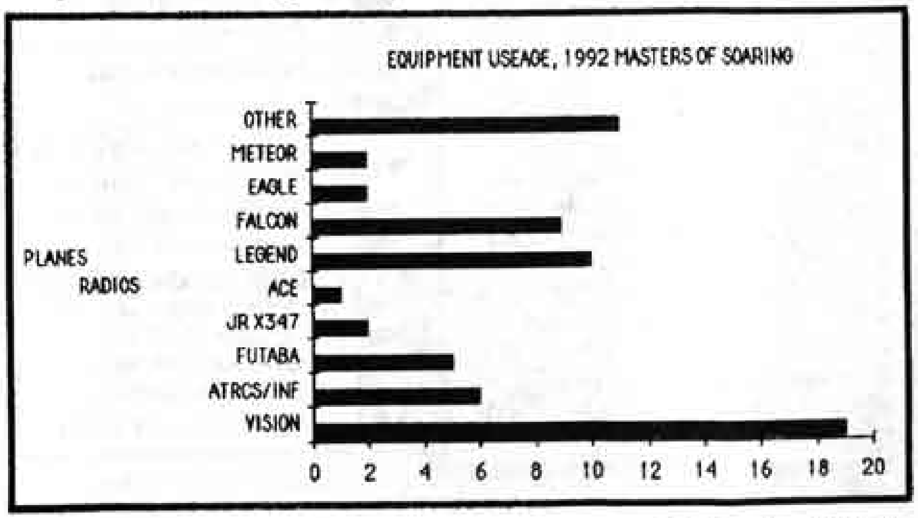
Saturday's eight rounds started with a three minute precision duration warm up followed by a 4, 7, and 10 minute triathalon. Round five was a five minute precision, six a seven minute duration, seven a three minute precision and eight, a six minute duration event. All landings were either runway or spot adding a maximum of only 40 points. These rules made the flying time of paramount importance. The scoring for the precision rounds was very "steep"; 30 seconds off the goal resulted in a zero flight score. The storm clouds provided lots of turbulence, lift, sink, and a few showers as well as some gusty winds during some of the landings. The contest was not meant to be easy!

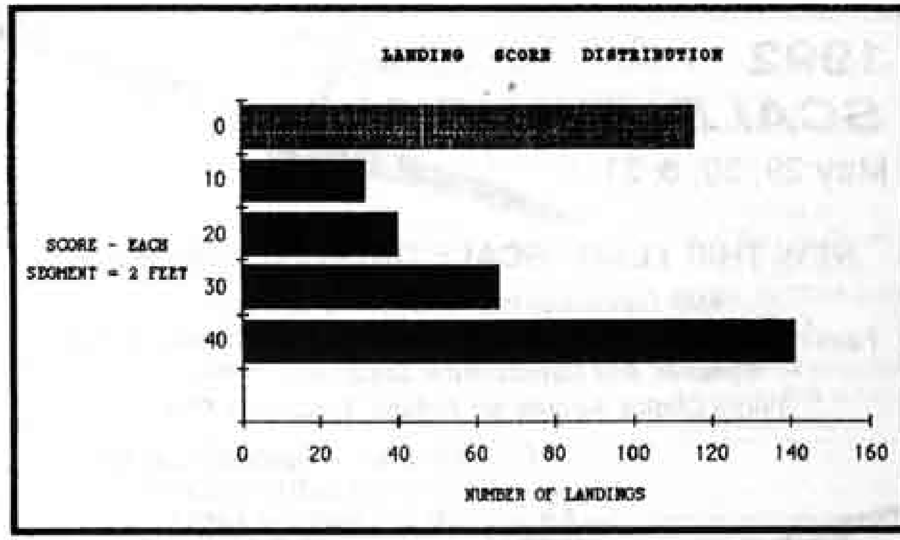
Round one ended with five perfect scores of 1000 points and a six place tie for sixth with scores of 994.6. At the close of round eight on Saturday, Joe Wurts led with 6968.1 points followed by Daryl Perkins with 6946.3 and Dan Fink was third with 6833.4 points.

The Sunday opener was a three minute precision. Round 10 was another seven minute precision duration and the last round a four minute precision. These three rounds required spot landings using eight foot tapes divided into four two foot segments counting 10, 20, 30, or 40 points.

There were a total of 15 perfect rounds flown in this contest with winner Joe Wurts earning five of them and second place Daryl Perkins earning four. Wurts hit 11 perfect landings in the 11 flights.

The most popular airplane this year was the Airtronics Legend (10) followed by the Falcon (9). The most popular brand of transmitter was Airtronics (25), 19 of which were Visions. All but six radios used were computer types. This equipment as well as some excellent eyesight allowed these fliers to venture a long way from the field in their search for lift. Full camber control was used by most of the top pilots. Flaps and ailerons helped to make landings look easy in the gusty winds.





Tim Renaud of Airtronics generously donated Sagitta 600 and Olympic 650 kits for the worker's raffle. Hobby Dynamics donated a JR dual transmitter case plus some JR hats. Bob Massmann, President of NSS, provided coffee mugs and NSS "T" shirts. All merchandise was raffled off to the SWSA folks who hosted the contest and provided their labor as well as free coffee and donuts.

Trophies were awarded to the top five places; 1 Joe Wurts, 2 Daryl Perkins, 3 Fred Weaver, 4 Chris George, and 5 Larry Jolly. Winning against the 35 competitors assembled at this contest demanded superb flying skills. ■

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A Contest, Trade Show & An Event for Juniors

The Memphis Area Soaring Society (MASS) and the Northern Alabama Silent Flyers (NASF) are sponsoring the Mid-South Soaring Championships in Memphis, Tennessee on June 27 & 28. This contest will include a Junior Class and *RCSD* is pleased to sponsor a series of "Junior Flyer" awards for this event.

In conjunction with the contest, *RCSD* will also sponsor an on-site "trade show". Bob Sowder, President of MASS says it best. "Space and facilities will be provided at the contest site to accommodate sailplane related manufacturers, suppliers, and vendors. This will provide a wonderful opportunity for these businesses, both large and small, to "target their market" to an enthusiastic and captured audience. Our two day fall contest last year drew in excess of 80 entries."

MASS & NASF will provide the logistic support. If you are a manufacturer or sell sailplane related items that you would like to display, please give *RCSD* a call. The format will be similar to the one we used last year at the Western States Soaring Championships in California (*RCSD*, August 1991, page 25). If you can attend, we will make the space arrangements and coordinate any special requirements you may have. If you can't attend, you can send us your brochures, flyers, or displays and we will set everything up ourselves.

Yes, Jerry Slates & Gordon Jones will be there. Rumor has it that Gordon has already obtained an entry form for Elf #12, our new special helper that appears when typing or envelope stuffing time arrives, and that one of the RnR Products team will be flying a Synergy at the event, as well. ■

TWO GREAT CLUBS SPONSORING ONE GREAT EVENT AND TRADE SHOW!

The MID-SOUTH SOARING CHAMPIONSHIPS

The largest sailplane contest <u>EVER</u> in the South will be held in

MEMPHIS, TENNESSEE

Dates: June 27 & 28, 1992

CLASSES: Unlimited Sailplane Junior, Novice, Sportsman, Expert

AWARDS:
1st - 5th place both days Sportsman & Expert
1st - 3rd place both days Novice
1st - 3rd place *RCSD* Junior

Due to the anticipated popularity of this contest, pre-registration will be requested. For complete information, write the Memphis Area Soaring Society, 1489 Wood Trail Circle, Cordova, TN 38018 or call:

Bob Sowder (901) 757-5536 - Memphis
Mike Kelly (901) 756-9410 - Memphis
Ron Swinehart (205) 430-2018 Day, (205) 883-7831 Eve. - Huntsville

SPONSORED BY:
The MEMPHIS AREA SOARING SOCIETY
& NORTH ALABAMA SILENT FLYERS
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Schedule of Special Events

Date	Event	Location	Contact
May 17*	Slope Fun Fly King of the Bluff Champs	Arcata, CA	Daryl Pfaff (707) 445-3538
May 15-17	F3H XC Western Great Race	Taft, CA	Myles Moran (818) 882-4687
May 16-17	Electric Contest	Memphis, TN	Bob Sowder (901) 757-5536
May 16-17	CSS May Memorial Contest	Cincinnati, OH	Chuck Lohre (513) 731-3429
May 23-25	Vintage Sailplane Assoc. Regatta - Fifth Anual	Hemet, CA	Harry Irvine (310) 429-4919
May 29-31	Mid Columbia Scale Int. Fun Fly	Richland, WA	Roy (509) 525-7066 Gene (509) 457-9017
June 6-7	Unlimited & 2M 11th Annual Rose Bowl Soaring Festival	Pasadena, CA	Noel Brooks (818) 796-9929 HM
June 13*	9th Annual Hand Launch	Riverside, CA (After 6:00 P.M.)	Ian Douglas (714) 621-2522
June 13/14	S.O.A.R. Great Race	Osewego, IL	Lee Sheets (708) 748-8934
June 27-28	MASS-NASF Mid-South Soaring Championships	Memphis, TN	Bob Sowder (901) 757-5536
June 28	Hand Launch - 1st Annual Rocky Mtn.	Denver, CO	Lenny Keer (303) 737-2165
July 18-19	CSS Mid-Summer Contests	Cincinnati, OH	Chuck Lohre (513) 731-3429
July 18-25	LSF R/C Soaring National Championships	Vincennes, IN	Mike Stump (616) 775-7445
July 25/26	World Inter-Glide 92	Fairlop, London	Les Sparkes 81-505-0191
Aug. 22	MASS Soaring Unlimited	Memphis, TN	Bob Sowder (901) 757-5536
Aug. 29-30	BASS Open for 444	Baltimore, MD	Guy Dickes (410) 484-0808
Oct. 3-4	CSS Pumpkin Fly	Cincinnati, OH	Chuck Lohre (513) 731-3429

* Change

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.

Find a good home for your "mature" models, excess radio gear, parts and accessories. List them free with **CLASSIFIEDS.** Sailplanes, Electric, slope ships and anything that helps them fly. Send your list with asking price, name, address, phone #, to: SILENT FLIGHT CLASSIFIEDS, 329 Little Ave., Ridgeway, PA 15853; (814) 772-4851. Subscriptions are $9.00/year or $1.00/issue.

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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.

VACUUM SWITCHES. A good, high quality, low differential, adjustable vacuum switch for professional-type results when bagging Glass, Balsa, Obechi, Carbon Fibre, etc...$30.00. **ONE-WAY VALVE** for use in the vacuum bagging system between the Reservoir Tank and the Pump, a must for a good sealed system...$3.50. Add $3.50 to cover S&H. Send SASE for list of other R/C related speciality items. Make checks payable to: Tom Overton, 1302 Arleen Ave., Sunnyvale, CA 94087; (408) 736-1568.

For Sale - Personal

Graupner ASW-22, B270 electric sailplane with speed 700 motor, prop, power switch 40, 2 servos in wings, flown only 2 times...$225.00. Call Jack at (215) 547-4243.

Dodgson Designs WINDSONG, kit, new in box with extra set of plans. Best offer over $120.00. Send S.A.S.E. to Mike Rohkohl, 19 Crescent Place, Smithtown, N.Y. 11787.

Multiplex AKRO, 72" span, glass fuse w/kevlar reinforcement, obechi/foam wings, built and in excellent condition, asking...$150.00; Slope Scale P51 MUSTANG, new in box...$70.00 firm. Call Brian @ (714) 661-1774 eve. CA.

FALCON 600 kit, new in box, pre-sheeted balsa wings, servo wire tunnels, 2 meter wing with 3021/3014 foils, fiberglass fuse, complete kit...$245.00 or trade for a winch. Call Manny at (714) 778-5254 SO. CA.

Graupner Cherry high performance 7-10 cell electric, 87" E214 fully-sheeted wing, T-tail, RTF, includes new prop, new motor and speed control plus new spare parts, perfect cond., beautiful paint ...$235.00. Call Steve Pasierb (410) 661-6641 Maryland.

LS4, nearly 1/2 scale fuselage, canopy frame, canopy, beautiful white gel-coat, brand new, incl. Obechi for the wing...$950.00; NIMBUS III, ready to fly, 6.25 meter, retract, tow release, 9 servos, mint cond...$1450.00; SAGITTA XC, mint cond., 3 servos incl...$650.00. Call Dan Troxell (714) 831-8013 SO. CA.

October 20, 1991

Dear U.S. Electric Flight Team Supporter:

I am writing to you on behalf of the 1992 United States F3E Electric Flight Team. The F3E Team will be representing the United States in the 1992 E-Power World Championships in Holland. In 1990 our team placed second both as a team and in individual. This cycle we are going with the same team members, and expect to do even better. This time we are seeking to wrest the gold from the Austrian Team and from the Austrian World Champion, R. Freudenthaler.

Our Electric Flight Team is much the same as the Olympic Team for competition in international events, except that we do not have the backing of the U.S. Olympic Committee. Instead, we are responsible for our own fund raising. As far as the cost of attending the competition goes, limited funding comes from the Academy of Model Aeronautics to cover the entry fees and the air transportation for the manager and the three pilots, but the remainder of the costs must be covered by donations. These costs include such things as overseas vehicle rental, model airplane box shipping costs, uniforms, on-site shelter, additional lodging time for practice and preparation, and other related expenses.

This year the team is seeking to raise funds through donations of prizes for a large raffle. The team raffle for prizes donated by members of the hobby industry will be held next summer (1992), June or July. For this, we are requesting a donation of merchandise, such as equipment, kits, or accessories. All donors will receive acknowledgment through the modeling press when the World Championships are reported, as well as in other electric association and club newsletters. In the raffle we hope to include the entire hobby spectrum, including R/C system manufacturers, batteries and accessories, kits, construction and finishing accessories, adhesives, newsletter and magazine subscriptions, and other merchandise.

Any contribution of merchandise you can make to our fund raising program will be greatly appreciated. Please address your donation to the following address: U.S. Electric Flight Team, 15173 Moran Street, Westminster, CA 92684.

If you are unable to spare any merchandise, gift certificates or discount coupons are also acceptable.

I would like to thank you in advance for your generosity in supporting the 1992 U.S. Electric Flight Team. I hope that you can help the 1992 Team effort to "Capture the Gold".

Sincerely Yours, Brian Chan, Chairman, 1992 F3E Team Fund-raising Committee

(Team Manager: Robert Sliff; Pilots: Jerry Bridgeman, Steve Neu, Jason Perrin; Assistants: Brian Chan, Keith Finkenbiner)

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Placed 1,2,2,3; California International Slope Race

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HIGH PERFORMANCE AILERON SLOPE PLANE

SPECIFICATIONS: ST
Control: 2-3 Channel - Wingeron
Span: 60"
Length: 34"
Wing Area: 315 sq. in.
Airfoil: Selig S3021
Flying Weight: 15-20 oz

SPECIFICATIONS: S
Control: 2 Channel - Wingeron
Span: 52"
Length: 31"
Wing Area: 270 sq. in.
Airfoil: Selig S3016
Flying Weight: 13-18 oz.

SPECIFICATIONS: EXCEL
Control: Aileron•Elevator
Span: 50"
Length: 31"
Wing Area: 260 sq. in.
Airfoil: Selig S3016
Flying Weight: 15-20 oz

Combine light wing loading, Selig low drag airfoils, and advanced slope plane technology, and you get **TURBO** and **EXCEL** planes that will float and thermal as well as perform hair-raising aerobatics faster and tighter than most slope planes available today. The **TURBO 'S'** version is for all-out slope flying while the **'ST'** is a multi-purpose plane that can perform in thermal as well as slope conditions. **TURBO**'s wingeron control gives it incredible aerobatic capability, high roll rate, and a wide speed range that will challenge intermediate and advanced pilots. The **EXCEL's** predictable flying characteristics are perfect for the beginner aileron pilot and in the hands of an experienced pilot, **EXCEL** can outfly anything in its class. The Selig 3016 airfoil gives the **EXCEL** a wide speed range, high glide ratio, and excellent inverted flight performance. All kits have foam wing cores, machine cut balsa parts, hardware kits, wingeron linkages (Turbo), rolled plans, instructions, and are micro or standard compatible.

• TURBO "ST" Kit	$70.00
• TURBO "S" Kit	$60.00
• EXCEL Kit	$45.00
• California Residents Tax	7.75%
• Shipping & Handling	$ 3.00

TURBO and EXCEL
Designed by Charlie Richardson
•BUILT R.T.C. PLANES AVAILABLE•
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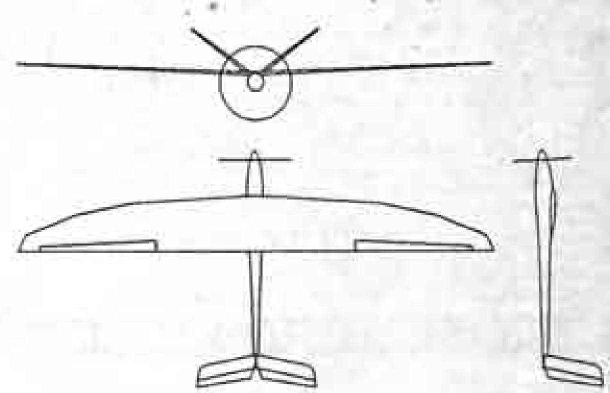
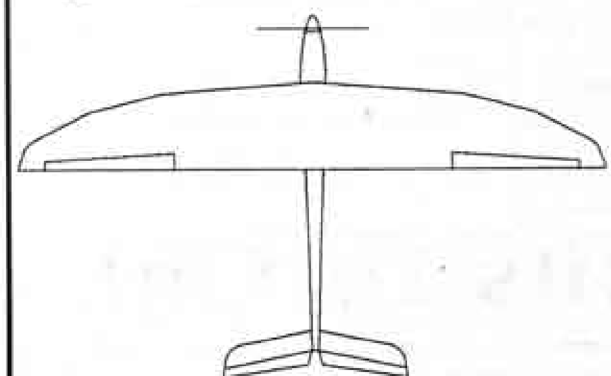
Two New Ones From WACO.



WACO 10-550

These new electrics are the ones you've been waiting for. They offer real performance gained as a result of the use of the latest construction methods and materials. Fuselages are 100% Kevlar, wings are vacuum bagged Kevlar over extruded foam. The airfoil is the new ultra thin WA003.

The WACO 10-550 is designed for FAI 10-cell electric competition. With a 15 motor and 10 cells, this ship is capable of vertical (as in 90 degrees) climbs, and has been clocked in level flight at speeds over 100 mph. The 10-550 has also turned in thermal flights with durations over an hour! On 7 cells with an 05 motor, climbs are still spectacular, and the 10-550 can compete with the best of the 7-cell duration ships. Airframe weight is about 15 oz, finished weight in 10 cell configuration ranges from 42 to 46 oz, and in 7-cell configuration, from 32 to 38 oz. Wing area is 550 sq. in.



WACO 7-F3E

7 cell F3E has been catching on in this country, and will be an un-official event in this year's Nats again. The WACO 7-F3E offers the same blazing performance as the 10-550, but in a 7-cell format. For the real thrill seekers, try this one on 10 cells!

Both of these designs are immediately available in kit form. Kits include wing and V-tail cores cut from extruded gray foam, Kevlar fuselage and tail boom, ply parts, all pushrods, control horns, servo extension wires and connectors and all Kevlar and glass necessary. Kits require vacuum bagging, but are quick to build. Kits are only $99.95. Completely built airplanes with all electrical components are also available.

Write us or call for more details, or ask for our catalog of building materials, and supplies. PS. We also sell a line of very fine sailplanes from Handlaunch to Cross Country size. Look for more information on our handlaunch next month.

Weston Aerodesign Co. 944 Placid Ct. Arnold, MD 21012