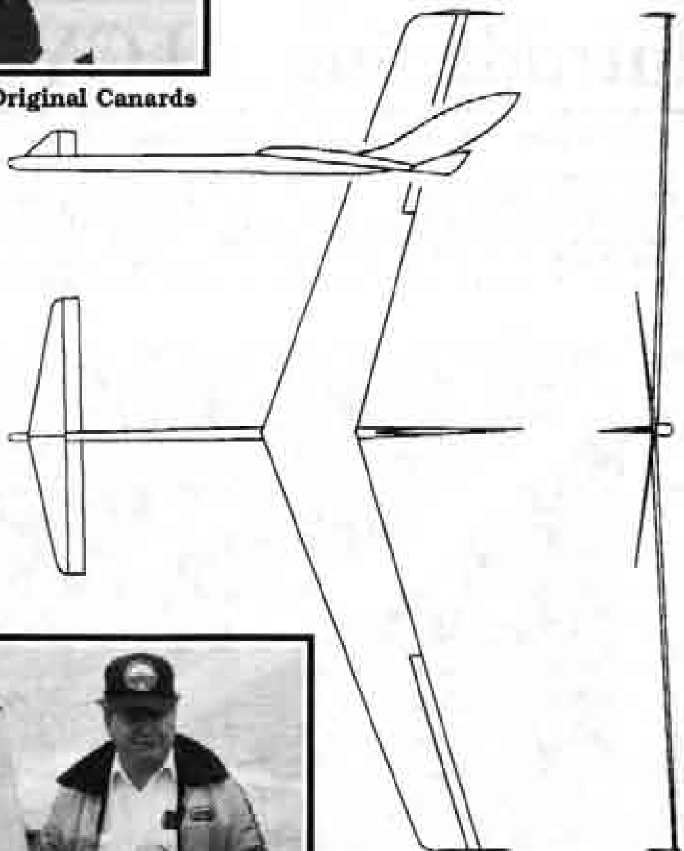
One of Del's Original Canards

Del Brengman's Canard Designs

See About the Back Cover...page 4



Del Brengman & Canard #3

R/C Soaring Digest

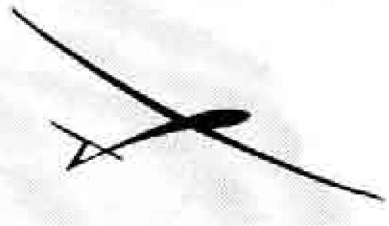
October, 1991
Vol. 8, No. 10

Lee Murray & Constellation

See About the Cover...page 3

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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R/C Soaring Digest is printed on recycled paper.

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The Soaring Site

So, what's in this issue? A bunch! With all the great articles and information coming in, there are 16 extra pages, as well! Read and Enjoy!

FAX News

From Jim Thomas, Holland, Michigan "As promised, I am forwarding the first word on the World F3B Championships. This information came off a computer bulletin board (The Hanger), and was posted by Don Edburg. The results:

Individuals:	Joe Wurts - 1st Place
	Darryl Perkins - 2nd Place
	Larry Jolly - Around 20th
Teams:	Germany - 1st Place
	Great Britain - 2nd Place
	USA - 3rd Place

"All-in-all, a great showing for the U.S.A. team!" (Way to go! Ed.)

Missing Words

Did you get down to the bottom of page 22 in the September issue and discovered that the top of page 23 didn't make any sense. Well, there were some words missing. It should read: As winchmaster it's your responsibility to keep all unnecessary people AWAY! In strong winds, the retriever line makes a graceful loop back well behind the winch area. Sorry for the error.

Regarding Spectra

We received the following FAX from John Sweet explaining who to contact regarding Spectra.

Dear Jerry,

We were pleased to be mentioned in your May issue as a source for FRP materials; however, in the case of Spectra this has created a problem for us. As you know, we are distributors of all sorts of FRP supplies and accessories but we specialize in the high-tech fabrics such as Kevlar, S-glass, carbon, and Spectra. While we sell primarily to the marine industry, only in the case of Spectra is that a condition of our distributorship.

Allied Signal, the manufacturer of Spectra, does not want us to sell their product into any market other than small boats and related equipment. We will be pleased to fill Spectra orders for canoes, kayaks, paddles, surfboards, sailboards and the like. I'm sure a radio-controlled model ship would qualify. I don't know about an R/C seaplane; it seems like a fuzzy grey area to me, but I imagine it is beyond the limits! We will be pleased to fill orders for any other product without regard to end use with one exception: we do not sell for human-carrying aircraft construction, for which we consider the potential liability to be excessive.

Anyone seeking Spectra fabrics for non-marine use should contact:

> Heh-Won Chang, Manager, Spectra Composite Business, ALLIED-SIGNAL INC., Box 31, Petersburg, VA 23804; Phone: (800) 447-3423; FAX: (804) 520-3388

Again, thanks for the publicity. I apologize for any inconvenience or confusion this situation has created for your readers.

Sincerely, (signed) John R. Sweet, US 220 South, Mustoe, VA 24468; (703) 468-2222, FAX: (703) 468-2223 ■

Slope Aerobatics Contest in Pacifica, California

...by Chris Fouquet, Los Altos, California

The Third Annual Slope Soaring Aerobatics Competition was held August 25, 1991 at Milagra Ridge in Pacifica, CA. Sponsored by the San Francisco Vultures, Jef Raskin, CD.

A new form of slope soaring competition has taken off on the West coast, slope aerobatics! This event doesn't require special equipment, or a large crew of helpers, just a group of pilots, a judge, and Mother Nature's cooperation.

This year, we had all three. The afternoon wind was straight up the hill at about 18 mph, with the typical San Francisco fog lingering a few hundred feet overhead. The seven competing pilots battled it out, each trying to out-do the other. Some of the maneuvers flown included immlemans, point rolls, half outside-half inside loops, and avalanches. First place and a Futaba 4 channel transmitter went to Chris Fouquet. A fly-off between Jef Raskin and Tony Carl decided second and third places, with Jef the victor. Jake Chichilitti took fourth, Brian Smith fifth, Al Morse sixth, and Jeff Wieland seventh.

The contest was of a "challenge" format with three planes in the air at once. Each pilot selected a maneuver and described it to the other pilots and judge. That challenger then had two attempts to fly his maneuver. Each of the other pilots in the heat were given three attempts to fly the challenger's maneuver. Each maneuver was judged on accuracy, smooth performance, and positioning. The pilot who flew the maneuver best received 1 point. If a challenger was unable to complete his own maneuver (or the judge deemed it unrecognizable), he lost a point. This sequence was repeated until each pilot had a chance to be the challenger. Ties were settled by a fly-off, in which each of the tied pilots was given one attempt to fly a maneuver selected by the judge.

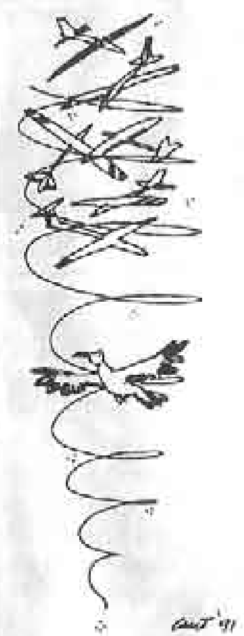
Events such as this are few and far between, and should not be overlooked by any soaring club with access to a slope site. The low-key "we're here to have fun" format does not require an expert pilot or an ultra high-tech slope ship. Aircraft flown at this year's event ranged from a hand-launch glider modified with ailerons, to a 'glass skinned ship designed for aerobatics. Anyone seeking information about hosting a slope aerobatics competition should contact Jef Raskin (415) 359-8588, or Chris Fouquet (415) 961-2115. ■

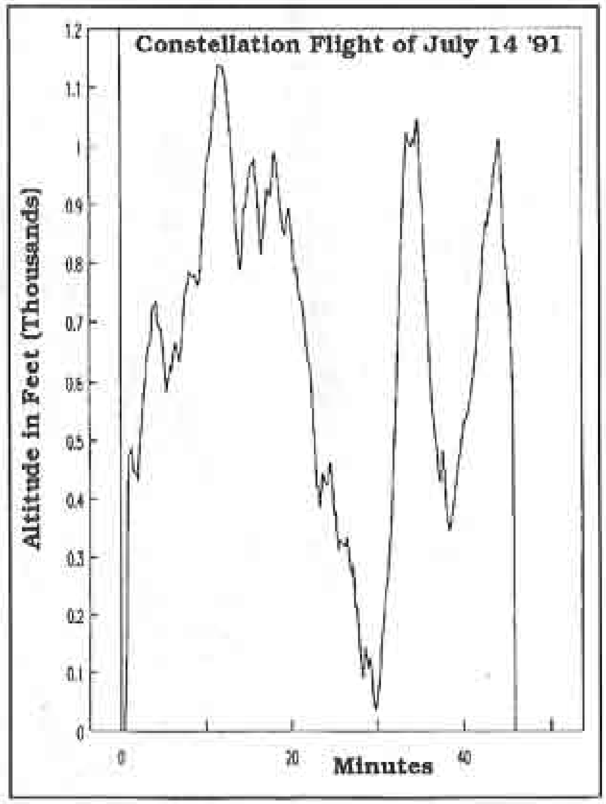
About the Cover... Going for a Record

...by Lee Murray, Appleton, Wisconsin

The Constellation and I have had two sessions. On the second outing I got the altimeter and datalogger running and took some flight information. The second flight was spectacular. The flight lasted 46 minutes and was terminated for fear of having the Vision transmitter run low on the battery voltage. You can see from the flight altitude plot that I came down fast from 1000 feet. Three minutes after my landing the low battery alarm went off. I need a bigger battery badly. It's time to talk to Tom Overton. The photo shows the kit canopy. I have a thermoformed polyester one for use with the datalogger that provides an extra .75" of height. The canopy form is epoxy painted wood and all I had was a hot air gun for the job, but it worked using high vacuum. There is no supporting structure, so I am taping it closed to keep everything inside and cut the pressure fluctuations down. I'm hoping that Al Scidmore will complete the velocity module so that I can take some performance data. One striking observation from the flights so far is that there isn't any period of stability during the flight that one can say with certainty that it is in still air.

The second benchmark for the altimeter effort will be an altitude record. That record is looking more illusive every day as I learn just how high 5,000 feet really is. I need more practice of flying with the model in and out of sight. The thermal sniffer is a must for that situation. ■

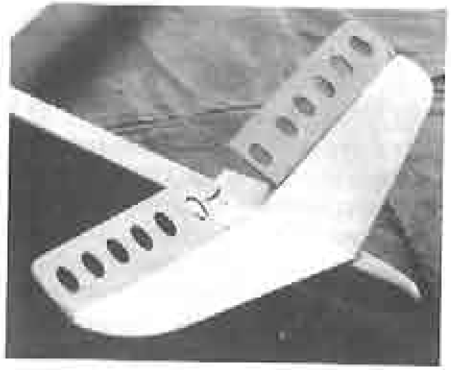




My Canard Designs

by Del Brengman, 6054 Emlyn Ct., San Jose, California 95123; (408) 629-1325

The Canard has always appealed to me as an airplane; I designed my first Canard in 1982 as a slope racer and have been improving on it ever since. However, my ultimate goal is to build a thermal performing Canard (presently under construction) that makes perfect spot landings.



The first Canard was completed about two weeks before the International Slope Race, which was called the R.C.M. Trophy Race back then. It was test flown at Sunset Beach, but light wind conditions limited the amount of flight time I was able to keep it in the air. The Canard performed extremely well on the slope. It turned easily, flew inverted, rolled smoothly and was easy to land. However, I feel that it needs more air time with a more experienced race pilot behind the controls.

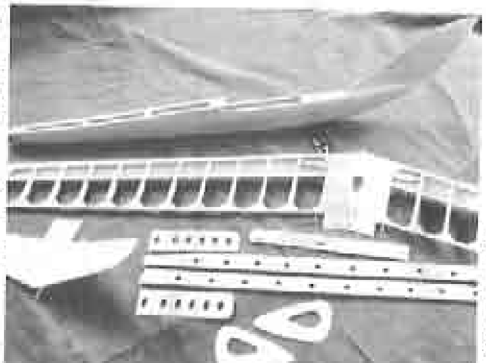
The day of the race finally arrived. I was just starting to get the feel of how good this plane was when it happened. I over-turned on the south end of the course and hit the cliff with the edge of the wing...

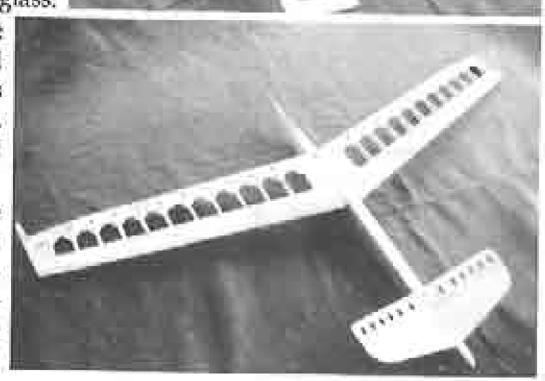
Well, it may have been short-lived, but at least I knew that the basic design had a great deal of promise. So, not to be deterred, I started construction of plane number 2. The fuselage is fiberglass carbon fiber re-inforced, while the wings are foam and glass.

Although it flew, it was not light enough to thermal. So, I started construction of number 3. This is a 50 inch hand launch type, which has proved to be a good slope plane.

I find that the dihedral in the Canard section tends to make it very stable. It doesn't yaw, which increases the lateral stability as well as pitch. The anhedral on the wing seems to give it stability, also.

The designs look like they are out of Star Wars. They're very rakish and impressive in appearance. Currently, I'm looking for a competent slope flier who is willing to see what my canard can do. I'm looking for someone who can really put it through its paces. If you are interested in obtaining more information or think you can help, please drop me a line or give me a call. ■





Construction photos of Canard #3.

Jer's Workbench

Designing a Sailplane

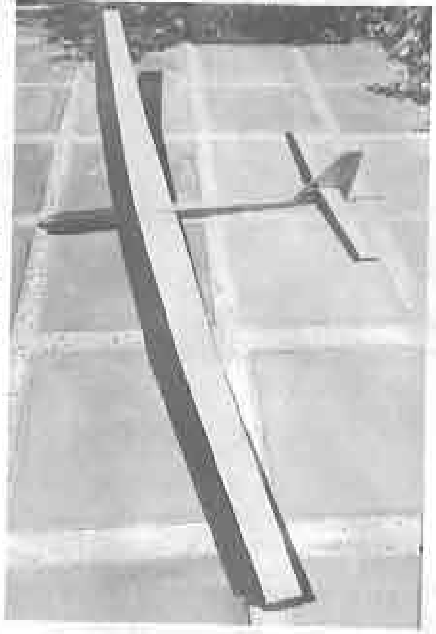
For those of you who have been following me on how I design a glider, my Test Bed has just been completed. I haven't had a chance to fly it yet, but hope to get out in the next week to do some flying and will report the Test Bed results.

First, the Test Bed was not intended to be a beauty, but a functional test bed, to test the wing, stabilizer and to work out the best dimensions for weight and balance.

Now, on to the layout and design of the Test Bed. First, I wanted a glider with a S3021 airfoil, 120 plus inch wing span with polyhedral, flaps and an aspect ratio of approximately 14 to 1. Working with these numbers, there was one more item that needed to be installed in the wings. I fitted two servos for the flaps, one in each wing, using the JR-901 servo. To get the depth required to accommodate this servo, I needed a wing with a 10 1/4 inch cord. With this information I went on to lay out the wing. When completed, the wing had a span of 124 inches, not including the fuselage width, with 1063.6 square inches of wing area and an

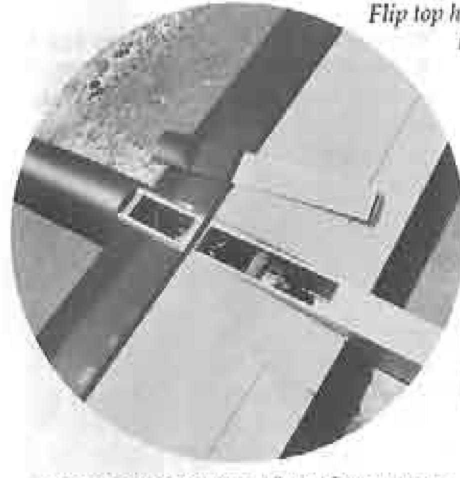
Test Bed ready for final sanding.

Completed Test Bed.



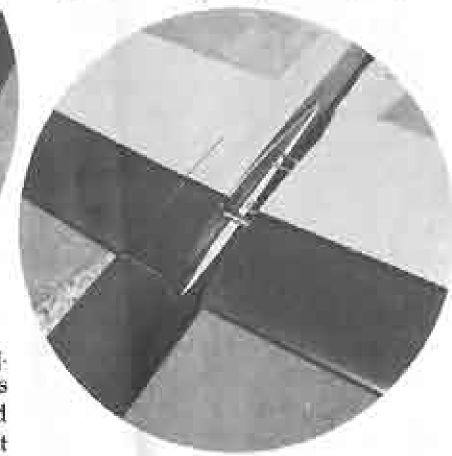
aspect ratio of 14.6 to 1. Next step was the stabilizer. For the stabilizer I selected the NACA 0010 airfoil. After the stabilizer drawing was completed, I had 154.2 square inches of area and that works out to a little less than 7% of the total wing area. The rudder has a profile using a NACA 0005 airfoil with 75 square inches of area. The fuselage that carries the wing and stabilizer has a 12 inch nose, wing cord of 10 1/4 inches, from the trailing edge of the wing to the leading edge of the stabilizer is 22 1/2 inches, stabilizer cord is 5 inches, and there is a 3 inch rudder for an overall length of 52 3/4 inches.

Now that the Test Bed is completed, I find that it looks like what I had drawn on paper. This is somewhat surprising because I didn't make any changes. But, some changes are going to be made later on. OK...going over the completed Test Bed, I have a wing loading of 11.5 oz. per sq. ft. This is acceptable, as I was originally looking for a loading



Flip top hatch...easy access to switch, rubber bands to hold wing on and flap servo plugs.

Wing inserts into fuselage. No tape required.



somewhere between 10 to 12 oz. per sq. ft. But, I'm not happy with the gross weight of 85 oz. I had to put 12 oz. of lead shot into the nose to balance the model at 33.3% of the wing core.

Craig Aho & his Sperber Jr.

To change or eliminate part of the 12 oz. of lead shot I had put into the nose of my model, there are several things that I can do. I constructed the fin and rudder by sheeting a foam core; this could be replaced with a built-up type construction. The stabilizer has a sheeted leading edge and cap strips on each rib; these could be eliminated. The distance between the wing and stabilizer could be shortened by 1 or 2 inches. By removing maybe 2 oz. from the tail, this could mean about 4 oz. from the nose, so that the gross weigh could be lowered to 80 or 75 oz. The wing loading would be lowered to 10.9 or 10.2 oz. per sq. ft. But, before I make any changes, I want to fly the Test Bed as is.

The time that I have spent building the Test Bed is somewhat embarrassing (2 months), but those who have seen my shop will understand, as I usually have several different on-going projects going on at the same time. Craig Aho of Mountlake Terrace, Washington sent me a picture of his beautiful, scratch built, scale Sperber Junior. Craig tells me that it only took 4 weeks to build this model.

Aviation Books

I read two books this last month that I would like to share with you. They are about two pioneers of early aviation here in America.

The first book is "The Boeing 247", by Henry M. Holden. This is about William E. Boeing who, as a young man, moved from Michigan to Seattle, Washington to make his fortune in lumber. Young William E. Boeing in 1908 was sometimes called "sportsman", because he didn't keep regular hours like ordinary working people, but enjoyed fast horses, fast cars and yachts, and later took up flying as a hobby. In time, William's hobby became a business and the rest is history.

The second book was "The Luscombes", by Stanley G. Thomas. During WWI, Don Luscombe went overseas and drove an ambulance for the French Army. At this time he became interested in flying. He would trade American cigarettes with some of the French crews who were ferrying aircraft to different flying fields for a ride and, sometimes, they would let Don take the controls. After the war, Don returned to the States and opened a small advertising agency in Davenport, Iowa and took up flying seriously. Soon afterwards he found for himself a brand new, still in the crate, war surplus "Curtiss Jenny", for $850.00. But, the Jenny was not to Don's liking, as it was clumsy on the ground and required wing walkers to get the Jenny in and out of the hanger. In flight it was slow, cold, drafty and uncomfortable.

Don Luscombe had a dream. He wanted an airplane that flew and handled like a limousine. The only way he could get what he wanted, not being a designer or a builder himself, was to put together a company and hire the people to build what he wanted. Together with himself and other businessmen, who wanted to develop commercial aviation, they put together $5000.00 and started "Central States Aero Company" in 1926.

The first production airplane was the "Monocoupe", which was followed by the "Phantom", the first built metal light aircraft. By 1939 Don Luscombe lost control of the company through corporate take over. But Don Luscombe's long lived dream still goes on. Today, in the 1990's there are still many of his Luscombe model 8's, model 11 Sedan's and Silvaire's still flying.

These books are available through Tab Books, The Flying Classics Series.

Another Composite Source

One last item, I have told you how to find composite building supplies like epoxy resin by looking in the yellow pages of your local telephone book under plastics; also, look under foundry supplies. Some of these shops carry epoxy resin and mold making supplies. ■

I'm Hooked on Scale

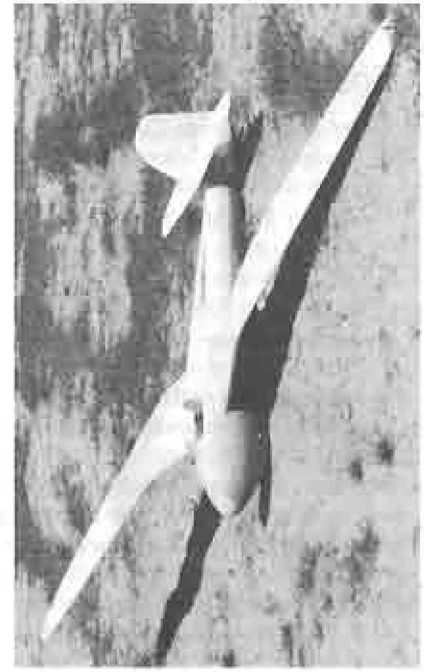
...by Craig Aho
Mountlake Terr., Washington

Here are the photos of my recent trip to Eagle Butte — Tri-Cities area. I went there Saturday only and the wind wasn't too cooperative. As it turned out, Sunday was the better day and those who stayed were able to fly without any problems. Eric flew his Kranich on Sunday and, apparently, had a good flight. Gary Brokaw's Habich flew great on Saturday and I was impressed to see it do axial rolls across the slope. His workmanship is superb! My Sperber Jr. didn't fly that week-end, but the following Wednesday at my home field I winched it aloft. It flew, but CG and a few other areas needed sorting out. As of this writing, I've made all corrections and am ready to try again. I'm hooked on scale! ■

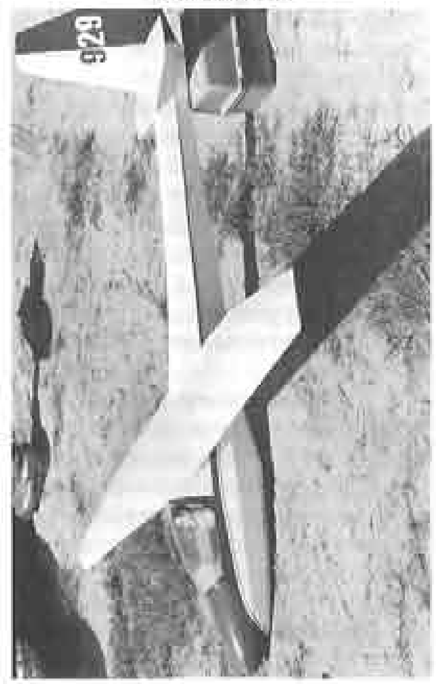
Fred China's TG

Salto — Viking fuse.

Gary Brokaw's latest unpainted Habich.



Gary's ASK-18



Frank Smith's Baby

Understanding Thermal Soaring Sailplanes

Part 4 of 4 Parts Continued

(This column began in January, 1990. Each part covers several months.)

...by Martin Simons

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

The effect on the tail of wing camber

A little tail drag can be saved if the wing camber is reduced at high speeds. Since it is camber that causes the nose down pitching moment, using a less cambered section for the wing reduces the counteractive balancing work the tailplane has to do, other things being equal, and tail vortex drag, small though it is, can be saved.

Camber changing flaps on the wing have similar effects. If, when flying fast, the wing flaps are sufficiently raised to reduce the wing pitching moment to zero the stabiliser will not be required to provide any negative balancing force.

Tuck under

The phenomenon of 'tucking under', which has been discovered by model sailplane fliers, is in the first place caused by the wing camber. The more cambered the wing, the larger the nose down pitching moment coefficient produced by the profile in the wind tunnel. As a model in actual flight is trimmed to fly faster, nose down, the airspeed rises. All aerodynamic forces increase in proportion to the square of the flow velocity, so as the model picks up speed the nose down force produced by the camber increases rapidly. A correspondingly more powerful counter force is required from the tail to prevent the nose going down further.

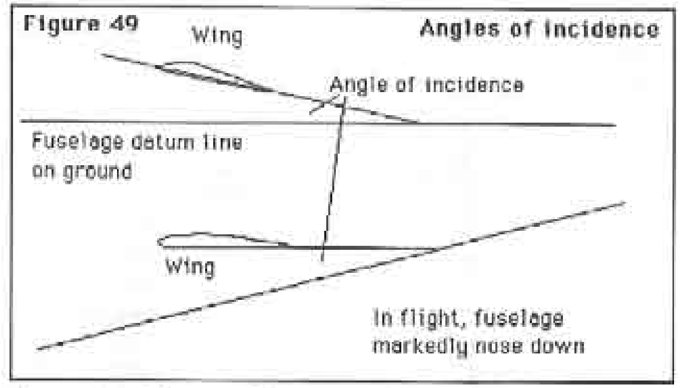
Although other factors probably enter the situation it is almost certain that a 'run way' tuck under results from too much structural flexibility of the model under the rapidly increasing loads at higher and higher speeds. The elevator pushrod or cables may flex or bend, the tailplane itself may distort or even break, the rear fuselage bends under the load, and the wing itself will certainly twist. All these can produce a situation where the model does not respond to the elevator but pitches further forward into the inverted diving attitude. (A quick-thinking pilot can often save the situation by pushing the model through into the fully inverted position, climbing to reduce speed and then rolling upright.)

If the wing has less camber, there will be less nose down moment from this source and all the loads will become correspondingly less. In addition, of course, a stiffer structure all round will reduce the danger. Note also that raising the wing flaps, if any, reduces the pitching moment and as a by-product, is likely to prevent tucking under.

Vertical tail drag

To cut the area of the vertical tail will save drag, but the scope here is not large. Sailplanes lack the effect of a fast slipstream blowing from a propeller, which enables many powered aircraft to fly safely with relatively small vertical fin and rudder surfaces. (When the motor is throttled back or stopped, lack of control in yaw often shows up.) The model sailplane usually needs a relatively large vertical tail and some drag penalty has to be accepted.

Again, basing the argument on an existing successful design, some small saving may be achieved if the aspect ratio of the vertical tail can be increased. A good many model sailplanes have vertical tails designed for fashionable appearance rather than either drag reduction or control power. They are quite often swept back with long dorsal extensions, to make a pretty shape but with an aspect ratio even less than unity. They would be improved by reducing their total area, but increasing their height. A tall, narrow surface is considerably more responsive in stabilising or control action, than a relatively short and broad one. This being the case, the same power can be achieved with less drag from a tall, narrow vertical tail, as from a low aspect ratio surface of larger area and larger drag. Unfortunately, this recommendation is not fully compatible with the preferred low drag arrangement for the horizontal tail, which is a high mounted or 'T' layout. If the vertical tail is tall and narrow, mounting the horizontal stabiliser at the top of it becomes difficult and the entire tail unit tends to be vulnerable to damage. Flutter is also more likely. An aspect ratio for the vertical tail of two or three is, nonetheless, quite achievable, and makes a distinct improvement to lateral stability and control.



The fuselage

The earlier diagram shows roughly what proportion of the total drag is produced by the fuselage of a typical model sailplane. Evidently, with wing and tail together never producing less than 90% of the total, the difference between an excellent fuselage design and a rather poor one, is not likely to make more than a small difference to the final result. As usual with parasitic items, any improvement that can be made will show up most at high speeds.

Fuselage drag is mostly a form of profile drag, consisting of skin drag and pressure or form drag.

Form drag is reduced by making the body as slender as possible, and keeping it in line with the airflow so that it moves through the air with the least possible disturbance. Probably the most important factor affecting fuselage form drag is the angle at which it is rigged with respect to the wing, that is, its angle of incidence. The angle of incidence is best thought of as the rigging angle of the fuselage to the wing, rather than the wing to the fuselage, because in flight it is the wing angle to the air, not the fuselage, which controls the flight and the performance. The fuselage moves nose up or nose down with the wing. As it does so, it may be more or less in line with the airflow.

When the model sailplane is flying slowly, the wing is trimmed to a high angle of attack, but the glide path through the air is inclined downwards. Old time sailplanes were often rigged so that the fuselage, at this low speed, was accurately aligned with the low speed glide path, so presenting the least possible frontal area to the flow at this speed and hence, least possible drag and minimal rate of sink. The setting of wing chord line relative to the fuselage datum on the drawings was perhaps five degrees or even more. On the ground, with the fuselage more or less horizontal, the wing appeared to be set at a very high angle (Figure 49). In slow flight, the wing being trimmed by the elevator to a high angle of attack, the fuselage then was pointing along the glide path. For early sailplanes, and free flight models, designed always to fly at the minimum possible rate of sink, this was an efficient system.

When the importance of penetration was realised, it was recognised that a different policy was required. At high speeds the wing's angle of attack is reduced. If the fuselage angle to the airflow is correct for the minimum sink, as the airspeed rises the fuselage finds itself lying distinctly across the flow and virtually acts as an airbrake.

As repeatedly emphasised above, parasitic drag becomes most important at high speeds, so to rig the angle of incidence too high is bound to spoil the penetration of a model sailplane. In low speed flight, parasitic drag is less important, so it matters less if the fuselage is rigged so that it appears distinctly nose up. There will be only a small drag penalty. At high speeds, such a fuselage will be more accurately in line with the glide path, and its drag will be less. For minimum parasitic drag at high speed, which is where this form of drag really counts, the fuselage should be set close to zero degrees relative to the wing chord line. This is not a hard and fast rule, for it must be stressed that as the trim changes, so does the angle of the fuselage to the glide path. Flap settings of the mainplane also make a difference. At one trim, and one flight speed, the angle will be right. At all other airspeeds, the fuselage will, to greater or less extent, be angled slightly across the flow. The required compromise should always be biased toward saving drag at high speeds, rather than low.

Assuming the fuselage alignment is close to the best angle, some further, but relatively small, savings can be made by attention to details of the fuselages form and skin drag. This means, basically, reducing its maximum cross sectional area and ensuring that the outline is streamlined with an oval or circular cross section. A correctly streamlined form for subsonic flight never has a sharply pointed nose entry. Nothing is sacrificed if the extreme fuselage nose conforms to the legal minimum radius, 7.5 mm, whereas a pointed nose is actually less than ideal from the drag reduction viewpoint.

The side and vertical projection of the fore end of the fuselage should then be based as far as possible on a suitably thin symmetrical aerofoil section outline, or on any of the established 'low drag' bodies whose ordinates are available in well known textbooks.

The fuselage skin drag depends, like the skin drag of wing and tail, on the total area of surface in contact with the air and on the character of the boundary layer. If laminar flow can be preserved in the boundary layer over the front of the fuselage, the skin drag of the whole component will be reduced. If the fuselage in front of the wing has badly fitted hatches and access panels, or switches protruding into the airflow, these can have unexpectedly large effects, not only because they contribute directly themselves to the form drag, but also make the boundary layer turbulent, which increases skin drag. The disturbance resulting continues aft and spoils the flow over the rest of the surface and the central parts of the wing.

For some years now, the best sailplane models have been fitted with perfectly smooth, detachable, streamlined nose cones which are slid over the front of the fuselage to form an airtight sheath. The cone extends back as far as possible, right up to the wing leading edge, so the model presents to the air a smooth and seamless form. With such an entry, there is every chance of preserving laminar flow. Such a nose cone is also eminently practical, giving free access to the radio equipment as soon as it is removed. In a bad landing, if the nose cone

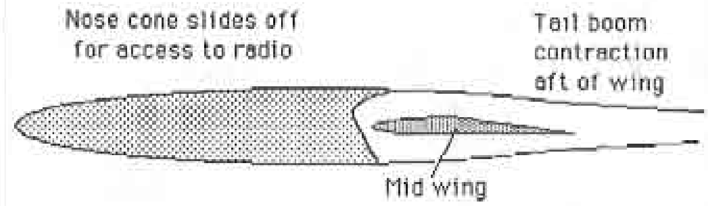


Figure 50 Detachable nose cone for low drag

is destroyed or split it may be replaced quickly with a spare. The joint at the rear of the cone can be made very accurately so that the air flows over it with minimum disruption (Figure 50).

Aft of the smooth nose cone, the flow will be disturbed by the wing root. The boundary layer will will almost certainly become turbulent, and skin drag will therefore increase rather sharply. To reduce the total area of fuselage skin exposed to this turbulent flow, the cross sectional area of the fuselage should be reduced to produce a slender tail boom. The contraction should be gradual because if it requires too sudden a change of flow direction, it will produce total separation and increase form drag and defeating the main purpose. Also, of course, the stiffness and strength of the tail boom must be adequate to prevent flutter and breakage under normal loads.

on the Wing

B^2

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In a previous column we promised more information about Bill Kubiak's Counsellor, a canard. The following article, describing canard design, originally appeared in Bill's club newsletter.

ON CANARDS
by Bill Kubiak MRCSS

"I've been interested in canard type aircraft for a long time. My first canard was a hand-launched glider I made when I was in high school in 1943, followed by some stick ROG types and finally in 1947 an O&R 23 powered free flight. It flew very well until the rubber band holding the canard to the fuselage failed in flight. It was then that I discovered the advantages of using several rubber bands rather than one large long rubber band. In general, canards are stable, easy to adjust, forgiving of heavy handed tweaking, and they fly well.

"Canard enthusiasts can usually quote several reasons why a canard is so desirable, especially in 1:1 scale. They are safe. The canard must stall first before the main wing in order to be stable. So the main wing never stalls, never spins, etc....

"They are also efficient. The tail downloading of conventional aircraft is replaced by an up load on the canard surface. This reduces the wing induced drag and so increases the overall efficiency of the aircraft.

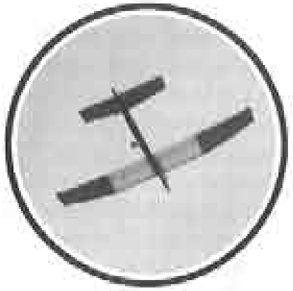
"Canards are also very easy to lay out. In conventional 1:1 aircraft, especially in general aviation, (small), the payload volume usually has to be located at the junction of the wing-fuselage load paths. Fuselage structure and wing carry-through design can usually be greatly simplified if you could just run a diagonal across the cockpit right through the pilot's chest. Cockpit design in a canard is a lot easier. The CG is ahead of the wing. The wing carry-through runs behind the cockpit. The canard loads run across the fuselage ahead of the cockpit. The cockpit is located in the center of the fuselage, and the pilot feels good without that diagonal running through his chest.

"But I think the greatest appeal of the canard is that it's different.

"Canard design is pretty straight forward. I have varied the area of the canard surface from 10% to 60% of the wing area, and have found 25-33% to be about best. I lay out the decalage at three degrees and add in 6 to 10 degrees of dihedral to the canard. The Vertical Tail Volume Coefficient is usually 0.02, and the main wing has about six degrees of dihedral. The forward fuselage of the canard needs some side area like a cabin or pylon. If it doesn't have the side area or dihedral the nose tends to fall in a turn. The canard surface should be located above the wing. It helps to have the canard tip above the ground when the fuselage and a wing are touching the ground.

"Whenever I build a model I weigh and

Enalpria, #18, held by Bill Kubiak.



Enalpria, #18, being launched by John Borlaug. Note how far back tow hook is located!

balance the wing, fuselage, and tail parts after they are covered. After several years and several dozen model designs, I can estimate weight and balance of a new airframe quite accurately. I also weigh and balance the innards and draw them in place in my layout drawing. Then it's easy to calculate the weight and balance point location before the design is finalized. On a canard I locate the CG at 0.21 +/- 0.03 times the average chord ahead of the neutral point. I locate the towhook 1/2" ahead of the CG.

"Normally the canard model's towhook is about at the center of the fuselage. When you put the highstart tow-ring on the hook, it's a strange feeling when you are about to launch as there is ALL THAT FUSELAGE ahead of the towhook. It takes several launches to get over the launching jitters.

"About 4-5 years ago, John Borlaug started talking about building a canard model. I offered to design him one, but Craig Christenson had plans for a model called the "Weird One", published in *Flying Models*.

"John built that design and it flew very well. I continued with a canard design, which turned out to be model design #18, "Enalpria", in my long string of designs, but I didn't get a chance to build it then. John followed up his experience with the Weird One by doing a design of his own. It turned out to be very handsome design, but overweight. Its life was short for a variety of reasons, but it looked so darn good it would have been a shame to let it die. We took it over to my house, put a clean sheet of paper on the drawing board, and traced the profile of the fuselage and tail. Using that as the starting point, I designed a Standard Class that John called the Counsellor (or #22 in my books). It flew very well, including a 60 minute flight one lazy Saturday afternoon. Well, that got some enthusiasm going to build old #18, so last winter it was built and its been flying all this summer. Stability is good about all three axes, and it has good L/D. The only downfall is it is too light to penetrate well, so it can only be flown on days with winds below 15 mph. It thermals well when someone like John is at the controls, but finding and riding thermals is not one of my skills.

"It has survived a launch with the receiver off, resulting in a spectacular pop-off and helicopter/frisbee return to earth. Ask Tom Rent for details as all I can remember is frantic blur.

"If you want to talk about flying canards, talk to John Borlaug. If you are interested in canard design, look me up. If you are interested in plans for #18, Enalpria (2 meter), or #22, the Counsellor (Standard), they are available from: B^2 Streamlines, P.O. Box 976, Olalla WA 98359." ■

Don Winiecki, Minetto, New York provided us with the new masthead for *RCSD*. Pretty cool, huh? ■

Enalpria, #18 — Note canard surface on pylon and single fin.

How to Improve Your Landing Scores Part I

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

(The following article appeared originally in the Journal of the Pikes Peak Soaring Society, *The Spoiler*, in June of 1990. It is reprinted with the permission of Frank Deis. Part II will follow in November. Ed.)

It is time to begin preparations for the Colorado Challenge Cup events this summer. A full day will be devoted to the duration event as it was last year. Because the duration target time is only 6 minutes (most planes are easily capable of this) and it is flown as man-on-man to cancel out the weather factor, landing scores will probably determine the winners.

The following discussion of precision landing techniques is provided as a part of PPSS's overall program to improve club member's skills. (And in the hope that members will go to work and take the Cup away from RMSA!)

Landing when and where you want is a fundamental piloting skill and its complexity is seriously underestimated. Fortunately, anyone who wants the skill can acquire it if someone will divulge the secrets to them and if they will practice a little.

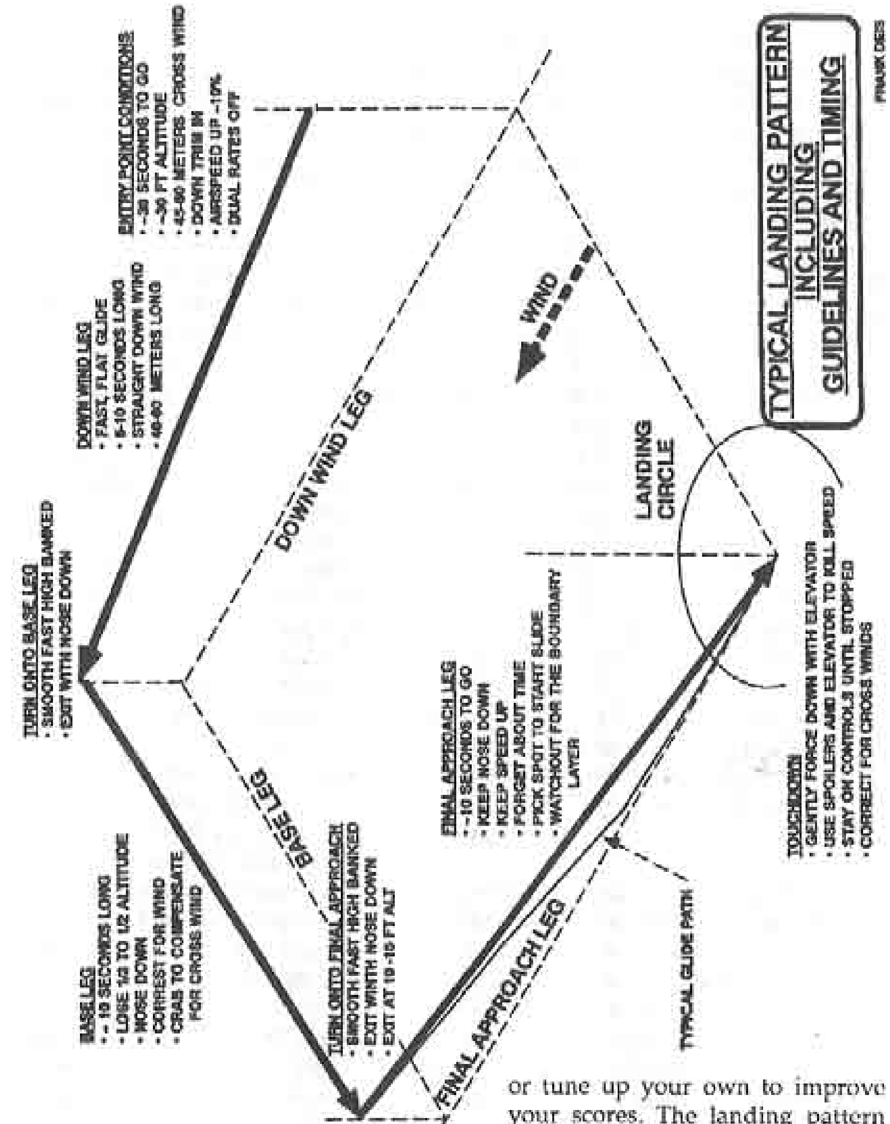
The first trick is to know if you have the skill or not. It is kind of like AA — Hi, My name is Frank and I can't land! I started out as a hot shot pilot who had that thermaling stuff down pat and was ready for competition. Soon, I realized I didn't know squat about how to fly. I would start my landing patterns at random points all over the field. The airplane would hurtle through the downwind leg and go bonkers during the turn onto the base leg. I would fight to regain control during the base leg and to get the timing right for the turn onto the final approach. The airplane would dive, then balloon into a stall, then dive again. The wind would get under one wing and toss me off my heading. I frequently ended up 5 ft short of the spot with the nose up in a stall, bank angle at 60 degrees and thinking about how to save the airplane instead of how to land. Not a pretty sight!

It is quite reasonable to expect to land within one second of the target time and within one foot of the spot most of the time. (John Reed does it routinely!) We are talking about 98% of perfect on a two minute precision flight using the AMA measurement tape (one point loss for every three inches away from the spot). The following techniques encompass the lessons I learned while trying to increase my contest scores. The hope is that they might help someone else. I will be glad to help anyone who wants to practice and I promise you will emerge an improved and more confident pilot. For those who want to go for the Cup, hopefully this will help.

The reasons precision landings are so difficult are basically two fold. First, lots of things have to happen exactly right in a very short period of time - there is no time to be innovative while in the landing pattern. Second, the results of a mistake are not immediate apparent. They show up much later in the flight. Hence, it is difficult to connect the problem with the cause. The key is to think it through ahead of time and practice until all of the adjustments are instinctive.

There are many different precision landing techniques and almost all will work. Although there are differences between them, they all share some important features. 1) They are highly disciplined. It makes little difference what you do as long as you do it exactly the same every time. 2) They include specific points where changes in wind speed and direction and errors can be corrected for. 3) They allow the pilot to divide the landing into two separate problems: a) getting down on time and b) hitting the spot such that they can be addressed at different points in the flight.

I will describe the technique I prefer -- the classic full size airplane landing pattern consisting of a downwind leg, a base or cross wind leg and a final approach. I will try to provide enough discussion so that you can use this approach or tune up your own to improve your scores. The landing pattern (shown in the figure) consists of three apparently simple legs, but there is a lot to know about each one.



Hitting the Landing Pattern Entry Conditions

First, let's discuss preparations prior to entering the landing pattern. A common landing mistake occurs here, before the pilot even enters the landing pattern! Landing requires re-trimming the airplane. Most of the flight is performed while trimmed for minimum sink of maximum lift to drag. Most of the landing pattern, however, requires increased speed to improve control response and to make sure the nose stays down. Therefore, prior to entering the landing pattern (10 - 15 seconds), I put in a click or two of down trim and increase the speed 10 - 15 % (i.e., noticeably) above the "normal" glide speed. This eliminates lots of problems later on as we will see.

The first event in the landing process is arrival at the "entry point". It marks the end of the thermal or distance portion of the flight and the beginning of the landing phase. If done correctly, you can make the following statements to your self or, better yet, to your co-pilot:

Entering the landing pattern now-
Cross wind distance - good
Altitude - good
Airspeed - up and stable
Down trim - in
Time to go - good

Missing any one of these entry point check list items spells potential disaster for the landing although it is not usually apparent until later. It is harder to achieve the entry conditions than you might think.

As will become clear as we progress, the objective is to fly the landing pattern exactly the same way every time so that the flight time in the pattern is exactly the same, to the second, on every flight. The landing pattern is 25 - 30 seconds long for most people. You are off to a pretty good start if you can break the entry point plane on every flight with exactly (say) 30 seconds to go. Hence, the first thing to master is passing through the entry point plane at exactly the right time. You may choose to wander on back to the landing area at the end of the flight, float around the entry point and then make a quick dash to the entry point to start the landing pattern. I prefer to stay in the thermal as long as possible, then come screaming out of the sky in a near vertical dive and race for the entry point at full speed. (I like to avoid the problem of leaving the thermal too early and getting caught in a downer on the way home.) Your technique will depend on your personality, airplane, skill level, weather conditions, the event you are flying, and how much guts you have.

When you can arrive on time reliably, you are ready to address the finer points of entering the pattern. Try penetrating the entry point plane at the same altitude every time - typically about 30 ft. Missing the correct altitude at the entry point immediately complicates the landing problem. The airplane's sink rate is about 2 ft per second. Hence arriving 20 ft too high will tend to stretch the landing pattern from 30 to 40 seconds! If you are going to land within 1 second of the right time you need to control the entry altitude within a foot or two! (Make sense?) Most pilots don't realize this and try to compensate for such altitude variations during the landing pattern. As you can see, it is almost too late by then unless you have really big spoilers.

The next thing to concentrate on is getting the cross wind distance to the entry point right. It is surprising how important this distance is and how much easier the whole landing process is if it is properly controlled. The distance is important because it "reserves" space for the base (cross wind) leg. The base leg consists of two high speed 90 degree turns with a straight cross wind leg in between. This uses up a reasonable amount of sky - typically 30 to 40 meters. If I penetrate the entry plane at too short a distance - say right over head, I cannot execute a clean, fast, repeatable base leg and I am headed for trouble. Leave yourself some room to maneuver. The most common mistake I see pilots make on their landings is cutting the pattern too tight at this point. Keep the airplane away from you and the landing spot until you are ready to set it down.

If the airplane is in the correct trim and the altitude, crosswind distance and time to go are correct at the entry point, the only thing left to go wrong is airspeed. The natural tendency is to control ground speed which is not the same as airspeed. Airspeed is what counts here. Plan to accelerate or decelerate to the correct air speed in the 5 to 10 seconds before arriving at the entry point. If the airspeed is too low, you will notice a sluggishness in the airplane's control response during the downwind leg which you will feel is odd but which you will ignore. The problem doesn't become clear until you attempt to turn onto the base leg and the airplane fades and dies in the turn. If you are lucky, you will land short. If you are not, you enter a downwind stall and crash. Downwind stalls, due to improper control of airspeed, are the leading cause of damage to our sailplanes. If the airspeed is too high, the airplane will zoom back into the sky when you attempt the turn onto the base leg. The zoom forces you to break out of the pattern and you lose control over the landing process.

Controlling the airspeed at the entry point in spite of the wind conditions is the most difficult skill associated with the entry into the landing pattern. The good news is that there are a couple of things you can do to get a handle on it. First, you can know and trust your airplane. If your control system and linkages are solid and repeatable (i.e, no NYRODS that change length with humidity and temperature) you can put in the down trim, get off the elevator, grit your teeth and let the airplane pick its own speed! If everything is perfect in the sense that the elevator goes to the same angle every time, then the airplane will seek the same airspeed every time. The other option is to get lots of experience under lots of different conditions until you learn how to estimate airspeed. Once you can estimate airspeed, controlling it is a matter of diving, stalling, using flaps or spoilers, or using some other energy wasting maneuver. Almost anything will work.

ENOUGH ALREADY! On entering the landing pattern — I told you it was complicated – you can now start practicing. Remember that you are forced to practice one landing on every flight. You have the choice of practicing a good one or a bad one. The kind you practice is the kind you will get good at. If you set specific goals for each landing you will learn something and steadily improve. Why Not? If you are serious about rapidly developing these skills you can set up a short high-start and shoot many landings in a short period of time. Whatever you do, keep a clipboard or notebook handy and write down what your entry conditions were (i.e., you need to know if you did what you planned to do). This is a powerful secret to improving your skills. Human nature being what it is, your memory will play tricks on you after a few flights and you won't remember what you did or how well it worked. The bottom line is that what gets measured gets fixed and what does not, does not.

You are now ready to go practice the entry into the landing pattern. Pick a point about 30 ft. high and about 30 meters crosswind as the entry point and a time to go of 30 seconds for starters. (I will show you how to determine the right numbers for you later.) Launch, fly, have a good time. When you are ready to come down, ask someone to give you a 1 or 2 minute count down (or count up if you prefer) for landing. I used to fly by myself when practicing so I used a cheap tape recorder with a 2 minute count down for landings — it works pretty good. After landing, write down how well you did on altitude, crosswind distance and time to go at the entry point. You are on your way to the Challenge Cup! If you have any trouble hitting the entry conditions, ask a club member for help. That's why we have a club. Next month we will get into the landing pattern itself. ■

Winch Line
...by Gordon Jones

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

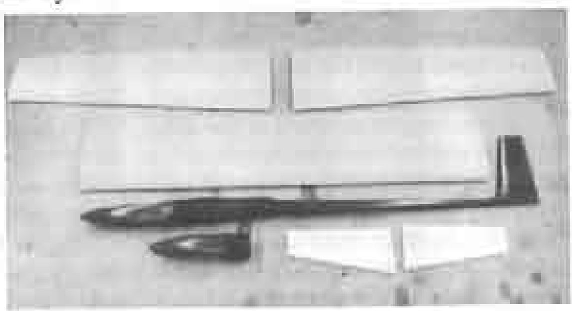
Jerry Slates' Special Edition

About a year ago, Jerry Slates of Viking Models, U.S.A. introduced a new fuselage called the Special Edition. The fuselage was designed to be a somewhat generic fuselage for use in F3B/SMTS and with the RG/Quabeck airfoil families. It is 54 inches long, weighs in at about 11.5 ounces and is configured for a bolt-on wing. With this design you can use a "T" tail or a conventional stabilator for your pitch control. It has a fiberglass nose cone up front, and as always the workmanship is excellent.

I first saw the Special Edition on a visit to Jerry's last August and was immediately impressed by the design and what possibilities there were for a thermal adaptation. Dale King, my basic flying and building partner, was looking for an open-size fuselage with a bolt-on configuration for use in trying out airfoils and as a thermal contest ship. Upon returning to Texas, I called Dale and provided him with the specs on the Special Edition. After about a half hour of thought, Dale called Jerry and ordered one. Dale's thoughts from this point center on the rest of the design like the wing and stab.

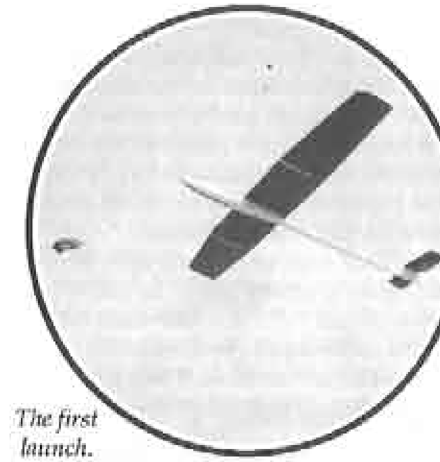
Dale and I got together about a week later and started to design the wing. First, Dale decided that the wing would be built as three pieces and with a three meter span. The center section would be flat with polyhedral outer panels as some of the European F3B ships have been designed over the years. This would provide the advantage of some stability and with the plug-in tips would be easy to construct. The panel sizes were next agreed upon as a 10.5' straight panel for the center. The tips would go from 10.5 inches to 7.5 inches at the tip with a straight trailing edge across the entire span. As we had been experimenting with all fiberglass wing construction, the wing would consist of fiberglass over gray foam with the stabs built with the same method. We even decided to go whole hog and do the rudder in fiberglass, as well. Well that was simple enough; presto, instant airplane, or so I thought.

The only remaining item of any consequence in this project would be the airfoil for the first wing. Dale borrowed my copy of Soartech 8 and proceeded to search for the airfoil that would meet his flying style and provide the best flying characteristics. This opened a real Pandora's box. This was the first airplane that Dale had designed and he wanted to make sure that the design was successful. Needless to say, a great deal of thought and an uncountable number of phone calls and face-to-face discussions took place. Before it was all over, I had ordered another copy of Soartech 8 because I knew I would never see my original copy again. I lost count of the number of wing designs that Dale came up with over the next few weeks; needless to say, the number was rather large.



Special Edition fuse with cores cut.

Quabeck, Selig, Selig/Donovon, Eppler, DF...the names began to run to-



The first launch.

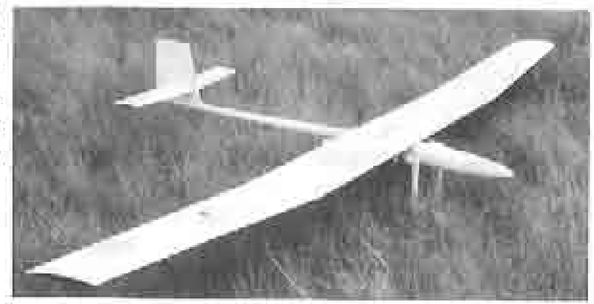
gether as Dale pondered the merits of the airfoils that were available. I think that Dale read and reread Soartech 8 a hundred times at least over the course of the next three weeks. When the dust settled, Dale selected the Quabeck 3/11 for the first Special Edition wing. He had been flying a Bounty Hunter with the Quabeck 2.5/10 and this seemed to be a logical transition. Plus, he was familiar with the flying characteristics of the airfoil and the change to the larger plane would not be so drastic.

During the airfoil dilemma, the fuselage had arrived and Dale started installing the bellcrank and making servo trays and other things that would put the project further along. He made a new set of foam cutting templates for the HQ 3/11 and, one evening, he cut the cores for the wing. The next evening a set of foam cutting templates for the stabilator were constructed using the SD 8020 airfoil, and a set of stabs emerged from the foam bin. At the same time, a rudder magically appeared ready for some glass cloth and resin. With all the parts in place it was time to glass some foam.

As this was the third set of glass wings we had done, some thoughts went into the problems and mistakes made on earlier attempts. We decided on a layer of 3 ounce for a base, a layer of uni-directional carbon fiber about 6 inches wide, a layer of Spectra, and a layer of 2 ounce fiberglass for the outer layer. This would provide a super strong center section (which turned out to be serious overkill). For the outer panels we decided on just a layer of 3 ounce and a layer of 2 ounce for the surface. This lay-up provided the needed strength at the center and strong but light weight tips.

We prepared the cores by putting in the hold down blocks. We then put in the sub ribs and root ribs of 3/8 in plywood for the carry throughs in both the tips and center section. As a note here, we have been using the Julian Tamez method of installing the carry through arrangement. With everything in place it was time to lay on some glass. We accomplished the glass work in two stages; first, we layed up the center section on an early Saturday morning. We removed the section from the bag the next afternoon to find that our preparation and planning had payed off. An excellent center section emerged from the bag. It was strong, the trailing edge was straight as an arrow and the leading edge looked pretty good. (We have gotten better at the leading edges since then.) All in all, it was a very acceptable job.

The following Saturday morning we bagged the two tip panels and the fol-



The Special Edition ready-to-fly, at last!

lowing day were rewarded with two nice looking tip panels. (Hey, this composite building is easy once you get the hang of it and it takes less time than sheeting a wing with wood.) These panels came out just like the center section and we were surprised at the weight: 10 ounces per panel.

We next made a jig for the carry through holes; this was done again via the Julian Tamez method using an airfoil shaped block with drill pressed carry through hole for alignment. We drilled all the carry through holes and verified the wing alignment. We had a really good match and did not have to do any realignment at all.

Next came the holes for the servos and wires. First, the servo cavities were cut in the wing and the servos fit. Then the shaft for the wires was drilled; this was accomplished by using an aluminum arrow shaft as a drill with a jig to ensure alignment. This is a real easy process that allows you to do all the sheeting or glassing prior to drilling the holes, thus saving the airfoil shape of the wing without the dips or bumps that can sometimes occur.

Along about this time we got around to glassing the stabilator and rudder. Here, we used two layers of 2 ounce cloth so as not to build up much weight at the back end. We first prepared the stab by inserting 1/8 ply root and sub ribs as we had done on the wing. This becomes a small wing as Dale put it. And if you are thinking about bagging, this is a good place to try it out. If you can do good stabs you can do good wings.

With all the glassing, cutting, drilling and sanding done, Dale put a light coat of K&B epoxy on the wing and the usual coat on the fuselage. It was then a matter of installing the radio gear and balancing this monster. When we first put the whole plane together we both had to stand back a bit to look at it. This was one big airplane (1100+ square inches and 120 inches of span)!

When the radio/balancing/et all was completed, it was time for the moment of truth. At the field I got the honor of doing the hand tosses, and after two we were satisfied with the stab centering. Plus, I was happy to feel it try to fly out of my hand on the first handlaunch. At this point Dale tried to hedge a little bit by telling me to get my Falcon up and see if it would still fly. (This was a test flight after a major oops.) Needless to say I did not let him off the hook; it was time.

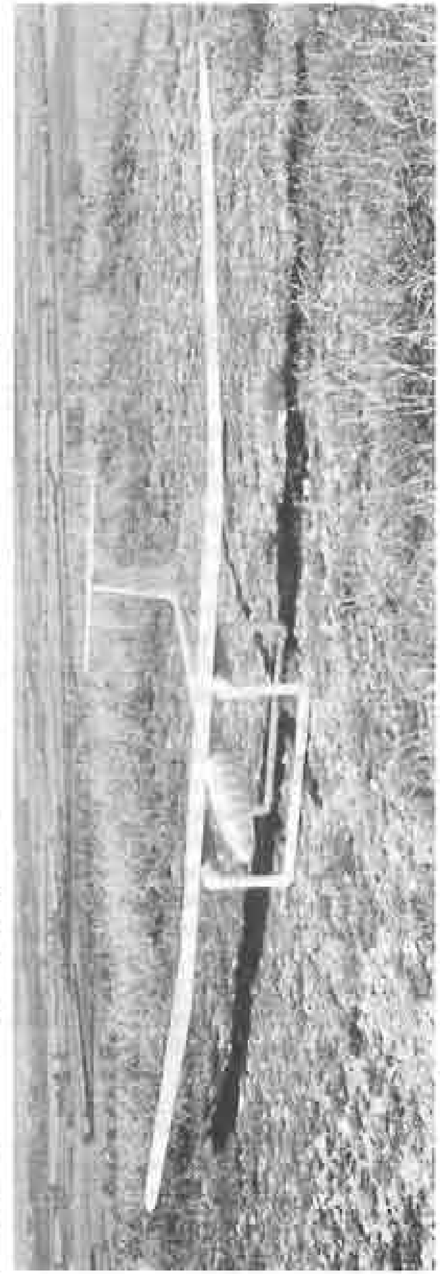
Say, this sure lands nice.

With the Dale "Dodge" out of the way it was up the winchline for the S.E. The first launch, with Dale's knees knocking, was done without flaps. It climbed up straight and true. Once in the air we were both amazed at the lack of trimming that was needed; a little down was all that was required and she was tracking like it was on a set of rails. (Dale was jubilant; it flew!) We had anticipated the need for turbulator strips on the tips but, when it didn't do anything nasty, even during slow flight, we ended up not adding them. The first landing was made without flaps and was a little long but at 88 ounces (11.25 ounce wing loading) that was alright, too. After the landing I thought Dale was going to fall over with exhaustion from the concentration of this first flight.

The next flight was started with a hard launch with the flaps dialed in and some real testing of the flight characteristics with tight turns, stalls, and moving it much faster in the air. This flight determined that this airplane was a "keeper". Dale, needless to say, was ecstatic with his new airplane and preceded to fly the batteries just about dead during the course of the day. It was also noted that Dale was doing more with this plane than any other I had seen him fly. He was making more of light lift closer to the ground than I have ever seen him attempt. It was almost scary at times. And he was putting that big bird on the spot after the third landing.

To say this airplane was a success is putting it mildly. Dale has an airplane that will fly the way he wants and will do the things he wants it to do. In addition, Dale found that he can design an airplane that will fly well. The Special Edition is just that to Dale. And I think I see another Special Edition in Dale's future. Jerry, get out the mold; you have a very satisfied customer in Texas.

One note to all this from Dale. He says, "About a year ago I didn't know what a composite was; now I am flying one and really happy with the results of my labor and learning experience. For those folks out there who have never tried working with composite structures you are missing out on a quick, sturdy building method. Don't be afraid to jump in and try some of these new techniques yourself." ■



The photo is from Graham Woods in England. He says, "David (Woods) salvaged two tip panels from his smashes and made a new centre panel using Nomex/glass. The fuse is the one he got from you — the model is called "Parabola" Special Edition. Section RG14, span 2960mm (?), weight 6 lb. 12 oz., Special Edition fuse., primarily for F3F...It does well in F3B and goes on the winch like a dream. Funny pink comes from adding fluo. pigment to two pack paint. Photo taken on best (West) face at Ivinghoe Beacon (Beds)." The pink is done in streaks on the fuselage. Quite unusual! I like it! Ed. ■

The Thermal Eagle

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

As some of you know by reading RCSD, I've been converting sailplanes into electric power. I will continue to do that and write about the results because it is still my favorite way of getting a sailplane up to thermal heights with the least amount of effort and field support equipment. I still, on occasion, fly without electric. Mostly for the challenge and to practice for contests.

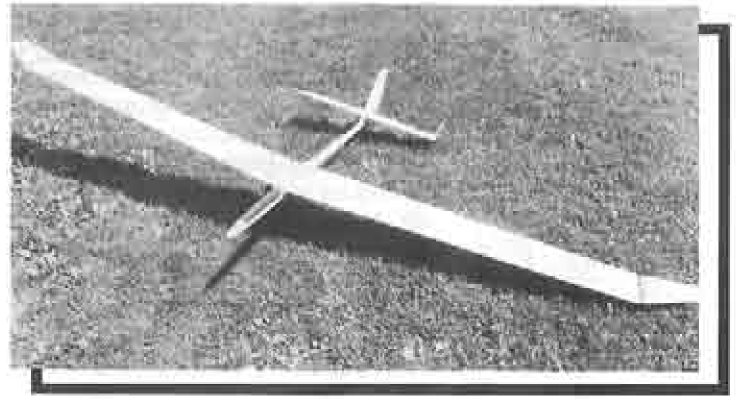
I have a few hand launch planes which are fun. I also have some two meter which I have a good time with if I want to get out the winch or hi start, but I did not have a good open class plane and wasn't sure what to get. As luck would have it, I was talking to Mark Allen of Flite Lite Composites and mentioned to him that I was looking for an open class sailplane. Mark recommended either the Falcon 880 or his new, not yet released, Thermal Eagle. After a lengthy conversation on the differences and having had tremendous success with Mark's other planes, I ordered the Thermal Eagle. As Mark said, the Thermal Eagle is a little more refined thermal sailplane than the Falcon 880, and refined it is. This was the first Thermal Eagle Mark released, so there were no instructions. But, as I have found out in the past, a phone call to Flite Lite will get you a fast, friendly and professional answer. Sure makes the hobby more fun. Thanks, Mark.

The Thermal Eagle can be ordered two ways: one as a full kit, or with a pre-sheeted wing and stabs. The full kit comes complete with all the wood and hardware necessary to complete construction, less radio covering. The first thing you will notice is the fuselage. It's one of the nicest shaped and built fuselages I've seen. The next thing you will see are the foam cores for the wing and stab. Again, excellent quality. The wood for covering the wing and stabs is Obechi. I have to admit that my experience in the past with Obechi has not been too good, but Mark assured me that the quality of the Obechi in his kits was the best you could buy and he was right. By the way, he gets his from Dave's Wood Products who has an ad in *RCSD*. The advantage of Obechi is that it is more consistent and lighter than balsa and works great. To sum it up, the Thermal Eagle kit is a well thought out and manufactured product.

I won't go into great details on construction of the Thermal Eagle because I think that by the time someone buys a plane like this they would have some experience in building and flying a high performance sailplane. Basic construction is to build the rudder with the wood supplied. Install the brass tubes in the stab and sheet. The wing needs to have the spars installed, brass tubes for the wing rod and carbon fiber on the top and bottom of the spar installed and the whole wing sheeted with Obechi. I like to cut the servo wire holes and the servo cutouts before sheeting. Next, install the pushrods and bellcrank in the fuselage. Do all your sanding, filling and painting of the fuselage. Cover the wing and stabs. Install your radio. Double check everything and go flying.

If all of this sounds like too much work or you're not comfortable sheeting a large wing or you want to get it done quickly, let the experts at Flite Lite do it for you and order the sheeted kit. The sheeted kit has the spars, wing rod tubes, carbon fiber and servo wire cutout already done for you. Also, the stabs are sheeted and the brass tubes are installed. For an additional cost you can have the flaps and ailerons cut out for you. To finish the wing all you have to do is add leading edge, cap off the flaps and ailerons and add wing tips. The rest of the construction is the same as the full kit. I think that you would cut the building time at least in half by getting the sheeted kit.

I've built a lot of Flite Lite Composites planes (I think about 14) and noticed that they are all constructed about the same. In an effort not to take up too much space I suggest you read Gordon Jone's article in the June issue of *RCSD*. His excellent article on the Falcon 600 would make a good construction article for the Thermal Eagle.



Flying the Thermal Eagle is more then I had hoped for. Winch launches are straight and very predictable. The Thermal Eagle is strong enough to zoom. One thing that helps is that Flite Lite is using only the best products available and, although it costs a little more, they are using a Dave Squire's wing rod. The Eagle really comes alive when looking for a thermal. It covers a lot of sky when you want, but can be slowed way down without stalling. One thing I've enjoyed is how tight the Eagle turns. You just keep turning and banking the Eagle over until it seems like it's turning on a wingtip. Great fun. Landing is excellent. With flaps down and lots of down elevator mixed in, you may find your landings better then ever. I did.

I'm using a 347 radio with 341 servos on all functions. I've found this to be a good, light and strong set up. Hard to believe that only a few years ago we flew without a computer radio. The travels are as follows, rudder 3/4" each way, stab 1/2" up and down, aileron 1/2" up 1/4" down, flaps 90 degrees down with lots of down elevator mixed in (flaps are very efficient), the C.G. is 5 1/2" from the trailing edge. Weight is 62 oz. and the wing loading is 9.7 oz./sq.ft. Airfoil is the SD8000 for the wing and SD8020 for the stabs.

As I said earlier, I wanted the new Thermal Eagle so that I would have something large to fly every now and then. Well, because it's rock steady, thermals very well, and lands excellent, I've found myself flying the Eagle more then anything else.

If you want to move up from a two meter or std. class sailplane into an open class sailplane that has no bad habits try the Thermal Eagle.

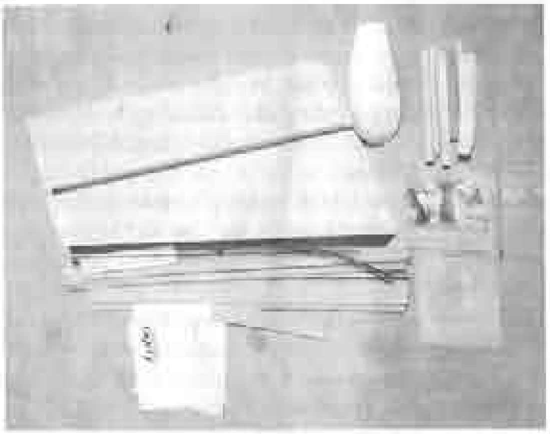
Good Flying! ■

LOBO

...by Rick Palmer
P.O. Box 1513, Springerville, AZ 85938

O'Boy, another flying wing. These are fun. This time, we have the flying wing "Lobo" from Steve Steidl in New Mexico.

The Lobo was meant as a slope ship for the intermediate pilot looking to try a flying wing. In testing, I went a bit further and tried flying it thermal and trying a beginner just to see what I could get away with.



The Kit

The kit is loaded with everything you need to keep you from having to go back to the hobby store for supplies. All you need is epoxy, radio and covering and, if you want to paint the canopy, some paint. Every bit of wood in the kit, with the exception of the aileron and elevator, is hardwood or plywood. I was thinking that all this hardwood was to keep the tips from flexing as some swept 'wings will do, but this was not the case. All Steve was up to was making it strong to survive hard landings. Well, it does so up to a point. When I got into the building of the Lobo, I found that the instructions might get to be a bit confusing. Things like elevator cable placement, trailing edge placement and center dihedral were not explained to the point. I had no problem with these parts, but I could see how they could cause problems for others. I guess this is why kit manufactures say to read and understand the instructions carefully. So, do so FIRST. O.K.? From talks with Steve, he is working to inform the kit builder better. And, if you still have troubles, you know what to do. Make a nice phone call to Steve because he would like to see you succeed with your 'wing.

You will find that you have a big canopy to put all your radio gear under. You will be able to get any combo of radio installed easily and, if you have a radio that has mixing to it, you might want to use it, as I see it as a plus for the controls. The Lobo has the ailerons to the inside to the root and the elevators out on the tips. This works great. If a radio with mixing is used, one could shorten the time building and have less control fixtures to install. This would let you use elevon control and do away with installing flex cable to the elevator.

Construction

When it came time to cover the Lobo, I was unsure if I wanted to. In the instructions, it's noted to not worry about sheeting the wings with balsa. This meant that you will iron on your covering to the foam wings. Believe me, I practiced a bit before hand on some scraps to see how little heat I could get away with and, yes, I did get it covered and you can too. Just take it slow. You could possibly use Presto covering, that self stick stuff, but this is what I say. My wing came out at 40 oz, just a couple of oz over the 34 oz suggested weight. This put me at about a little over 8 oz to sq inch in wing loading and, for the slope, I did not think that too bad. If you wanted use some 1/64 or 1/16 inch balsa and sheet the wings, I

LOBO Specifications

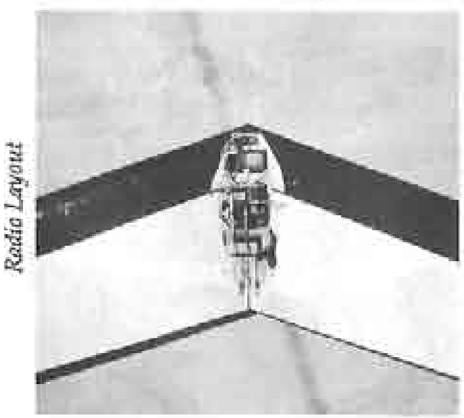
Wing Span	71"
Wing Area	638 Sq. In.
Flying Weight	34 Oz.
Airfoil	SD 7003
Radio	2 Channel
Cost	$49.95

Manufacturer: Steve Steidl,
Aerolab Designs, 336 Utah NE,
Albuquerque, New Mexico 87108

don't think it would weigh you down that much. Just be sure with your sanding as not to mess up the airfoil.

Flight Testing

Let's get into the flight testing. I knew from other reading and kits that most swept flying wings need very little, if any, reflex. This comes from how the tips react in flight to stabilize any negative pitch the airfoil has. When I got ready to give the Lobo a test flight, I balanced to the point given on the instructions and then went and gave it a few test throws. It went out well, but had a steep glide, so I put in a little up elevator trim until I had a nice smooth glide. Looking at the Lobo's elevators, I now had some reflex on them. I thought this could be a point to work on later, as I might of had about 3/16 inch of up in the elevators. Now remember, most flying wings will fly better at a faster glide. It might be harder to get used to, but it will help the performance.



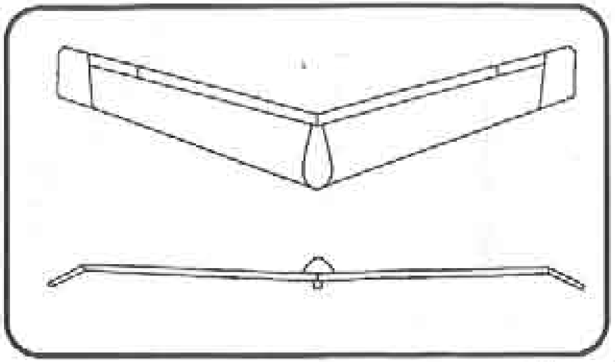
Radio Layout

Slope Flying

Now, the testing went to the slope. Using a wind of 10 to 15 mph, I let the Lobo go. I found as soon as I was away that I needed down trim. I thought this was OK and worked on seeing how the ailerons would work. This turned out to be no problem, as the Lobo would just groove around a corner. As things looked all right, I went up a bit to see how it would do in a dive. Now, something seemed wrong. As I sped up I got a little bit of a turn. Not too bad, but the faster I tried, the more the turn would show. I had flown for about 10 minutes, so I was bringing it in for landing to check out this turning bit. Dumbness set in as I turned too tight to the ground and it got me. I had knocked off one of the tips that turned down. My goof.

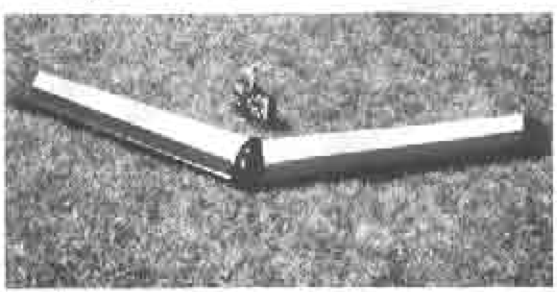
Back at the shop I had the tip back on in a few minutes with epoxy and went to work finding out where this high speed turning problem was coming from. Checking under one wing I found my other goof. I had an aileron that stuck out a bit under the airfoil shape. It must have been acting like a small flap and making that wing lift a bit more. Before heading back to the slope, I checked out the Lobo better and took out 1/2 oz of the weight in the nose. This was a thought that I had: to try to get out some of that elevator reflex that might be slowing me down.

This time, the wind was about 20 mph and off I went. Now we were flying. I already liked the way it was flying. I was able to put a click down in the Lobo and it looked more level and stable than the first flight. I took it, threw some loops and tried some rolls. The rolls will not look right with this wing, but a lot of flying wings will have this look to their rolls. Try putting a little bit of down in, as you start the roll. It will look better; throw it faster, too. I let the wing drop a bit on the other side on the landing and, now, I had the other tip off the wing. This looks like it could get trying.



I picked a day that I could give the Lobo a test of how slow it would go. With a wind of 10 mph, I let it go and went to slow it down. It will show you when it gets too slow. It will yaw back and forth, but it never seemed to go to a real stall, as it would lose turning control and fly downward to one side or the other and, as soon as it did so, it would gain speed and be more in control. Now don't worry, I still had to get really slow to make it pitch down like that and I went on trying to slow it even though it was losing control. You will be able to slow it down to land if you know about the speed that it begins to yaw. Remember the tips. If you drag one, you might have to glue one. Well, you might be thinking that the tips are trouble. Yes, and no. Think about it this way. These tips that droop down, if they where made stronger could, if they hit the ground, damage the main section of wing. It takes just a little time to glue them back on and, now that I know that the landing can take them off, I try to keep the wings level.

I have gone on to try and see if setting the CG back a little more could help speed the Lobo up a bit and, also, to see if I could get the rest of the reflex out of the elevator. Up to this point, I had been flying the Lobo with about 1/8 inch of reflex on the elevator. I took out the only other weight in the nose and that was 1 oz and, now, the CG was about a 1/4 inch behind the CG noted in the instructions. So, what did it do? Well, I got a quicker elevator action; turning did not seem to change. But, the Lobo started to tuck under in high speed. Now, I went a different direction. I added back the 1 oz and put a 1/16 inch reflex in the ailerons. That gave me a real smooth flyer. The aileron and elevator still worked the same as before, but I now had a bit faster wing and, looking at the top of the wing without the elevator sticking up so far, this looked good, also.



On one occasion I had the chance to run the Lobo into a thermal that I had spotted coming into the ridge I was flying. The crows or ravens that were flying in it showed it to me; so, I had a go. I did all the wrong things: pulling back, slowing the wing down and letting the wind carry me back over the top of the ridge. But it did thermal good! I had to trade altitude for speed to get back to the ridge, but I was satisfied.

Using a High Start

So, now I tested for thermal on the flat. The first high start launch was made carefully, because I remembered something about launching flying wings. Some are better off launching zoom style, not one of those straight up launches. It went OK, but I was not up very high; so I tried again. Out it went. Straight a bit

and, then, I would pull up a bit; still not high enough to suit me. So, this time, hard up! I had my camera person with me. He stood back about 10 yards behind me. I just missed him by a foot or so. The Lobo went up 50 foot or so and made a vicious turn and headed for the ground. I had no choice but to pull full up to get off the line. It shot past me and then my camera man, and made a high speed landing downwind. YUP, both tips came off. The Lobo went on to get some thermal time, but all flights were a bit short. I moved the towhook ahead by about 1/4 in, and that kept it under control on the high start. I think that if a person left the CG alone it would go better on the high start, but remember the Lobo was made for the slope and that is where it will fly the best.

In Summary

To finish this report, I will review what I did and what to watch out for. First, do not let the instructions throw you for a loop. If you have a bit of building skill they should not bother you. Try sheeting the foam cores with balsa. If you use the Lobo for slope only, I do not think it would hurt and it won't get dinged as much. If you can use a radio with mixing, do it. It will save you time building. Do not be scared about moving the CG back a little. I would not go more than 1/4 inch. And, any reflex should be set to the ailerons. That way you will not have the elevators sticking up too high. If you plan to fly the Lobo thermal, leave the CG alone and don't try too steep of a climb on the high start. You may try moving the tow hook forward by a 1/4 inch. But, to tell you the truth, I am going to keep the Lobo on the slope. It is a lot more fun there. And remember, keep the wing level on the landing. Don't try to turn too low to the ground or you might take a tip off.

On a scale of 1 to 10, I will give the Lobo a 7. It's fast enough, turns and handles great, and does not need ten tons of wind to fly. But, I had to knock off points on the instructions and having to watch out that I did not drag the tips.

O-Yah! I did say sometime about a beginner. The son of one of the airport workers near where I fly wanted to fly the Lobo. After I got off the high start, I turned the radio over to him. All I had to do was tell him left or right on the stick. When he got low and was pointed into the wind, I told him not to turn anymore and that the Lobo would land itself. I was ready to grab the stick, but he made a perfect landing and he didn't drag a tip. He is one up on me, and that was his first fight ever!

Til later, Rick! ■

Rick is always looking for someone to fly with so, if you're in his area or want to fly, be sure to give him a call at (602) 333-2386. Ed. ■

Getting Bent Out of Shape

A New Study of Wing Joiner Rods

...by Bob Bayard and Dave Squires
South Bay Soaring Society, California

(The following article was originally written for the South Bay Soaring Society newsletter, *Silent Flyer*. The photo and caption is an update received from Dave Squires. Ed.)

Some time ago, one of us (Bob) did a study of the strengths of music wire, drill rod and carbon fiber in wing joiner applications (*Silent Flyer*, May 1989). Since then the other of us (Dave) became the supplier of a new wing rod material, case hardened tool steel, and, being an engineer, was curious about just how strong this material really was. Having heard terms like "bullet proof" from enthusiastic users of his wing rods, and stories of completely demolished planes whose wing rods slid freely out, Dave decided that a thorough evaluation of the strength of this new wing rod material compared with others in common use was warranted. Consequently, he proposed to Bob that together they make some new measurements. This report describes the results of those measurements.

Materials tested - Steel

We tested music wire up to the 1/4" diameter available in hobby stores and we tested case-hardened rods, for which one of us (Dave) is the supplier. This material comes in diameters from 5/32" up to 1/2" in 1/32" increments, and we tested rods in this range. The steel used is known as H11 tool steel. The case hardening ranges in hardness from R65 to R74 on the Rockwell C hardness scale. A file can be run over the surface and not leave the slightest mark. The case hardening ranges in thickness from .008" to .018". The core hardness ranges from R38 to R44, which is still pretty hard but does not have brittle characteristics. The theory is that the case hardening gives the rods increased stiffness and the softer core prevents brittle fracture types of failures.

Carbon fiber

We tested carbon fiber rods from 1/4" to 1/2" diameters, and for one diameter, 5/16", we tested both normal and high modulus samples. In addition we tested 1/4" and 5/16" samples sheathed with brass tubes expoxied over them. The carbon fiber material was kindly supplied by George Sparr of Aerospace Composite Products.

The test apparatus

Figure 1 is a sketch of the set-up we used. The rods are placed in holes drilled lengthwise in 1 1/4" thick oak boards. The ends of the boards are supported on one end by a bathroom scale (accuracy 5% or better), and on the other by blocks. The force is applied at the center of the set-up with a "C" clamp, thus the moment applied to the rod being tested is equal to the force on the scale multiplied by the distance between the applied forces at the end and the center of the set-up, which was one foot for the larger rods (1/4" and up) and 3" for the little rods. For each test, we left a small gap between the ends of the two oak pieces - 3/8" for the bigger rods and 1/4" for the smaller rods. The effect of and the reason for this is discussed in the next section.

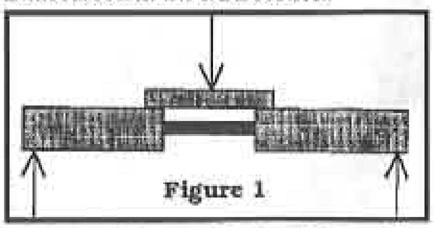


Figure 1

Comparison with tow-line pull

On launch, the bending moment at the center of a wing is the tow-line pull multiplied by a certain fraction of the span. For constant chord wings this fraction is one-eighth, but for tapered wings it is a bit less, usually being between one-ninth and one-tenth of the span. For the Falcon 880 wing, the moment is almost exactly the tow-line pull times one foot. Thus if we test a rod to 50 ft lbs, that would be equivalent to a 50 lb pull on the tow-line of a Falcon being launched.

Testing the rods - Elastic limits

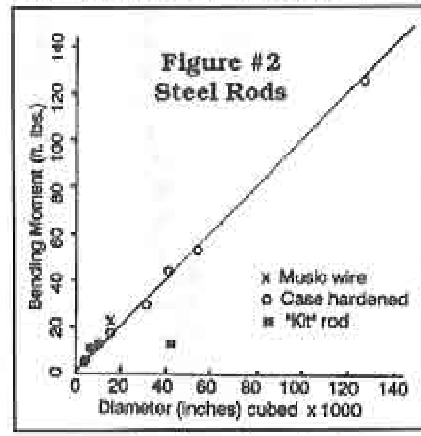
Steel under stress will return to its original shape providing the stress isn't too large. Beyond some stress, called the elastic limit, it bends permanently. We wanted to find the point of maximum stress that would not exceed the elastic limit. The way we proceeded was to put a force on the rod, measure whether or not it had bent permanently, and if it hadn't, put a slightly greater force on it and look at it again. We determined whether or not it had bent by rolling it on a flat metal surface. If it did bend we would measure the angle of bending using a feeler gage between the tip of the rod and the metal surface. We could easily measure angles as small as 1/30 of a degree, which is small enough that a rod bent at that angle will slide through a length of the appropriate sized brass tubing about as easily as a perfectly straight rod.

Beyond the elastic limit

Many of the steel samples we stressed beyond the elastic limit to see how far they would bend. The results of those measurements are less easily interpreted than is the elastic limit because the amount of bending depends not only on the stress but on the length of the unsupported part of the rod. In a model this depends not only on the gap between wing and fuselage but also on such things as the clearance between the hole and the rod and on how much "give" there is in the material around the rod (e.g., brass tube wall, epoxy bed, etc.) In our set-up the bend depends on the length of the unsupported gap (3/8" for the big samples, 1/4" for the smaller samples) and on the clearance of the hole and the "give" of the oak itself. We deliberately left pretty good sized unsupported gaps so that the bend angles would be large, thus enhancing sensitivity of finding the very small bends on exceeding the elastic limits. We did not actually break any of the steel rods. The most damage we inflicted was putting a good kink in them. The carbon fiber rods seem not to have an ability to go beyond the elastic limit without breaking. When they break, we hear a snap and the force drops suddenly. All but one of the carbon fiber failures we have had were of the compression type in the upper fibers. The exception was a short length of 1/2" rod which failed in shear.

Results: Music wire

The highest bending moments tolerated by the music wires without permanent bending are given in Table I. A plot of these moments vs. the cube of the rod diameter is given in Figure 2. as the values marked x. The bending moment vs. maximum stress theoretically varies as the cube of the diameter, so a straight line through the origin (0,0 point) should theoretically pass through all of these points.



Case hardened tool steel

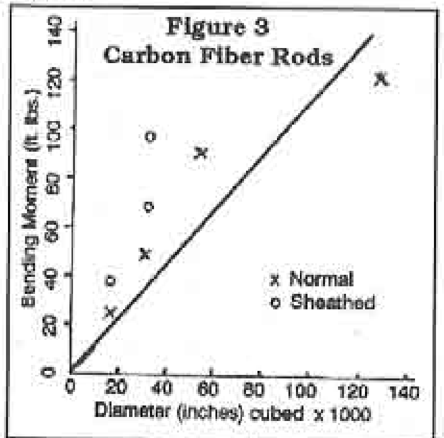
The highest bending moments tolerated by this type rod without permanent bending are also shown in Table I. Figure 2 shows the relation between the maximum elastic bending moment and the cube of the diameter for these rods, shown as points marked o. The line in Figure 2. is a least squares fit to all the data points, both for music wire and case hardened rods. It is interesting that the elastic limits for the music wire and the case hardened samples were almost the same for the three smaller sizes. For the 1/4" samples, the music wire was actually a bit better. Don't pay much attention to these similarities/differences. Our error of measurement is certainly such that a repeat of everything with other samples would be similar but not identical.

Basically the results say that music wire and the case hardened material have the same elastic limits. Beyond the elastic limit, the case hardened material bent only about half as far as the music wire, though both could take twice the stress of the elastic limit without bending more than a few degrees. For example the 1/4" music wire and case hardened rods bent only 3.6 and 1.6 degrees respectively at 38 ft lbs. No samples of either material ever broke.

We also compared the 11/32" diameter case-hardened rod with one of equal diameter supplied with the Falcon 880 kit. We do not know the pedigree of this rod though it looks like cold rolled steel. This rod is listed in Table I as "kit rod". The case hardened rod of this diameter went to 46 foot pounds without any permanent bend so we thought to start the kit rod at 20 lb. Unfortunately it bent, so we straightened it (thus possibly work hardening it a bit and making it a tad stronger) and started again at 15 ft lbs. Even that force bent it a bit so we estimate the elastic limit to be about 13 ft lbs. On stressing this rod to 46 ft lbs, which the case hardened rod took without a permanent bend, it developed a definite dihedral, bending 5.9 degrees. Meanwhile the case hardened 11/32" rod was stressed to 80 ft lbs and was bent only 0.7 degrees.

These results make it easy to understand why Falcon flyers who have used both the kit and the case hardened rods have termed the latter "bullet proof".

We thought it would be a good thing to check out the case hardened rods for micro cracks after abusing them, so we examined several (1/4", 5/16", 11/32") under the microscope, for micro cracks at the point of bending. The 5/16" and 11/32" diameter rods showed no signs of micro cracking, even at 200X magnification. The 1/4" rod showed a few surface micro cracks on the tension side running about 1/3 of the way around the rod and estimated to be about 2 to 3 microns wide. If the entire rod cross section were the same hardness as the case, then these cracks would concentrate the stress and propagate through the rod, causing brittle fracture failure. The softer core apparently does stop the propagation of these cracks.



Carbon fiber

As mentioned earlier, the carbon fiber rods did not bend permanently. In fact, most of them failed by buckling of the fiber on the upper, or compression, side. We stressed to failure rods of 1/4", 5/16", 3/8" and 1/2". In addition we tested a pair of 5/16" high modulus rods. The moments at failure are given in Table II. The failure moments for the normal samples (not high modulus) are plotted in Figure 3. vs the cube of the diameter. The least squares fit to these values is shown as the straight line. In contrast to the steel samples, which followed the diameter cubed relationship pretty well, the carbon fiber samples seem to be much more erratic. We speculate that this may be due to some inhomogeneity in the carbon fiber-epoxy mix during manufacture.

Though we don't know why, the high modulus samples were weaker than the normal samples, as can be seen in Table II. Thus, it looks as though there is no good reason for ever using the stiffer but weaker high modulus carbon fiber material.

We tested another arrangement with carbon fiber rods. First we tested two 1/4" carbon fiber rods which were inserted into lengths of 9/32" OD brass tubing. One sample was just slipped in the tubing and the other was glued in its tube using a laminating epoxy (EZ-LAM, available from Aerospace Composite Products). This is a technique that some builders have used on carbon fiber rods. The thought here is that, since the compression failures are from the fibers buckling, the tube and glue would help keep the surface fibers in line and delay buckling. As can be seen in Table II, the protective sheath helped the strength considerably. The glued sample has half again the strength of the normal sample. The brass tube itself evidently doesn't do anything if it is not glued. Following this experience we did a similar test on two 5/16" rods, each glued into 11/32" OD brass tubes. In both cases the strength was considerably greater than the unsheathed samples. However, the two samples, identical as far as we know, tested to 69 and 98 ft lbs., thus showing still another example of the variability of carbon fiber strengths.

A short length (5 1/4") of 1/2" rod failed at an even lower moment (88 ft lbs) than the longer (one foot) sample we broke first. The failure was not in compression but in shear parallel to the rod axis. It was like a log split along its length.

Discussion - Music Wire vs Case Hardened Steel

Music wire and the case hardened steel seem to be about equal up to the elastic limit. Beyond the elastic limit, the case hardened rods are somewhat stiffer and will set permanent bends only about half that for music wire. For small diameter rods, music wire is probably adequate. Most music wire applications are for stab joiners and joiners for short wing sections (tips or short span). Also, music wire is readily available in diameters only up to 1/4". For diameters larger than 1/4" the case hardened rods seem to be the way to go.

Table I, Steel Rods

Dia. (Inch)	Description	Elastic limit moment (ft lbs)
5/32	Music wire	5
5/32	Case hardened	5
3/16	Music wire	9
3/1 6	Case hardened	9
7/32	Music wire	12
7/32	Case hardened	11.5
1/4	Music wire	23
1/4	Case hardened	18.5
5/16	Case hardened	30
11/32	Case hardened	46
11/32	"Kit" rod	13(est.)
3/8	Case hardened	55
1/2	Case hardened	126

Table II, Carbon Fiber Rods

Dia. (inch)	Description	Breaking moment (ft lbs)
1/4	Normal	23
1 /4	Normal	25
1/4	Sheathed	38
5/1 6	Normal	46
5/16	Normal	52
5/1 6	High Modulus	38
5/1 6	High Modulus	38
5/1 8	Sheathed	69
5/16	Sheathed	98
3/8	Normal	90
1 /2	Normal	123
1/2	Short (5+")	88

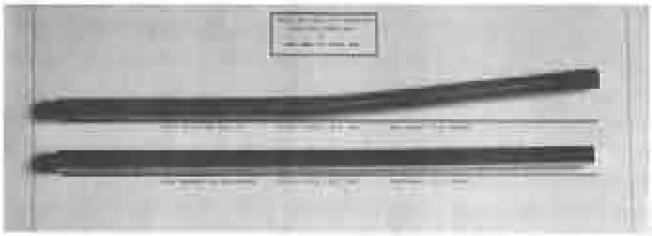
Carbon Fiber vs. Steel

In our tests, comparison of equal diameters of carbon fiber and steel showed that the carbon fiber rods break at about the same moment that the steel rods are just beginning to get a permanent bend. The steel rods will take of the order of twice that much load and still only bend a few degrees. None of the steel samples broke and the "kit" rod, weak as it was, still went to about four times the elastic limit stress and though it bent several degrees, it didn't break. We've seen a model with a steel wing rod which took off with straight wings and instants later was a V wing design, which the pilot successfully landed.

We also measured the bending of some of the rods under actual load - the "dihedral" induced in the rod - and found the steel rods to be a little bit stiffer than the carbon fiber rods. For example, under a load of 100 ft lbs, the 1/2" case hardened and carbon fiber rods flexed 3.0 and 3.6 degrees respectively.

Conclusion

If weight is a factor and you want to use carbon fiber rods (don't use high-modulus material), sheath them with brass tubing epoxied in place and make them about 20 times as long as their diameter. And be aware that a gorilla launch could break rather than bend your rod. If weight is not too important for you, then use steel-music wire up to available sizes and case hardened for larger rods. Though steel rods may bend, they probably won't break. ■



"FALCON 880 kit rod vs case hardened...The top rod in the photo is the stock "kit" rod supplied with the Falcon 880 kits. The bottom rod is the H11 case hardened rod. The kit rod is shown after 48 ft-lbs of applied force with a bend angle of 5.95 degrees. The case hardened rod is shown after applying a force of 80 ft-lbs. The bend angle is 0.71 degree, which is barely visible in the picture. This rod will still slide out of the fuselage joiner tube with only slight binding." Dave Squires

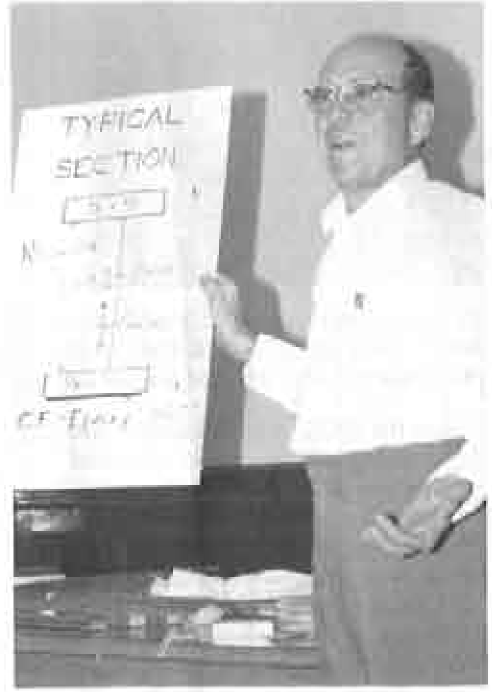
About Bob Bayard

...by John Dvorak, San Jose, California

I think of Bob Bayard as Mr. Research, but not in a stuffy sense. Bob is just a plain vanilla glider guy who checks out the building materials and techniques that modelers use, and he writes all the stuff down, sprinkled with a smile. After comparing three airfoils, he said, "If I were Prince Valiant and, to win the princess' hand, had to make a genuine SD7032 wing that couldn't possible be an S4061 or any other, I'd probably wind up a bachelor."

When Bob is not flying, in his shop, or scuba diving off the coast of Mexico, he's helping people with their feelings and frustrations. Dr. Bayard is a psychologist. I asked Bob what his wife thinks about gliders and glue. "Jean loves it. It's good therapy." What a neat lady! And right on target - Jean is also a psychologist.

What's a psychologist doing dinking around with nuts and bolts, computers and calculators? So happens that Bayard also has a PhD in physics. To top it off, Bob's sidekick in several of his research projects was fellow club member Reinhard Lahde, aeronautical engineer. Here are a few of the research subjects that Bob has investigated and which have appeared in South Bay Soaring Society's *Silent Flyer*, in other newsletters and in national magazines: wing joiners, wing spars, foam cutter, vacuum pump, altimeter, wing surface drag, wing destruction tests, and comparative airfoils.



Bob Bayard discusses his research on wing spar materials and adhesives during SBSS meeting. Photo by John Dvorak

Bob and Jean have five children. Three are Korean kids, adopted when they were five and eleven. They are grown now and live all over the place, from here to Oregon, Kansas, Washington, and Florida. With all of this experience in child rearing, I can see how the Bayards wrote and published their book "How to Deal With Your Acting-Up Teenager", which has been translated into many languages - Russian, Chinese, German, French and others.

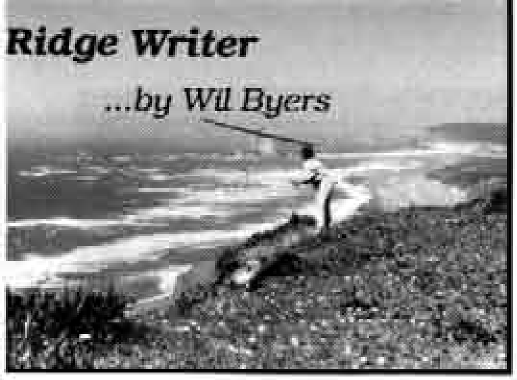
Bob Bayard and Reinhard Lahde demonstrating spar testing during SBSS meeting. Photo by John Dvorak

Bob's latest adventure was helping build and fly (indoors) a R/C sailplane, within two hours, at a club meeting contest. This was a team effort which included Gerry Arana, Ariel Lane, and Ed Franz. And the team won first place!

So, if you just augered in your new sailplane and need a psychologist or maybe a nuts and bolts trouble shooter, Bob Bayard may be just your man. You can contact him at 10120 Crescent Drive, Cupertino, California 95014; (408) 255-8894. ■

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)

During the *R/CSD* survey many of you slope soaring zealots wished we would provide you with slope site locations. I've hesitated to accommodate you in this area for a couple of reasons. The first reason being that since most of the sites that I know of are on private land I can't really give you permission to fly there without, of course, taking on the responsibility of your actions. This is the same as saying; I don't like to get sued for something you might do. The second reason was that I only know of a few sites that are not private.

This month I can tell you about a site that is not private. However this site does belong to an entity. That entity is the U.S. government. And the site is therefore one that if you should use it for slope soaring I hope you will respect it. It is a park located in southwest Oregon state. This park is by the way the furthermost west point in the continental United States and located very close to a small town by the name of Bandon. The park is Cape Blanco and is also the home of a working lighthouse.

Cape Blanco was originally an area where the Indians called home, but more recently within say the last 100 years, it was the home of a large dairy. It is, as would be expected, an area where grass grows abundantly. Moreover, the Cape is scenically beautiful with this luscious grass reaching right down to the shore

I'm launching my racer "Kiona Kruzer" from the northeast facing slope. Note the southwest, west, northeast, and east faces are all within walking distance of one another. The wind was blowing about 35 mph. I landed on the beach for fun (smooth).

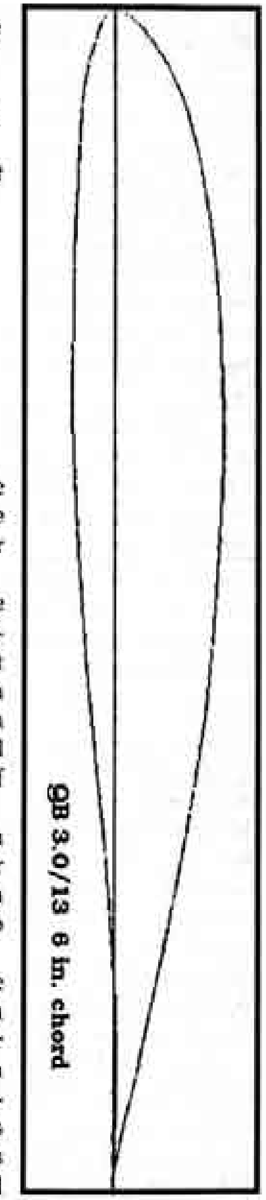
VS Sailplane's Ken Stuhr holds his pitcheron model for a picture. Note the low profile fuselage and aspect ratio of wing.

Mark Gaskiewicz's nice little P-51 sloper. Ship does nice aerobatics

Ken Stuhr is about to launch his polyhedral Ranger model, a good light air flyer.

The pictures are from the informal Fun Fly the TRICS (Tri-City Soarers) had last June.

Pete Marshall's Spitfire in the grass after burning up the air. Ship is quite a performer.



separated from the water only by a narrow beach. The site is as well the home to grand spires of rock that rise out of the water to provide a wonderful backdrop for vacationing or flying.

The Cape which guts out into the ocean probably a mile and one half rises above the beautiful Pacific ocean approximately 300 feet. Because it is a point of land that sticks out into the coastline of the Pacific Ocean, it is also an area where the ocean generated winds blow. Winds that when striking these bluffs induce a band of lift that allows a model glider to sustain flight and yield the pilot a great deal of enjoyment.

If you are interested in flying the Cape, I suggest you locate it on a map and then drop the city of Bandon a letter requesting information on accommodations. There are a number of reasonable motels and quite a few fun shops to entertain the non-flying members of your party.

If you have a light lift model you should know that the town of Bandon sports a couple of small hills that can produce flyable conditions with good landing areas. As for the Cape itself, it is soarable when the wind blows from a number of directions as it has faces that look south, southwest, west, north, and northeast. Further, the landing zones are quite good with grass area to accommodate your model's return to earth. In these areas there are only a few small bushes which don't present a problem to a landing approach. The day I flew Cape Blanco the wind was blowing at 35 mph and my conservative side kept me from landing at the top of the hill. However, it was an extraordinary enjoyable time for me while walking to the bottom of the hill as the model soared the ridge. The landing was a superb experience of watching it touch down after flying in ground effect for some distance. And quite excitingly there was absolutely no rotor zone that the model might normally encounter. Lastly, the

...continued on page 40

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. Third class postage included. For 1st class include additional $1.50 per issue. (U.S. funds) 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

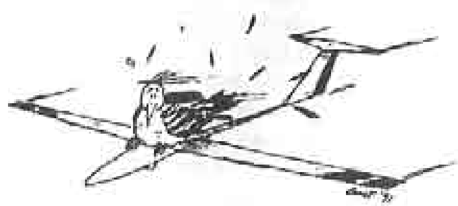
California - California Slope Racers, Rich Beardsley (Director), 2401 Country Lane, Santa Maria, California 93455 U.S.A., (805) 934-3191

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

Eastern U.S.A. - Eastern Soaring League (Covers North Eastern U.S.A.), Frank Weston (Editor), 944 Placid Court, Arnold, Maryland 21012 U.S.A., (301) 757-5199

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



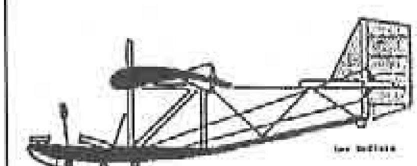
© Curt Nehring

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

experience was enhanced when I was able to fly well out over the ocean and experience lift rising from the windward side of the huge spires of rock found rising through the surf. It really left me feeling as if my model was part of the community of seagulls that call this area home. Yes, I highly recommend the site to those of you looking for some place new and fun for the whole gang. Give me a call or send an S.A.S.E. if you need more details.

Airfoil of the Month

The Quabeck 3/13 is ideally suited to scale models or maybe even a slope ship designed for slope cross country. It is 13 percent thick so your wing can be thick at the root for strength and has a camber of 3 percent of the airfoil's chord. Also, this section seems to prefer a reward C/G. It would probably be happy with a balance point of from 33 percent of M.A.C. (mean aerodynamic chord) all the way back to 40 percent. Also, the Quabeck sections love to be flapped. They will provide your design with an even wider drag bucket than would normally be possible without the aid of camber changing. Give it a try and let us know what you think. We think you'll find it a great performer. ■

Greco Technologies

& the Design of The MODI 900

Written by: Gregory Chun of Greco Technologies, the principal engineer for the *MODI 900* project. He has an aerospace engineering degree and has been in the R/C sailplane sport for 15 years.

It is important to understand how our firm is positioned. Greco Technologies is a Technical / Management Consulting firm. The company is set up to serve clients on a product level. For Greco this means producing services such as: Research and Development, Re-designs, Product Development, Production Consulting, Marketing, and Advertising. The development of the *MODI 900* was not a project initiated to demonstrate this Firm's ability to make a profit, but rather to draw attention to our Firm's technical expertise. In reality, the Firm plans to give away a number of *MODI 900's* and CASE (Computer Aided Software Engineering) Tools and Data Runs developed by our firm. The recipients will include aeronautic and aerospace contractors.

During "secret" early morning test flights the most often asked question by observers on the fields was if the *MODI 900* was going to be commercially offered. In the beginning, the answer was no, not from Greco Technologies. Ironically the project was initially being funded for development by a third party, who's intention was to take the product to market; but early in the development phases the third party had to drop out and could not complete the project. The decision to discontinue work on the *MODI 900* was not a popular one, as a group of excited engineers became even more determined to somehow keep the unfunded, sinking project alive. Two of these motivated engineers came up with the public relations idea of combining the *MODI* with our software. At this point scraping the project seemed unthinkable. The cost of continuing the project was worth the level of positive energy it created for the staff. Besides, termination of the project at this point could have caused a small mutiny in the office place. Offering the product to the R/C soaring community became a secondary financial consideration in order to help pay for the project.

As a small firm trying to be productive, we break down into project groups of 5-8 persons and smaller work groups of 2-3 persons with each group working on anywhere from 2-4 projects at a time. A project such as the *MODI 900* required a core group of 5 persons. It is difficult to explain the level of energy and excitement this particular project caused. It seems like everyone in the office wanted to work on this project or help in some way, especially when it came to the actual field testing of the sailplane.

The original design goal was to build a competition style sailplane that used the latest advances in materials and proven design techniques to create an aerodynamically sound sailplane that excelled in speed, duration, and thermaling, and was strong enough to handle the abuse of competition. The resulting sailplane is definitely not for everyone. The *MODI 900* was created for the R/C sailplane pilot who wants to test their own performance envelope. This sailplane has capabilities that are beyond the beginning pilot.

Sitting down at the design board, in this case a Computer Aided Drafting (CAD) program, we wanted to design an efficient sailplane that would retain energy in multi-tasking competitions. With this in mind we chose to use two different airfoils, the RG-15 and a S3021, both at their standard thicknesses. The RG-15 version of the sailplane is for the advanced pilot. It is a relatively low drag airfoil, making the plane extremely fast. This version is ideal for the pilot who can make use of every advantage attainable, but he must keep on his toes to stay

Jerilyn Schmidt, Director of Marketing with the Modi 900

ahead of this plane. The S3021 airfoil has good all around characteristics. This version is a for the intermediate to advanced pilot who wants a competition plane, but with a bit more breathing room. The bottom line is that the pilot must decide if he wants to own a RG-15, S3021 or both.

In the construction of the *MODI 900* we employed the use of composite materials and manufacturing processes to built a strong and durable plane. The vacuum bagged wings are made up of Dow blue PRB foam which is carefully cut using Roger Chastain's outstanding new foam cutter, the Feather Cut, to insure accuracy. Then a 4.5 oz. uni-directional carbon fiber (Graphite) cloth is used over the top and bottom of the wing, with an additional layer at the root of the wing to support and protect the wing joiner assembly. The outer layer is 1.4 oz. fiberglass cloth. A triple taper in the wing planform is designed to add surface area to the wing, reduce tip stalls, and retain esthetics. For those wondering, the wings distinctive rounded tips do not serve any significant purpose, but they sure look good. They are the product of George Spitzer, who served as a valuable design consultant on the project.

The wing joiner rod is a 1/2" carbon fiber rod laminated within a brass tube, giving it greater strength than steel at a fraction of the weight. The tube support assembly consists of a root rib and a sub rib made of 1/4" plywood, laminated with strips of carbon fiber. The hinges used to attach the flaps and ailerons for the *MODI 900* are aluminum shafts with brass hinges that are glued into place. The hinges were designed to reduce drag and withstand the pressures put upon the flight control surfaces. The hinges are much more effective than standard tape hinges.

The fuselage was engineered to serve as an efficient but functional platform for the wings, stabilizer and rudder. Its thin cross section is designed to reduce drag. However, careful consideration was given so that it would not be too thin and that it would be impossible to fit in radio gear. Two standard Airtronics 94102 servos can fit snugly, side by side in the fuselage. Strength was an important consideration for the fuselage. We knew that competition pilots would be making hard landings, so we reinforced the boom with Kevlar, and in the wing area multiple layers of 10 oz. glass cloth was used. The thin boom is not only for looks, it also reduces the weight in the rear of the plane. Since weight was a major consideration, we used either Kevlar or steel pull pull cables for the rudder. This procedure gives the rudder much better response. The *MODI 900* can be flown light for Sportsman Competition and thermaling, or loaded up for F3B speed runs and aerobatics. If built right it can easily make the 12.5 oz/ft^2 sportsman wing loading requirement. In one prototype we had the total weight down to 70 oz., with a wing loading of 11.13 oz/ ft^2. As expected, at this low weight, and with the RG-15 airfoil, the plane did not perform as well as at higher weights. We suggest using the S3021 airfoil for lower weights.

The resulting design and construction of the *MODI 900* delivers a brawny plane. We used a Raum winch and 150 pound mono filament nylon fishing line to launch the *MODI* in initial test. The first flight was an exciting experience. I loaded up the line as much as possible, pointed the nose up at a 45 degree angle, let go, and stood on the peddle all the way up. The first thing I noticed was how long this plane retained its energy on the zoom launch. Since the *MODI* was still going up fast I decided to roll it, but before I even thought about stopping the first roll I was half the way through my second. I stopped the second roll, regained my composure and decided to settle down before I made a mistake and crashed the plane. The air was dead but the plane made nice flat turns losing little altitude. The total time in the air was approximately 6 minutes 34 seconds. On other flights the *MODI* was clocked at well over 135 mph and we found that the *MODI* responded well to reflexing. On one good day I thermaled the *MODI*, with an RG-15 airfoil, for close to an hour, but the low battery warning went off, so I brought it in.

This plane is a result of many persons efforts, not only my own. Other people who helped on the project are John C. Schmidt (Materials Engineer), Andrew Starnes (Chemical Engineer), Kenith Falf (Mechanical Engineer), Ronald Folsom (Technical Marketing and Sales), Jerilyn Schmidt (Director of Marketing and Public Relations), and George Spitzer (Independent Consultant).

The *MODI 900* is in the process of being flown and reviewed by several prominent figures in the R/C soaring community including: Jim Thomas who is reviewing it for *RCSD* and Byron Blakeslee reviewing for *Model Aviation* and *F3B/USA*,. Initial reactions have been enthusiastic, and review articles should be coming out soon, so keep an eye out for them.

Specifications of the MODI 900: Type: Unlimited Class Sailplane; Wingspan: 116 in.; Wing Area: 949.21 in.^{2}; Fuselage Length: 50 in.; Weight: 81 oz.; Wing Loading: 12.29 oz./ ft.^{2}; Root Chord: 10 in.; Tip Chord: 3.6 in.; Airfoil: RG-15 or S3021; Stab Airfoil: S8020; Aspect Ratio: 13.1 : 1; Suggested Retail Price: $595 (Pre-Bagged); $895 (ARF); Contact: Greco Technologies at (800) 34-GRECO. ■

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*.

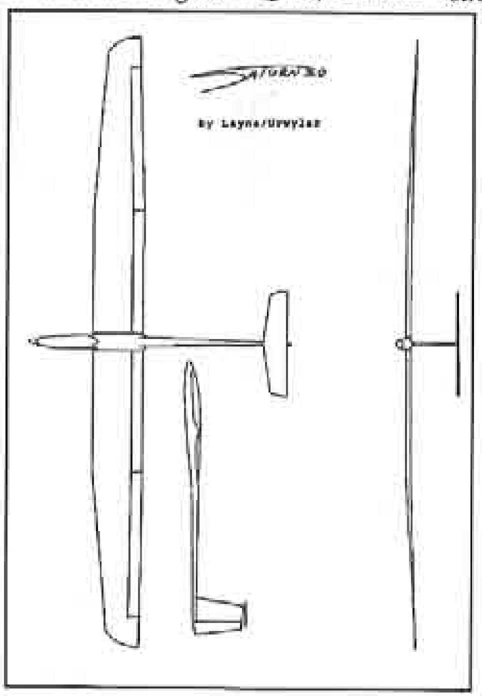
Saturn 3.0 — Performance Out of This World...

...from Layne/Urwyler

Saturn 3.0 is an unlimited class sailplane that combines the highest quality composite materials, state-of-the-art design and manufacturing techniques, together with the proven thermal performance and speed range of the HQ 2.5/9 airfoil.

Saturn was specifically designed and engineered around the proven high performance thermal specifications of the HQ 2.5/9 airfoil. Dr. Helmut Quabeck's series of airfoils have produced world champion sailplanes and continue to be a top choice of several European sailplane designers including many F3B entries. The combination of Saturn's high efficiency wing plan design, together with its accurate all glass HQ 2.5/9 airfoils (Quabecks best all around thermal airfoil) delivers the perfect blend of light lift thermaling performance with a most impressive speed range. The HQ 2.5/9 was designed to employ full trailing edge camber changes which increase Saturn's already superb thermaling and speed range performance.

The wings and tail surfaces are a vacuum-bagged composite of glass and epoxy resin sandwiched around 2.0# density extruded styrene foam (all surfaces are pigmented white). The wings incorporate a unique spar system constructed to accommodate Saturn's 3/4"x 24" T60/61 aircraft aluminum wing joiner tube. The spar system is designed and constructed using PVC tubing, Spectra, and extruded foam (shear web) to provide maximum strength while maintaining enough flex to work efficiently with the structural characteristics of the epoxied glass skins. The dihedral joint in each wing panel is joined, reinforced, and vacuum-bagged along with the entire wing to eliminate any weakness at the dihedral joint and to provide a finished wing right out of the bag.



Saturn's fuselage is a one piece epoxy resin design, fully reinforced with Spectra. The fuselage is lap-seamed to provide the strongest and lightest finished product. The tail boom moment is longer than average to provide additional stability in choppy thermals and for precise handling at high speed. Saturn's fuselage has beautiful "scale type" lines which were incorporated to keep the flaps from extending below the fuselage when fully deployed (90 degrees).

Specifications:

Wing Span:	117.25"
Wing area:	980 Sq. In.
Airfoil:	HQ 2.5/9
Flying Wt:	78 Oz.
Aspect Ratio:	13.3:1
Wing loading:	11.47 Oz./Sq. Ft.

Peter Urwyler holding one of first two prototypes.

From petal-to-the-metal launches, to coring up in the lightest thermals, to predictable and consistent spot landings - Saturn delivers! Saturn's all composite air frame is strong - very strong, yet light enough to respond in the lightest lift. Thermal response and handling is superb with Saturn's high efficiency glass HQ 2.5/9 airfoil which is combined with a wing plan design which virtually eliminates tip stalling. Spot landing Saturn is predictable, consistent and therefore uneventful - the way it's supposed to be. If you like to quicken your pulse rate, Saturn's 3-meter span transitions beautifully through aerobatic maneuvers.

Saturn is a high-tech unlimited class competition sailplane which is nearly complete and ready to fly out of the box. Saturn's all composite structure is completely built - you just finish and paint, cut out flaps and ailerons, install your radio and control linkages, and you are ready to fly. Painting the pigmented wings and tail surfaces is your option. Saturn is now available for $500.00 plus shipping and delivery time is currently six weeks. ■

Who are Layne/Urwyler?

David Layne, who has been involved in R/C soaring for many years, and Peter Urwyler, who has many years of experience in the field of new product development and marketing along with a few years of R/C soaring experience, decided to design and manufacture "European style" high performance sailplanes in Modesto, California.

The focus of Layne/Urwyler is to provide the R/C soaring community with the finest quality, high performance sailplanes for thermal soaring competition. The Saturn project is the culmination of months of design, engineering, and development by Layne/Urwyler in an effort to offer a completely unique, state-of-the-art sailplane for the competitive sportsman or expert R/C soaring pilot.

Layne/Urwyler is currently testing it's new Saturn 2.5 (99.75") standard class sailplane, and will be making it available by the end of 1991.

Additional information on Saturn 3.0 and Saturn 2.5 can be obtained by contacting either David Layne, or Peter Urwyler at: Layne/Urwyler, 2821 Lou Ann Dr., Suite B211, Modesto, CA 95350; (209) 544-8779 8:00 AM - 5:00 PM, (209) 529-8457 5:00 PM - 8:00 PM. ■

New High Start & Winch Retriever

...from VMC Flight

We at VMC Flight (Dick Benson & Ernest Barter) have developed a retriever that is efficient, fast, and reliable that handles both high start and winch launch systems. The concept is new in respect to line handling and is a joy to use. Gone are the tangled and twisted lines of the past. Gone are the motor bikes and launch retrieval system assistants chasing after the parachute. Launch and retrieval takes about a minute and the ring is ready for the next launch.

Our Model 20 has been over a year in development and has proven effective with standard high starts and all model winches.

The line untwisting device (patent applied for), custom ball bearing thermally protected main motor, wiper action of the guide, low power consumption of the motors, light weight and portability, and ease of operation make the Model 20 a real asset to glider flying.

The Model 20 is introductory priced at $279.00 until October 15th, 1991. The system comes complete with Instructional Video, retrieval line, untwisting device and battery hook-up leads. The battery requirement is any 12 volt automotive or deep cycle type battery. Another option is a direct connection to your winch battery.

Any questions can be addressed to us by calling our tech line at (408) 973-3333 week days from 7 AM to 5 PM PDT. Ask for Ernie. To order: VMC Flight, 18971 Fernbrook Ct., Saratoga, CA 95070. To order toll free: (800) 225-0364. ■

Soaring Accessories

...from Soaring Stuff

Soaring Stuff is now manufacturing the **Ultra Rod**...the strongest wing joiner rod available! These rods are surface hardened to Rockwell 6574, and surface Nitrided to prevent bending, however, since the centers of the rods are not hardened, they are not brittle and will not break. Try one of these rods and you will never go back to anything else. Are they expensive.... yes! But what does the aggravation of bent (or worse yet, BROKEN!) wing rods cost? Ultra Rods are available in 7/32", 1/4", 5/16", and 11/32" diameters. Additional larger sizes are coming soon. Call or write for availability. Ultra Rods retail for $7.50 each, in 10" lengths. (Postage is prepaid in the Continental United States.) Visa, MasterCard, and American Express are all accepted by Soaring Stuff. Dealer inquiries are invited. Soaring Stuff, 9140 Gualalupe Trail N.W., Albuquerque, New Mexico 87114; (505) 898-1129. ■

The ATRCS Version 3.0 Upgrade

...from Control Systems Laboratories

For ATRCS SP7 Module Transmitters:

- Replaces your Micro-processor with an improved version — allows larger more sophisticated programs.
- Replaces set-up memory chips with a larger capacity set — doubles set-up memory to 8 set-ups.
- Upgrades ATRCS transmitters to include new features — adds PCM fail-safe; adds aircraft naming for each set-up.

For Vision 8SP Transmitters:

- All of the above plus additional receiver capability — Futaba FM - PPM 4-8 channels.

$95.00 plus shipping ($4.00 ground or $10.00 air), CA res. add 8.25% tax. Check, VISA & M/C accepted. Send transmitter, less antenna and battery to: Control Systems Laboratories, 238 S. Hillview Dr., Milpitas, CA 95035; (408) 946-4142. ■

Vacuum Bagging Made Easy

...from Composite Structures Technology

Build stronger models faster and easier with the economical Mighty Mini-Vac System from Composite Structures Technology. The continuous operation electric Mini-Vac pump has a preset vacuum pressure safe for all foams and is very quiet during operation. Everything needed to vacuum bag wood skins to foam cores is included in the Mighty Mini-Vac System: nylon bagging tube, breather strip, bag sealant, tubing, fittings and instructions for only $74.95. With the optional rigid mylar sheet, fiberglass skinned wings with a glass smooth finish are quickly completed. CST vacuum bagging systems and supplies are available thru your hobby dealer. Direct Orders can be placed by calling 1-800-338-1CST or, for a catalog, write to: CST, Dept. M81, P.O. Box 4615, Lancaster, CA 93539. ■

F.Y.I. — Quiet Flight™ ...from Dynamic Modelling

Dynamic Modelling announces the release of a new book, **F.Y.I. — Quiet Flight**™ (**F.Y.I.** = "For Your Information"). The book, edited by R/C Modeler's Soaring Editor Don Edberg, is intended to make the task of finding information on all aspects of R/C soaring and electric flight much easier. It includes a wealth of information on R/C systems (including separate information on transmitters, receivers, servos, connectors, speed controls, and other accessories), R/C kits of all types (including handlaunch, two meter, standard, unlimited, cross-country, scale, slope, and electric), construction and finishing materials (including composite materials, adhesives, woods, pushrods, tools, etc), launching apparatus (winches, high-starts, electric motors and props, parachutes, etc.), instructional materials (books, periodicals, videotapes, and computer analysis programs), and other categories. **F.Y.I. — Quiet Flight**™ is the only reference available that lists the larger manufacturers together with the small cottage industries who are just as important to today's modelers. Information from over 350 manufacturers is listed.

What is unique about this book is that items are listed by *category*, not brand name. For example, to find out about releasable towhooks, one merely looks in the index under towhooks, rather than searching through each manufacturer's listing. You won't find this sort of information in any of the other commercial directories! In fact, **F.Y.I.** has more sources than both of the well-known directories combined!

The book is designed in a very easy-to-use format. Contents begin with an index of all components in alphabetical order together with a product cross reference number. The cross reference number is used to locate all of the pertinent listings associated with the particular category in the second portion of the book. Each category contains line listings with the names of companies carrying the particular component, its retail price, a few descriptive words, and the state in which the company is located (to assist the reader in finding the closest source of the needed material). The third part of the book will be an alphabetical listing of companies which includes name, address, telephone/FAX numbers, a contact person, catalog or brochure information, and ordering information.

F.Y.I. — Quiet Flight™ will be a full-size softbound book about 250 pages long. Retail price is $19.95 POSTPAID (CA residents add 7.75% sales tax). Copies may be ordered direct from Dynamic Modelling, 4922 Rochelle Avenue, Irvine, CA 92714-2941, phone 1-800-SENDFYI (orders only), 1-714-552-1812 (info), or 72417,2067 on Compuserve. Clubs and groups: buy four copies and get one free!

The first printing will be available after September 1st, 1991. **F.Y.I. — Quiet Flight**™ will be updated yearly (or sooner if a particular printing is sold out) to ensure that it remains up-to-date with the rapidly changing hobby.

Should you be interested in power models as well, the fully integrated volume **F.Y.I. — Model Flight**™ will add R/C power planes, helicopters, engines, and all the accessories associated with power R/C to **F.Y.I. — Quiet Flight**™ and is scheduled for release early 1992. ■

Case Hardened Steel Wing Joiner Rods

...from Dave Squires

The rods I offer are made of H11 tool steel. They have a core hardness range of R38 to R44 on the Rockwell 'C' hardness scale. The case hardening measures between R65 to R74. This means that you can't even scratch the surface with a file. The thickness of the case varies between 0.008" and 0.018". The case hardening on

Wing Span	Glider Type	Rod Diameter	Rod Length
<2M	Slope & Hand Launch	5/32" - 1/4"	4" - 7"
2M	Light Weight Thermal	1/4"	6" - 10"
2M	Aerobatic Slope/Racer	5/16"	8" - 12"
80" - 110"	Thermal and Slope	5/16" - 3/8"	10" - 18"
100" - 120"	Slope Racers & F3B	7/16" - 1/2"	10" - 18"
3M - 5M	Scale Thermal, Slope, XC	3/8" - 1/2"	12" - 24"

Prices for Different Lengths

Diameter	7"	10"	14"	18"	25"
5/32"	4.88	5.52	6.75		
3/16"	5.00	5.66	6.92	8.92	
7/32"	5.56	6.34	7.75	10.00	
1/4"	5.66	6.90	8.43	10.87	15.10
9/32"	6.45	8.00	9.55	12.32	17.11
5/16"		8.88	10.78	13.55	18.82
11/32"		10.00	12.43	17.21	20.53
3/8"		11.14	13.55	17.55	21.00
7/16"		13.55	17.10	22.63	27.00
15/32"		14.83	18.82	24.92	29.73
1/2"		16.11	20.54	27.20	32.45

a softer core makes for an extremely stiff rod that is not brittle. It is very difficult to set a permanent bend in one of these rods under normal winch and flight loads. Assuming you are using the proper size rod for your plane, it is likely that the wings of your glider will fail before you can put enough stress on one of these rods to bend it permanently.

If you bend one of these rods on the winch or in flight to where it becomes unusable, then let me know and I will replace it free of charge. I won't guarantee them against bending on crashes because crashes are too variable. Hard competition landings should provide no problems.

The table above shows recommended ranges of diameters and lengths for different types of gliders. If you intend to do high speed aerobatics, slope racing, and wide open zoom launches on the winch, then favor the larger diameters and longer rods. If you are just going to thermal and float around the sky and do normal winch or high-start launches, then the lower end of the range will be safe. Prices include shipping, handling and cutting. Actual stock rod lengths are about 1/4" shorter than what is shown (e.g., 10" is actually 9.75", etc.). If you want a rod cut to an exact length, then pick a size that will give minimum waste. Your cost is the next higher rod price. Dave Squires, 2225 Fazeli Ct., Campbell, CA 95008; (408) 371-4789 (Eve. & Week-ends 'til 10 P.M. PDT.) ■

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FS-25 4M Bauer Ready kit...$325.00; HOBBIE HAWK...$275.00. Nick Demay, (415) 728-7709.

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The First F3J Soaring Contest in Czechslovakia

...by Dave Darling, Modesto, California

Czechslovakia hosted its first ever F3J contest on July 27 and 28, 1991. My family and I were fortunate enough to visit this contest during its first day and we will give you some of our impressions of the contest, the country, and its people.

First, Czechslovakia is a beautiful land. The fields and rolling hills are all green, in contrast with California, where they seldom are. Any slight rise is likely to be capped with the ruin of an old castle. Highways are quite good, but quite slow off the few freeways, with lots of slow farm and truck traffic, and many little towns to go through. Entering the country is no problem, just show them a valid passport at the border, no visas required. Be sure to stop and buy gas coupons, though, as cars without Czech license plates can't buy gas at any station. You must exchange the coupons that you buy at the border. Gas is cheap in Czechslovakia, the cheapest in any European country that we entered.

Be sure to head for Prague. German shelling and bombing and Soviet occupation haven't left craters, but the dinginess of the apartment buildings is more than made up for by the warmth of the Czech people, who are wonderful! If you stay for a couple of days, rent a flat at one of the private tourist accommodation places. An American-style hotel can cost three hundred dollars a night, but we rented a flat for three for about forty bucks. American dollars are always welcome for private deals, and their use, along with that of German deutchmarks, is quite legal. You will need local currency for food and store purchases, however. Consumer goods are in short supply, but nice souvenirs can be found in shops that sell crystal, a best buy, and in tee shirts, which are scarce, but available. A ride on the subway, which uses Russian-built cars, costs fourteen cents. A bottle of pop costs a dime. A bottle of their excellent beer costs a quarter! For a three-course dinner with drinks beforehand, dessert and coffee for the three of us, we paid fifteen dollars! Which reminds me, bring a jar of instant coffee if you like American-style coffee. Theirs always had an inch of grounds at the bottom of every cup.

There is only one hobby shop in Praque, and I didn't find it. I was told that it is quite well stocked, but imported items there from Germany are expensive. The best sight to see is the Czech Air Force Museum, which has all its planes in flying condition, and offers the latest stuff. Want to walk up and touch a MiG 29? You can do it at the museum, as well as seeing them take off and land, as this is also an active airfield. Buy copies of the model magazine, *Modela*, as it's crammed with interesting items!

After leaving Prague, we drove north towards Usti nad Labem, home of the club sponsoring the contest. A little more than halfway there, we left the main road and turned east a couple of kilometers to the sport flying field where the contest was being held. The site is used for parachute jumping and full-size soaring by a local club, but there was plenty of room for all to have fun. About forty Czech competitors showed up to fly, along with two Brits, Dave Jones, who writes the soaring column for the famous English magazine, *Radio Control Models & Electronics*, and Terry Stuckey, who shared the same modified Sagitta 900 and Airtronics "Vision" radio on 35 mHz. Also competing was Werner Reinhard of Osnabruck, Germany. Werner writes for several magazines and speaks far better English than I do German. Few of the Czechs spoke English, but quite a few spoke German.

An exception was Petr Krejsa, the contest director. Petr speaks good English and German, and is also responsible for the design and kitting of most of the gliders entered at the contest. My favorite was the Prowler, a three meter plane with a lovely glass fuselage and built-up wings of various shapes. A photo of Petr's Prowler is in this article. The other photo shows the flying site. Coffee and soda were available at the site, and the contestants were also furnished nice tents with wooden floors and cots, furnished and set up by the friendly Czech army!

Landings were in or out of a circle that appeared to be about ten meters in diameter. At the start of working time, contestants and their crews had five minutes to ready their planes and unreel their line

for the launch. Remember, F3J is HAND tow! When the five minutes are up, the contestants have a ten minute window to launch and land, man-on-man. As many as six planes were launched in each segment. At first, the Brits elected to wait and check out the lift, then launched as much as two minutes after the Czech flyers did. The Sagitta, with its modified 205 airfoil, could range out a little further than the local flyers ventured, at first. During the second round, however, the Czech pilots were scooting way out upwind searching for lift, especially the pilots of planes with flaps that could reflex a little negative. Launches with the hand tow were very high. The British and German competitors worked together because of the common language fluency, and their zoomies were just about as high as we can get locally from a winch! As they were all walking back from a particularly good flight, Dave Jones mused, "Who would ever have thought that the British and the Germans would team up against the Czechs!" Ain't glasnost wonderful?

Speaking of the planes, Werner Reinhard intended to fly his latest addition, a Muller Thermal King look-a-like from Poland where the cost was under four hundred dollars for a finished plane, less radio. Some receiver problems at the field forced him to fly his back-up plane, a swept wing. Werner belongs to the all flying wing club in Osnabruck, and the wing launched and flew very well. Penetration was no problem, and that thing turned in the tightest circles you have ever seen! He had no problems with landings in the circle, but I bet I would have.

Scoring was done on a small Dutch personal computer operated off batteries, and there was also a printer to tally results, round-by-round. Altogether, a very nice contest. I wished that I could have stayed for the final day. I did, however, manage to buy one of Petr's Prowler fuselages, a lovely epoxy glass creation, and carrying it home on the Lufthansa jet was another story in itself. Petr does make a full range of products, quite reasonable by our standards for very high quality. His full name and address is Ing. Petr Kreksa, Dolni Zalezy 38, 403 01 okr. Usti nad Labem, Czechslovakia. Tell him that Dave Darling sent you! ■

Flight Groups

...by Guy S. Russo
5722 Pinegrove Drive W., Coeur D'Alene, ID 83814; (208) 765-9772

The N.W. Soaring Society hosts 24 contests from April to September. Its membership will be competing for the season championship trophy across the Northwest U.S.A. and Western Canada. We have contests in: Great Falls, Montana; Bend, Oregon; Vancouver, British Columbia; Calgary, Alberta and lots of places in between. Check this on a globe! We cover time zones, mountain ranges, latitudes, costal, desert, and you named it! We fly in it!

The Board of Directors is trying to evolve a system which rewards the top flyer no matter where that flyer is. Currently, a pilot in Calgary can be competing with a pilot in Portland for the championship. We use a combination of winners score (or percent of winners score) plus percent of the perfect score, divided by two to determine the season score for a contest day. That means you could fly very well in different conditions and get 1000 points for the win, but you only flew 800 raw score points (80%) for a total of a 90% season day. Perfectly clear!

Now, this is O.K. but other factors enter into the program like: Easy events and a laid back flight order at one contest or a gung-ho Contest Director (C.D.) who thinks anything less than 10 minutes in a 20 M.P.H. wind is for wimps at another contest. So, onward to flight groups.

Because there is so much pressure on pilots who are in contention for the season trophy, they sometimes will engage in sandbagging tactics. This is no big deal if everyone gets to pick their air, but if one pilot must launch now and another is in the can, again, it's not fair. If I can always pick my air, then my chances are greatly improved. Flight groups take care of a number of tactics and provide a better run and a more fair event.

1. At sign up, designate a flight group coordinator who gets all the frequencies and names listed. If you have 6 pilots on one frequency and 36 contestants, bingo — 6 groups.
2. Disperse the other channels as best you can. flight group 1 is now up to fly and group 2 is on deck. And, I mean on deck in a ready area.
3. You can launch a group of ready pilots in 6-8 minutes with good equipment and retrievers. This puts them in relatively the same air. When the crowded channel pilot lands, group 2 is at the winch and begins launch. We have flown this with 9 minute flights and there is usually little or no wait between groups.
4. The pilots are assigned numbers: Group 1 Pilot 1, Group 1 Pilot 2, etc. This means that in round 2 that Pilot 2 leads off. The launch order for round 3 would be Pilots 3-4-5-6-1-2. Get it? So, you are not always leading or trailing.
5. Now, if group one is flying, then group six can man the winches and, obviously, you can't be timing if you are in group two. This eliminates the "I'm timing" sandbag.
6. This stuff works. If you want to really find out who is slowing down your contest, have your winch boss (Pilot 1, Group 6, for example) start a stopwatch when the winch is ready and clear and the parachute is handed to the next pilot. Give him 15 seconds to release and deduct time over that. Really, I don't intend to do this, but at the next flight group contest, we will track this and award a big bag of sand to that bagger.

This practice has a lot of advantages. I feel that contests should be casual, but fair. We tried this at a contest with over 30 pilots and it was well received. We got comments like: "Best run contest I've ever been to."

Listen gang, there are really only a few contenders out of our membership who are into these details. This event gets more people into air and in better competition if they are into it or not. If you think I'm over-emphasizing these details, I remind you that the season championship was won by .78 points. That's right, 99.85 to 99.07. In fact, the split between first and tenth was 6.27 points. What that means is that every second and every inch holds the championship or, better luck next year!

Try flight groups. Give me a call for more information. ■

Schedule of Special Events

Date	Event	Location	Contact
Oct. 5-6	Visalia Fall Soaring Festival	Visalia, CA	Ed Hipp (209) 625-2352
Oct. 5-6	2 Meter & Unlimited	Lakeland, FL	Bob Wargo (813) 938-6582
Oct. 5-6	Pumpkin Fly Standard, Unlimited	Cincinnati, OH	Jack Strother (513) 583-9018
Oct. 6	SMT Contest	Denver, CO	Lenny Keer (303) 737-2165
Oct. 12	Slope Race California State Champs	Santa Maria, CA	Rich Beardsley (805) 934-3191
Oct. 13	Dual Elimination	Dallas, TX	Gordon Jones (214) 840-8116
Oct. 13	Unlimited Thermal	Kirkville, NY (Syracuse area)	Dave Zinteck (315) 656-7103
Oct. 19	Duration 2M & Open	San Antonio, TX	Tom Meeks (512) 590-3139
Oct 20	9th Annual Last Fling of Summer	Tulsa, OK	Dale Nutter HM (918) 492-3760, WK 446-6672
Oct. 20	Hand Launch	Dallas, TX	Gordon Jones (214) 840-8116
Nov. 9	Duration 2M & Open	San Antonio, TX	Tom Meeks (512) 590-3139
Nov. 10	3-6-9 2M & Open	Dallas, TX	Gordon Jones (214) 840-8116
Nov. 10	Dual Elimination	Houston, TX	Julian Tamez (703) 540-3944
Nov. 17	Hand Launch	Dallas, TX	Gordon Jones (214) 840-8116
Nov. 29-12/1	2 M & Unlimited - Tangerine Soaring Champs	Orlando, FL	C. Baylor (407) 699-8750
Dec. 8	2 Meter Only	Dallas, TX	Gordon Jones (214) 840-8116

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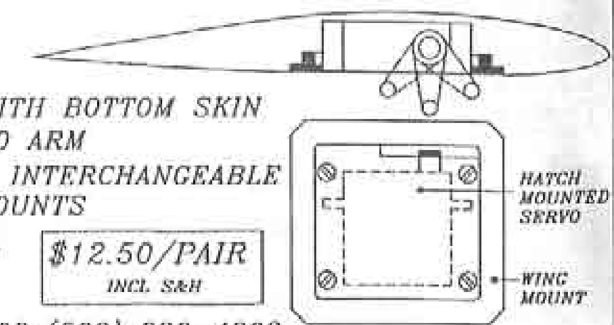

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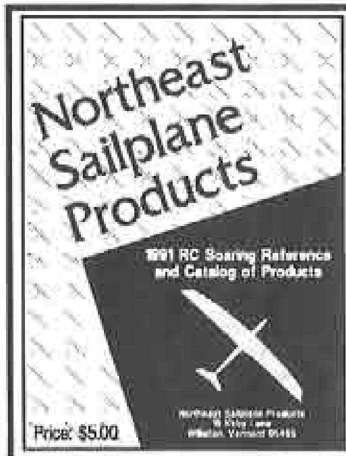

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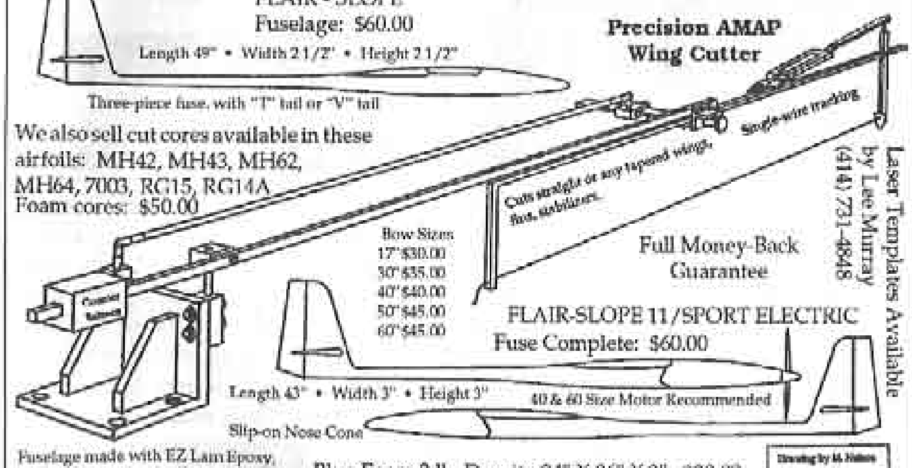

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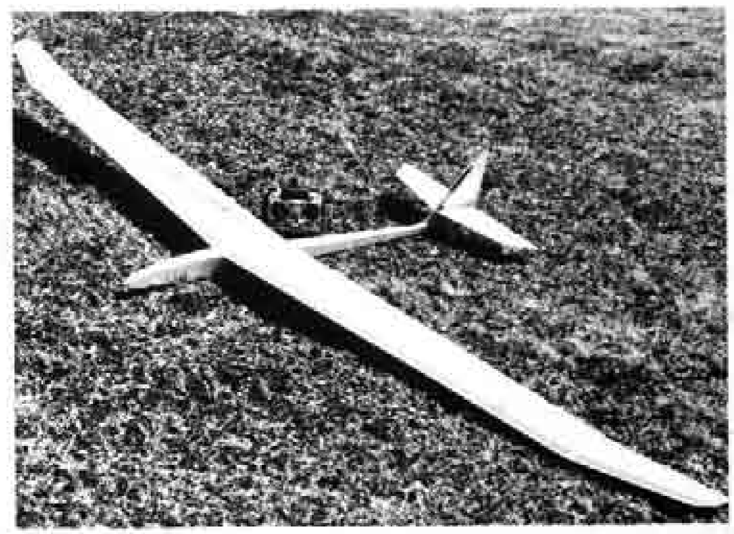

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