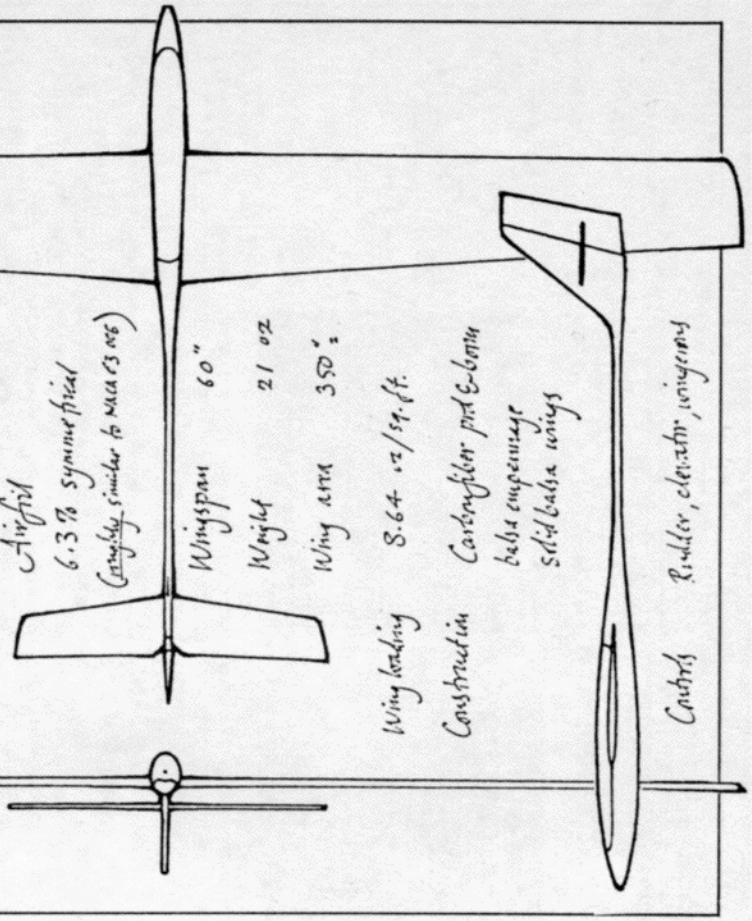
R/C Soaring DIGEST
Vol. 3 No. 6 June 1986

Low-slow, aerobatic SNARK

by John Benson



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Hi Start

MOTHER OF PEARL! IT'S JUNE ALREADY, AND HERE I WAS PLANNING TO ATTEND A BUNCH OF CONTESTS THIS SPRING - YET I'VE NOT BEEN TO EVEN ONE OF THEM. SURE, I HAVE LOTS OF EXCUSES, BUT YOU DON'T WANT TO KNOW ABOUT THEM ANYWAY. ONE THING THOUGH, AND THIS IS SOMETHING THAT MAYBE YOU WOULD LIKE TO HEAR ABOUT - MY 'PLANE. YEP, THE CHEROKEE 140C IS HERE FROM ARIZONA, FLOWN IN BY MY SON WHO NOW HAS HIS CFI TICKET. NOT ONLY THAT, HE CHECKED ME OUT IN THE AIRPLANE AND GAVE ME MY BIENNIAL FLIGHT REVIEW! TO THINK OF HIS SIGNATURE IN MY LOGBOOK IS A GREAT PLEASURE AND HAPPINESS TO ME. WHO WOULD HAVE EXPECTED THAT'WAY BACK WHEN' I USED TO TAKE HIM UP FOR RIDES IN SAILPLANES AND POWERED PLANES? HE WAS ONLY A TODDLER THEN...AND THE YEARS IN BETWEEN SEEM TO HAVE FLOWN BY.

RCSD CONTINUES TO GROW; WE MAY MAKE THAT MAGIC 1,000 BEFORE THE END OF THE YEAR IF THINGS KEEP ON LIKE THEY HAVE BEEN. OVER 800 COPIES GO OUT EACH MONTH NOW, AND WE'RE UP TO 18 COUNTRIES AT LAST COUNT. YOUR COMMENTS, SUGGESTIONS, LETTERS, ARTICLES, AND IDEAS ARE WHAT MAKES RCSD SO POPULAR. THANKS AGAIN, READERS AND SUBSCRIBERS; WE'RE GONNA MAKE IT AFTER ALL! BEFORE I LEAVE YOU THIS MONTH WITH THE USUAL SIGN-OFF, I'D LIKE TO MENTION AN AIRFOIL THAT LOOKS AWFULLY GOOD TO ME: THE EPPLER 201. IT HAS EXCELLENT LOW DRAG CHARACTERISTICS OVER A VERY WIDE 'BUCKET' ON THE CL/CD CURVE, AND WHAT'S MORE, IT'S VERY CONSISTENT. ACTUAL TUNNEL TESTS BEAR OUT THE THEORETICAL PERFORMANCE ALMOST POINT FOR POINT. BESIDES ALL THAT, IT'S FAIRLY THICK AND CAN SUPPORT A GENEROUS SPAR DEPTH. WORKING AT ITS BEST UP AROUND R.N. 200,000 THIS AIRFOIL OUGHT TO BE YOUR FIRST CHOICE FOR THAT CROSS-COUNTRY SAILPKANE. IF YOU NEED DATA, OR A DRAWING, LET ME KNOW. I PLAN TO TRY IT ON MY NEW LOW-ASPECT WING.

HAPPY SOARING, Jim

SOAR-CES.....Jim Riggle

For anyone interested in building wind speed and direction indicators, there have been some articles that you should know about. The first - LED WEATHERVANE - is from the Fall 1985 issue of ELECTRONICS HOBBYIST. The second - MEASURE THE WIND - USING IC'S AND LED readout, appeared in 1985 BUDGET ELECTRONIC PROJECTS. The magazines referred to may be obtained from WORLDWIDE PUBLICATIONS, INC., P.O. BOX 5206, NORTH BRANCH, NJ 08876; TELEPHONE: (201) 231-1518.

WING TIPS

Eric Marsden, 8 Murray Road, Horndean, Hants., England PO8 9JS, sends along a very neat solution to a problem faced by some who are involved with scale and scale markings. Extra-fine point PILOT pen markers are available in silver, gold, gold and bronze or similar. The silver one is particularly handy for line work and is easy to use on tissue surfaces. It is quick-drying, and requires very little pressure. For very fine black-line detail, Geha Formy 30 'Permanent' is excellent and much easier to use than India Ink pens of any type - and much quicker drying. This pen also writes very well on plastic sheet and glass, giving a fine line perhaps half that of the model 230 Superfine, and is available in colors as well.

Thoughts on Sailplanes with Gyros.....Pete Carr*

*From Steel City Soarers newsletter March 1986

Ever since watching Helmut Lelke do nasty things to the competition at the 785 Nats, I wondered how I might duplicate his controls without going to the electrostatic system he used. Being terminally cheap, and having a very small radio room in the GOBBLER, I bought a Kraft gyro and installed it. The ship already carried a sniffler, controls for rudder, ailerons, elevator and spoilers. Things were so crowded I considered towing another glider behind to carry all the extra gear! The instructions said not to put foam around the gyro or it would damp the control effect. They needn't have worried, as I couldn't fit a decal between the gyro case and the fuselage!

The first test was at Maple Cave and the ship performed alright. My main concern was the very high battery drain of five servos plus the gyro on my 500 MaH battery pack. Also, the darned thing makes such a racket that I was accused of having an engine on board. The timer of my first flight almost ran off the field when I switched on - afraid that the ship woud blow up! I don't know why he woried, as it's a well-known fact that balsa shrapnel only hurts a guy's wallet!

So I flew the gyro-equipped GOBBLER for the rest of the season, but didn't exactly set the world on fire. The ship didn't crash, however, so that is a small blessing. The bottom line is that the gyro encourages a pilot to quit "dumb-thumbing" the elevator, thus keeping the ship on an even keel. This is great progress, as we now have a device that can "dumb-thumb" for us while we chat with the timer. Now THAT'S what I call progress!

SOAR-CES

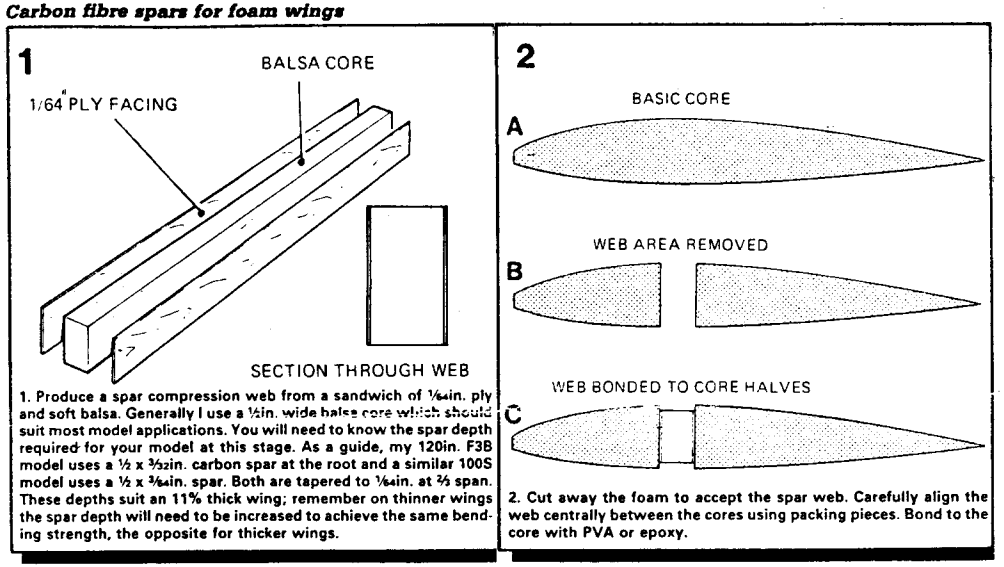
Need a Larry Jolly PANTERA, METEOR, or COMET kit? You can get one from Jeff Troy at Allied Hobbies, Y-12 King of Prussia Plaza, King of Prussia, PA 19406. Telephone: (215)-337-9737. Jeff had several kits of each in stock as of the time of writing (end of April, beginning of May). Call first to check on availability, and tell him RCSD sent you.

The following information was provided through Sean Walbank and RC MODEL WORLD, March 1986 issue. Sean is the soaring editor of RCMW, and Stu Blanchard is world famous for his Calypso design that won him a fine 4th place in the World RC Soaring Championships in Australia - April 1985. Thanks, gentlemen for your kind permission to use this material.

Working with Wings **RC Model World, March 1986**

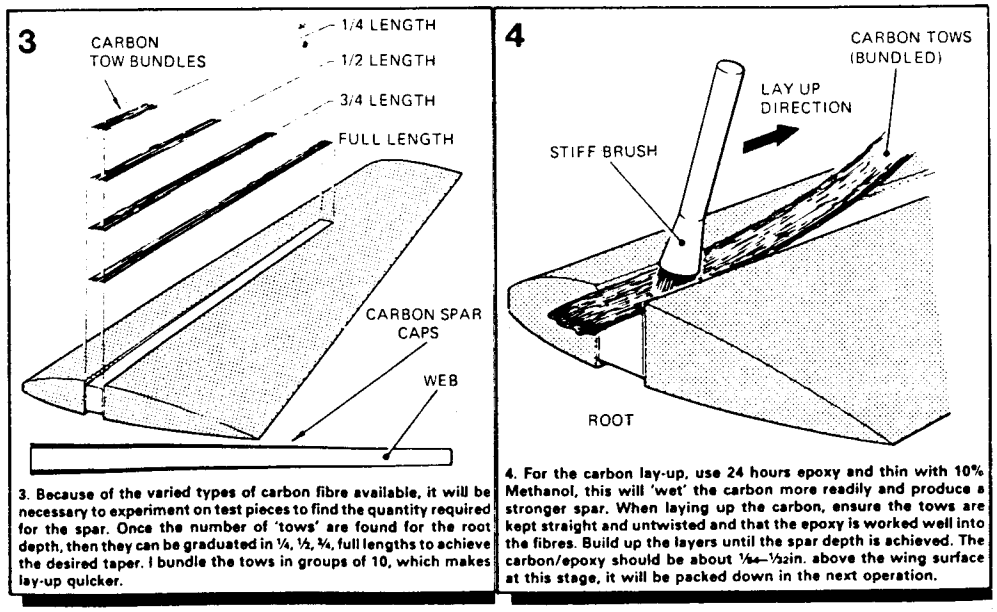
STUART BLANCHARD

Carbon fibre spars for foam wings



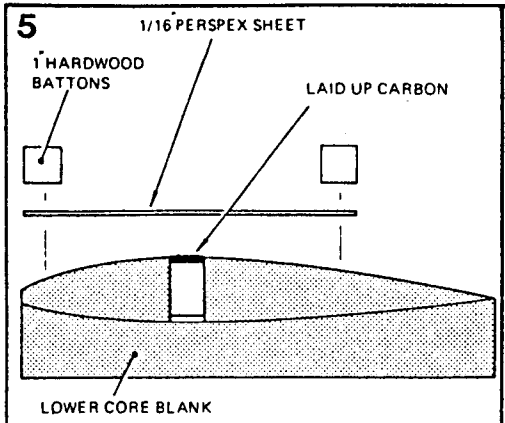
1. Produce a spar compression web from a sandwich of 1/64in. ply and soft balsa. Generally I use a ½in. wide balsa core which should suit most model applications. You will need to know the spar depth required for your model at this stage. As a guide, my 120in. F3B model uses a ½ x 3/32in. carbon spar at the root and a similar 100S model uses a ½ x 3/64in. spar. Both are tapered to 1/64in. at 2/3 span. These depths suit an 11% thick wing; remember on thinner wings the spar depth will need to be increased to achieve the same bending strength, the opposite for thicker wings.

2. Cut away the foam to accept the spar web. Carefully align the web centrally between the cores using packing pieces. Bond to the core with PVA or epoxy.

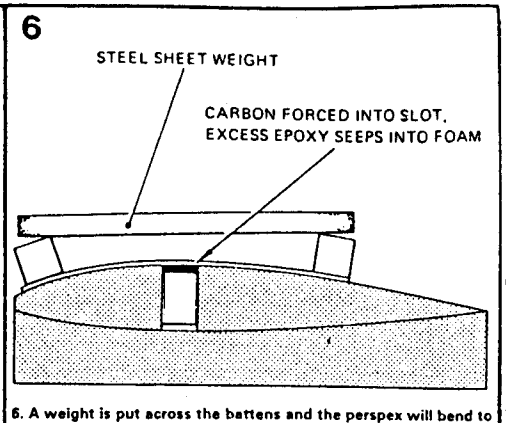


3. Because of the varied types of carbon fibre available, it will be necessary to experiment on test pieces to find the quantity required for the spar. Once the number of 'tows' are found for the root depth, then they can be graduated in ¼, ½, ¾, full lengths to achieve the desired taper. I bundle the tows in groups of 10, which makes lay-up quicker.

4. For the carbon lay-up, use 24 hours epoxy and thin with 10% Methanol, this will 'wet' the carbon more readily and produce a stronger spar. When laying up the carbon, ensure the tows are kept straight and untwisted and that the epoxy is worked well into the fibres. Build up the layers until the spar depth is achieved. The carbon/epoxy should be about 1/64–1/32in. above the wing surface at this stage, it will be packed down in the next operation.

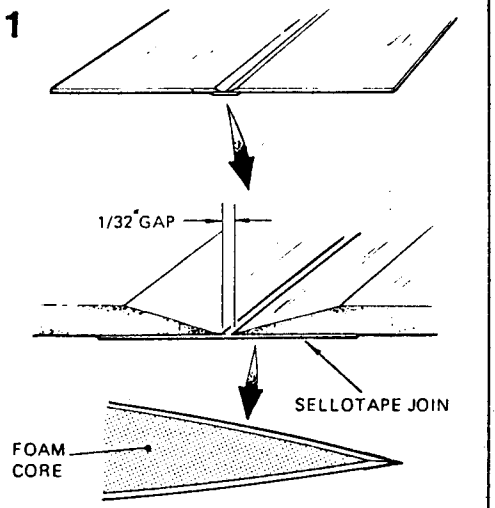


5. Polish a sheet of perspex (6in. wide by the length of the spar). Lay on top of wet carbon and place on two 1in. sq. hardwood battens.

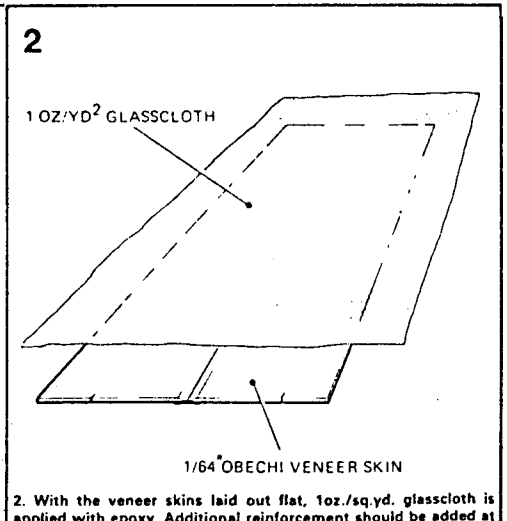


6. A weight is put across the battens and the perspex will bend to the wing curvature. This will pack the carbon down into the slot and any excess epoxy will seep into the surrounding foam. When dry the perspex is removed leaving a spar which is perfectly flush to the wing surface. Repeat the operations for the lower surface.

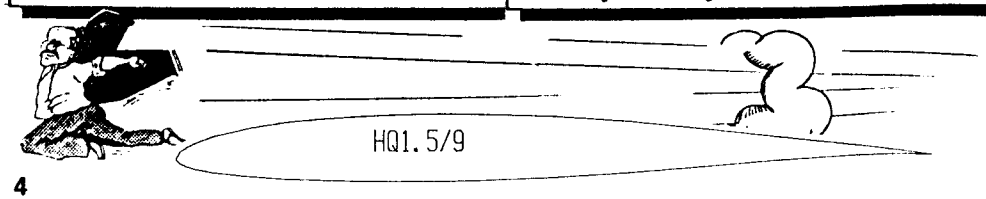
VENEER/GLASS LAMINATE SKIN FOR FOAM WINGS

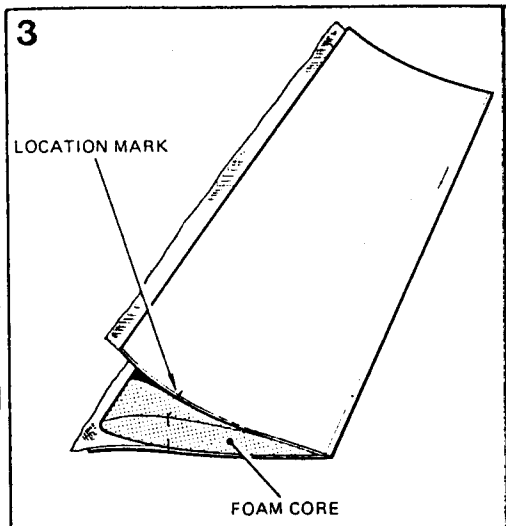


1. Cut the veneer skins to size, leaving a slight overlap at the leading edge. Chamfer the trailing edges and join with sellotape. Allow a ½zin. gap between the skins to allow them to fold over after a glasscloth skin has been applied. When the wing is finished, the trailing edge will have a hard glasscloth/veneer edge, which can be tapered down to at least ⅛in. thick.

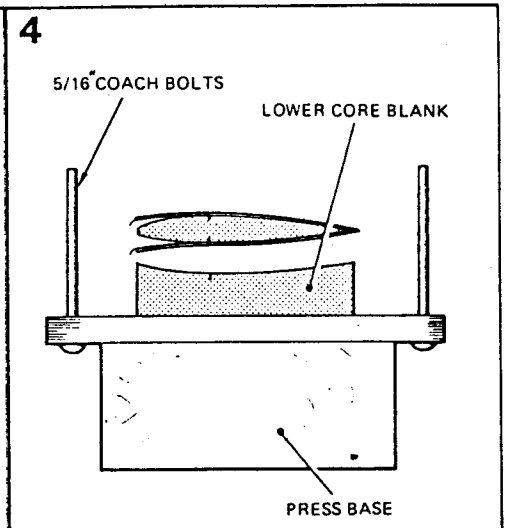


2. With the veneer skins laid out flat, 1oz./sq.yd. glasscloth is applied with epoxy. Additional reinforcement should be added at this stage, such as at the wing root, servo box positions, spoiler cut-outs, etc. No more than two layers of glasscloth should be laid over the trailing edge, as it will be too thick to fold over properly. If you use more than one layer of glasscloth on the wing they should be laid up at 45° weave orientation, to maximise the torsional strength in the wing.

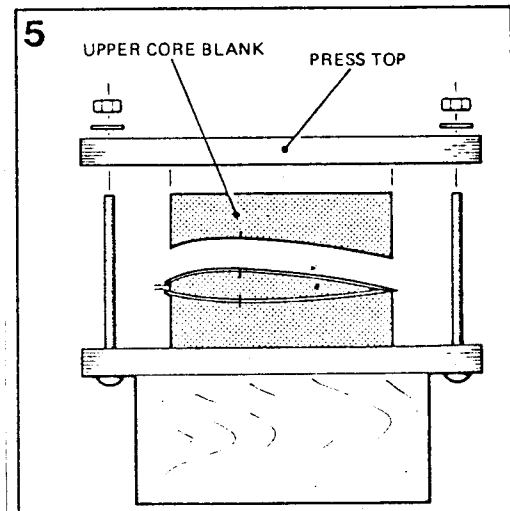




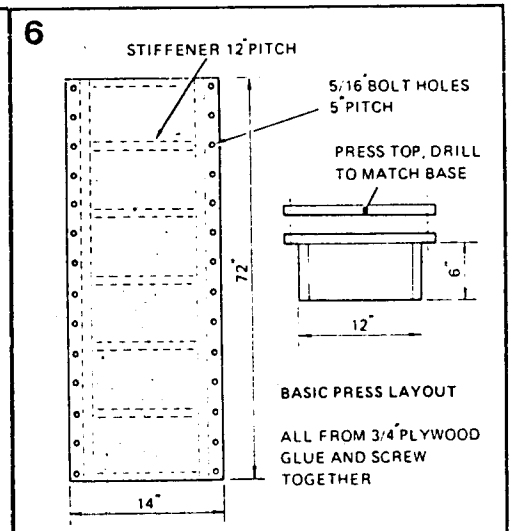
3. Place the wing core on one skin half and fold over. Align carefully on the core and smooth the skin down (it will not adhere at the leading edge yet).



4. Place the core/skins on a lower core blank and align. I usually tack the two together with sellotape to stop movement when the press top is lowered into position.

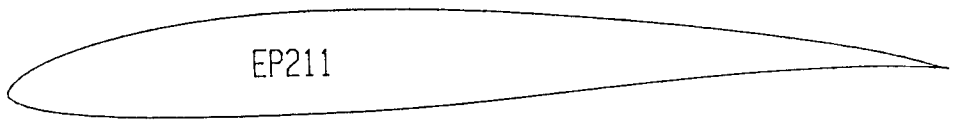


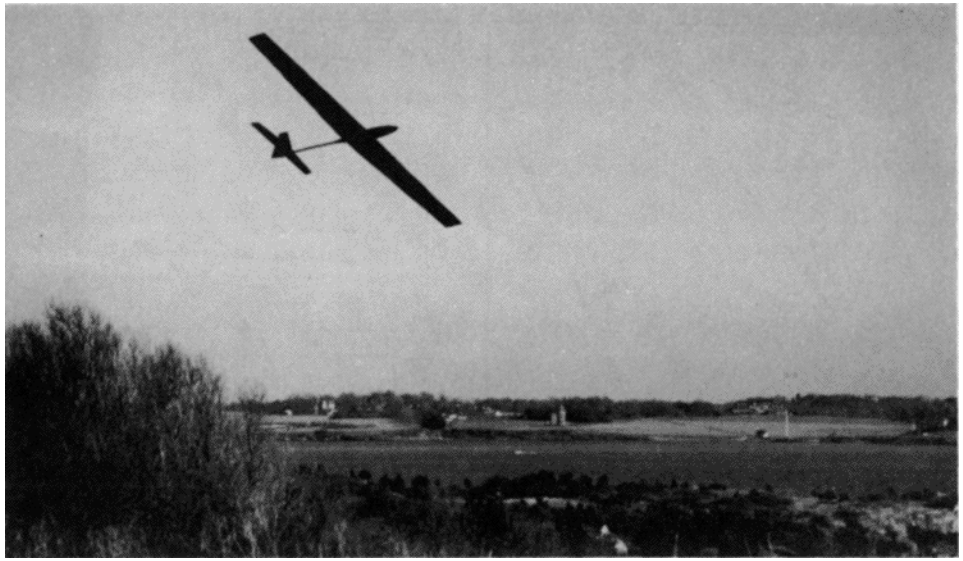
5. Put an upper core blank on top of the wing and carefully lower the press top down the bolts and onto the wing and blocks. Check that the cores and skin haven't moved, then screw on the nuts. Use a torque wrench to tighten and apply a constant pressure all over the wing. Leave the whole assembly 2–3 days before removal, to ensure the epoxy has fully cured. The wing now needs only a leading edge to be added and then lightly sanded. The trailing edge can be sanded sharp, I don't usually sand to less than ⅛in. as it will become too brittle (unless an additional glasscloth/epoxy layer is added to the wing exterior).



Making of the Press

6. The main criteria here, is that the press is perfectly flat with no twists (which would be transferred to the wing). Use good quality ¾in. plywood and glue and screw all joints. The press size shown will accommodate most wing sizes, use only the bolts in the area of the core being pressed. Remember to use large clearance holes in the press top, this makes alignment easier when lowering over the bolts onto the wing structure.





THE HUNTING OF THE SNARK John "Buzz" Benson

For some time now I have been trying to teach myself aerobatic soaring on the low, seafront slopes of the New England coast. In terms of practicality this is right up there with the kid who trys to parachute off the garage roof with the family umbrella. But it's amazing what a little perserverance and a lot of Yankee pig-headedness can accomplish. Three years into the thing I am just about where a reasonably gifted beginner with a good teacher could expect to be after one season on a proper slope. And, in the process, I've put together a really interesting collection of wreckage.

Early on it was clear that the sharp, confined lift of low slopes called for a special sort of model. Unlike big slopes, little ones don't kick up steep, bouyant waves of lift. In light air with a very light model it is possible to float around with comparative ease. As the wind pipes up everything changes. The lift gets all sort of flat and nasty. Even with plenty of ballast a lightly built floater can get blown

to oblivion with a single wrong move. And the enlarged scale of the maneuvers which a ballasted model makes just isn't suited to low level flight.

Trying to meet these demands I embarked on a series of kit modifications and one-design efforts in an attempt to find an ideal sloper for my locale. Gradually, a series of equations took shape. Strong breeze on low slopes gives good lift but powerful headwinds. Ballast produces better penetration but ponderous maneuvers. Would it be possible to through our headwinds? Low drag, reduced surface area and skin friction, thin airfoil sections; all these looked promising. Lifting airfoils keep you aloft but don't stunt well. Symmetrical sections that do stunt well just don't give the lift. Was there some magical, middle ground in here?

Experiments had been made with variable camber and this technique was clearly promising but there were an awful lot of variables. How could I assemble some really solid data on airfoil sections without devoting months and months to the task? It was about at this point that I encountered the wingeron control system ("Slope Soaring the Pivot" RCSD March '86).

Flying the Pivot I began to see that the wingeron system would let me build and test a variety of airfoils without the bother of ailerons, drag (and labor) producing hinges, complex linkages, etc. Likewise, wingerons, together with a full flying stabilizer, would allow me to change angles of attack of both wing and stab without making structural alterations or adding drag on hinged surfaces. A light, clean, wingeron design took shape quite quickly from these parameters.

As drawn and built the new machine has a slim, graphite fiber tail boom and a fuselage pod that is kept to an absolute minimum. At its largest point it is 2 3/8" deep by 1 11/16" wide; just big enough to stuff in a Futaba S32 for the wingerons, two S33's for rudder and elevator and a 450 SR battery pack. Construction of the pod is all carbon fiber and resin laid up over a blue foam plug. Three layers of CF were used with fast cure WEST SYSTEM epoxy. After curing a hatch opening was cut out and the foam was melted away with acetone.

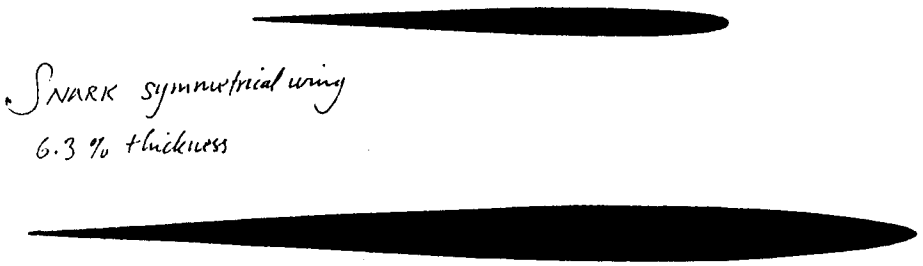
The tail boom is a mass produced CF arrow shaft upon which a conventional, balsa sheeted tail fin was framed up. Half A Sullivan cables were installed at this stage for the full flying stab and independent rudder. The rudder was built as an open structure and the stab was made of lightweight, solid balsa. Upon completion of the tail feathers pod and boom were joined aligning the fin to the hatch opening and the boom to the pod center line.

After this the radio gear was installed and the sleeve for the wing pivot rod was fitted, carefully aligned to the fin and stabilizer. Two light coats of black auto primer were dusted onto fuse and fin and onto the rudder as well which had been covered with pre-primed Micafilm. After drying all painted surfaces were rubbed with triple 0 steel wool for a satin finish.

Lewis Carroll, author of "Alice in Wonderland", wrote a lesser known work called "The Hunting of The Snark". It tells of a group of voyagers in search of a mythical animal believed to be half snake and half shark. I'd been searching for my ideal sloper for quite a while and the lean, mean look of the new model called Carroll's beast to mind. So, Snark is what I named it.

At the outset the Snark flew with the Pivot's Eppler 387 wings. I switched the wings back and forth between the two models to get a clear comparison. For stability and ease of handling the Pivot had me, hands down. For penetration and speed, Snark had a distinct edge. And the mid-mounted wing of the new plane gave improved aerobatic performance over the shoulder mount and deep fuselage of the Dodgson design. I had also trimmed my wings at a flatter angle of attack than the Pivot's so inverted flight was a bit easier. But I must admit that the contest was a close one. It is a tribute to Dodgson's skill that his lightweight, elegant, hand-launched glider is also a terrific performer on the slopes.

The next Snark wing used an airfoil designed by Jack Chambers. Chambers has drawn several airfoil shapes, two of which I had flown extensively. For the new wing I went to the JC16 which had already given me one great season on a small,elevator and aileron sloper. It's characteristics are a thin profile of 8.3%, a fairly sharp and gradual entry, a front section that comes a little closer to symmetry than the E387 and a modest bit of undercamber at the rear of the foil. This wing was also built to the same planform as the Pivot's using blue foam cores, a short box spar, full length carbon fiber strip spars and 1/16" balsa sheeting.



On the Pivot, Dodgson uses a few degrees of dihedral which tends to stabilize slow flight and the rudder coupled, thermal turn. Dihedral also helps the Pivot groove through maneuvers and exit cleanly from them. But all stability is achieved at the expense of some maneuverability and dihedral ships are not as happy upside down as their flat winged brothers. I decided to forego dihedral this time. Maneuverability was the goal, and penetration, and more speed.

The Pivot flys with a weight of about 17oz and a wing loading of 7oz per square foot. Snark, with the Pivot's wings, came in at 21½oz for a wing loading of 8.7. In test flights I ballasted the Pivot up to this same weight and Snark still outperformed it in good air. With the JC16 wings Snark came in at 25oz boosting the WL to 10. This resulted in equal or better performance in anything over a moderate breeze. In light air there is a distinct loss. It's possible, however, to fly in winds up to 40mph with no ballast at all. And aerobatic performance is visibly improved.

Continuing the quest for aerobatic capability I most recently built a fully symmetrical wing with a thickness of only 6.3%. Construction was solid balsa with gussets of cf matting resined over the wing pivot tubes both top and bottom. Once again the pivot planform was used. With the new airfoil the C.G. could be pushed much further back than before and a flying weight of 21oz resulted.

Aerobatic performance of the symmetrical winged Snark was dramatically improved though there was a significant loss of

lift. As Dave Hughes says on the subject of symmetrical profiles "for every other application then slope aerobatics there is no worse airfoil." But our combination of a very low drag fuse, relatively light wing loading, and a thin, low drag airfoil seems to minimize the drawbacks. And the aerobatics are really something.

Throughout the range of maneuvers the Snark with this wing flys with great decision. Any control input results in a crisp change of attitude which the model holds onto solidly until another control is put in. With the wing and stab set near zero zero frequent tugs of up elevator are used when upright and similar nudges of down when inverted. While this flight mode wants a little getting used to it is certainly not dull. Inverted flight is indistinguishable from upright. An outside loop is no different from an inside one. Yaw response is very good and it is almost possible to steer the plane with rudder

and elevator only. From a quick dive, a quarter roll into knife edge gives you the option of making a pylon turn one way into inverted flight or the other way into upright. Yet all the while there is a feeling of lightness and agility. It's awfully tempting to think that I'm really onto something.

Of course, all this has been happening in a sort of Zen-like isolation. I may just be re-inventing the wheel. Has anyone else out there flown any really thin, symmetrical sections? I'd love to hear about it.

For now I intend to fly with the symmetrical wing for a while and then try the same foil on some different planforms. Maybe variable camber should come back into the picture too. And then? Well, we'll have to see. The hunting of the Snark goes

COMMENTS ON AEROTOWING.....Dick Miller*

"Your discussion of Aerotowing in the October issue of RCSD brought back some memories. Several years ago I was a member of the Cumberland Aircraft Model Society in western Maryland. At that time we were actively giving RC model demonstrations at several of the local festivals that dot West Virginia and western Maryland during the summer and fall months. I had just obtained my full-scale glider rating, and a modeller friend was in training. It was very natural to attempt model towing and incorporate it into our demonstration activities. Over the course of two or three years of active towing, we evolved a technique that was both reliable and relatively easy to do. The following summary is given in the hope that it may be of interest to your readers.

Position, Attitude and Perspective

"Our approach was based on full-scale experience and a judgement about the problems that would be most important when the pilot's perspective is shifted from air to ground. The problem of full-scale aerotow falls into two parts: the relative positions of the towplane and sailplane (in essence, you are formation flying); and the control of relative airspeed (the sailplane should never fly faster

than the towplane, while maintaining an even and not excessive tension on the towline). For an excellent discussion of full-scale towing, I would recommend the SSA training manual "The Joy of Soaring" by Carl Conway.

"Relative position is important because any displacement of the sailplane from the optimum location makes control of the towplane difficult and - in the extreme - impossible. The best location for the sailplane on tow is direcly behind and slightly above (or below) the propeller wake of the towplane. Speed control is important on tow because the sailplane can actually go up and over the towplane if its angle of attack slows it down and puts great tension on the towline. Likewise, if the sailplane speed gets much faster than the towplane speed, the towline will develop a big sag and no longer be under proper tension. When the sailplane or towplane pilot tries to remove the slack, the towline can break under the surge. (Note: when this used to happen to me in the full-size sailplanes, I could get rid of the slack without difficulty by gently applying spoilers until the slack was gone, and I have reason to believe it might also work with the models...JHG). In the case of severe slack, the towline may become entangled in some part of the towplane or sailplane, leading to structural damage and a crash.

"In the case of models, with both pilots on the ground, judgement of relative position and speed is difficult. Therefore, the approach to model aerotow must allow for less precise (i.e., sloppy) flying. Four factors need to be considered for model towing:

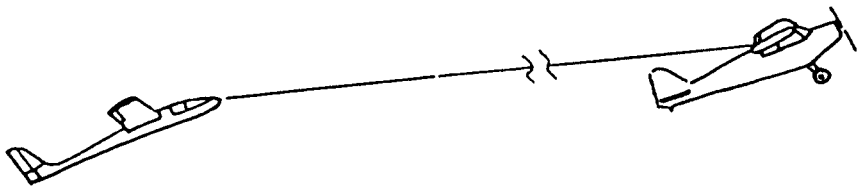
1. Flying technique
2. Selection of sailplane and towplane
3. Towhook location
4. Towline length

Flying Technique

"In full-scale tow, relative position and speed are largely the responsibility of the sailplane pilot. The towplane pilot strives to maintain constant airspeed and climb rate. However, in the model case, we opted for a technique which separated the problems of airspeed and position. The model towplane pilot flies a profile that gives him control of airspeed for both aircraft, while the sailplane pilot controls relative position.

"On tow, the towpilot establishes a rate of climb such that the sailplane is being DRAGGED upward at a speed just above its stall speed (Sketch 1), leaving the sailplane with just enough energy to maintain position, but not enough to induce any large excursions of

speed or position. A steep climb is established immediately after take off,and the best climb rate is determined by the sailplane pilot informing the towplane pilot when the sailplane is just about to stall (i.e. when control is sluggish but enough to maintain position). Maintaining the best climb condition in good soaring weather (i.e., turbulent stuff) requires constant communication between the pilots and a well-educated throttle thumb on the part of the tow pilot. Do NOT fly at full throttle; establish climb at about 3/4 throttle, leaving a power reserve.



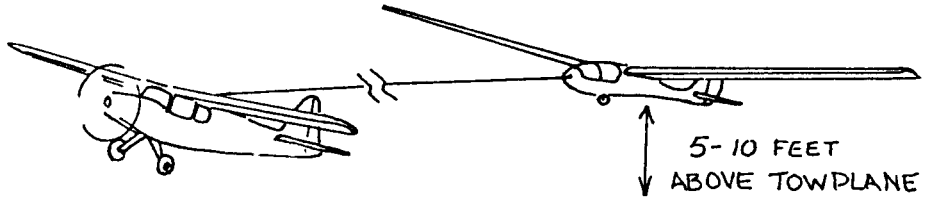
KEEP CLIMB ANGLE STEEP ENOUGH THAT SAILPLANE IS JUST ABOVE STALL SPEED.

"Climb is continued with the tow pilot dictating the overall flight path and coordinating any turns with the sailplane pilot before they are started. Because the sailplane is being dragged, the turns should be gentle. The climb is continued until the sailplane finds lift or when one of the pilots can no longer stand the pressure. Aerotowing is fun but requires intense concentration and cooperation by both pilots. Completion of tow follows full-scale procedure. After release, the towplane breaks immediately into a descending left turn while the sailplane breaks right.

"Take off, relitively speaking, is a piece of cake. All of our takeoffs were made from the ground. Most of our early work was done by letting the sailplane fuselage slide on the ground (we had a grass field). Later, we used some sailplanes equipped with a conventional single wheel gear mounted in the fuselage at, or slightly in front of, the C.G. Rudder and elevator are sufficient for the sailplane, but ailerons help considerably on takeoff to keep the wings level.

"Take off procedure follows full-scale practice. As the towplane starts its roll and the towline just becomes tight, the sailplane is released from restraint and a wing runner (preferably very short) holds the sailplane wing level for a very few feet until the wing is flying. The sailplane takes off first (Sketch 2) and establishes a position directly behind, and about five feet above, the towplane. Climb is established immediately after the towplane lifts off, and that is that.

SAILPLANE FLIES FIRST



"We found this technique to be very practical and successful in hundreds of tows. Almost 50 gallons of fuel were put through the Senior Telemaster/Webra Blackhead combination before it was retired. This approach was easy enough in that it was used frequently for afternoon thermal flying with the club, and had the advantage of allowing a long search for usable lift.

Aircraft Selection

"We employed a wide selection of sailplanes ranging from light floaters of the Gentle Lady type to an old Craftair LEO at 13 pounds. As I recall, some relatively high performance types like a semi-scale ASW-17 were also used.

"Sailplane requirements are minimal. Choose one that becomes sluggish in control response at a speed just above the best climb speed of the towplane. You also should avoid a sailplane with nasty stall characteristics - such as an abrupt tip stall and wing drop. Rudder and elevator are sufficient, but ailerons make takeoff much easier. We found a combination of spoiler and tow release to be very good, with the towhook engaged at partial spoiler deployment (aids speed control) and disengaged with spoilers closed. (Note: this would seem to imply takeoff with spoilers partially open...JHG)

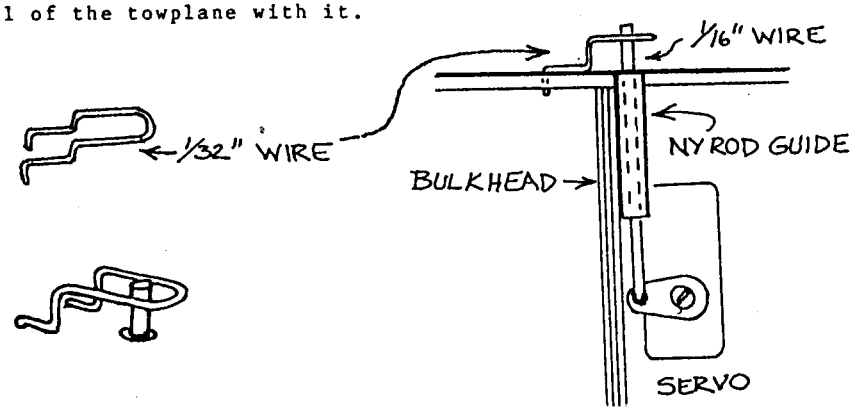
"Towplane requirements, on the other hand, are critical. The towplane you choose should be overpowered, have a very low stall speed, be rugged, and light weight. For us, at that time, a Hobby Lobby Senior Telemaster with a (then) hot Webra Blackhead 60 was the ideal combination. I would now go for a modern 60- or 90-size engine, but stay with the Telemaster. Nothing lifts more or flies slower.

Aerotowing ...

Remember: you are NOT looking for speed but, instead, a high rate of climb and lots of pulling power. DRAG the sailplane up slowly. Excessive speed only makes things go wrong faster!

Towhook Placement

"We explored towhook placement because we believed that relative position between the models would be hard to maintain. A conventional placement for the towplane hook and a center-of-gravity towhook location on the sailplane (i.e., the usual best location for winch or high start launching) ARE NOT DESIRABLE. At best, tow is difficult, and at worst, impossible! The sailplane can wandèr and pull the tail of the towplane with it.



SIMPLE TOW PLANE RELEASE MECHANISM

"The best towhook arrangement we found was to place the towplane hook just aft of the wing trailing edge (Sketch 3) and the sailplane hook on the nose. In this manner excursions of the sailplane had minimal influence on the towplane, while the nose hook on the sailplane added improved directional stability.

"A releasable towhook of simple design (Sketch 4) was used on BOTH models, giving either pilot an option to 'chicken out'.

Towline Length

"A towline of 50 - 100 feet in length was used to minimize the influence of sailplane position on the towplane. Breaking strength of the towline roughly followed full-scale practice, and was about 2 to 3 times the weight of the sailplane. As I recall, we never broke a towline. A light, brightly-colored streamer (old 72 MHz frequency flag) was attached to the towline about 3 feet in front of the sailplane to stabilize the towline after release of the sailplane, and as an aid in locating the towline after it was dropped in preparation for towplane landing. We dropped the towline over the runway before landing for two reasons: it followed correct full-scale practice, and the second reason will become obvious the first time you snag a branch or fence post on final approach! It is a beautiful way to practice carrier landings from an altitude of about 20 feet!

"Aerotowing really is FUN and will definitely improve your flying precision. Bob Riggs of Ridgely, West Virginia was the other partner in this exercize, and he contributed as much or more to the development of this technique than I did. I hope if he reads this it will bring back some memories of the good times we had."

*Roy R. Miller, 1659 Santa Ana Road, Hollister, CA 95023.

RCSD PHOTO CONTEST ANNOUNCED - WIN A SUBSCRIPTION AND DECAL!

Everyone knows about those photos showing pilots standing and holding their sailplanes - grinning (or frowning) at the camera/photographer. Every magazine you see is full of such pictures, yet soaring provides a magnificent opportunity to get shots of unequalled quality, subject matter, and magnificence. Well, RCSD would like to do something about it!

If you have photographs that you think ought to be in RCSD, or if you can take some that you think should be here because they exemplify some aspect of RC Soaring (even humor) please enter them in the RCSD photo contest this year. We will take black & white photos ONLY, because we have no means for reproducing quality color pictures.

Submit your best photos before the end of October 1986, and we'll feature the winners in the DECEMBER 1986 issue. Yes, plural!! There will be more than one featured photo and more than one winner. Maybe one will make the cover! Send all photos to Robert W. Rondeau, Graphic Designs, 73 Main Street, Brattleboro, VT 05301 or to me. Be sure to identify all sailplanes and persons shown, plus the name and address of the photographer and all pertinent technical information. If you wish to have your photo(s) returned, include a stamped, self-addressed envelope with your entry(ies). LET'S HAVE SOME FUN!

INTERESTING AIRFOILS

Here are a couple of airfoils that ought to do quite well for you. The Eppler 211 is one that can be flown over a wide range of speeds, yet perform well at thermal duration work without flaps. The Quabeck 1.5/9 would be suitable for use with flaps and is a definite contender for F3b work, having a good turn of speed plus the ability to slow down for thermalling with a few degrees of flap deployed. **See the Bottom of pages 4 & 5 for profiles...**

NOR-RAY PRODUCTS FOAM CUTTER .....TY SAWYER & JIM GRAY

INTRODUCTION

Many of us have seen the ads for the Nor-Ray foam cutter.I, too,was curious about what it was and what it would do - so I ordered one for this review. Ty Sawyer has done most of the work with it, so I'll let him do most of the reporting, save for my own introduction and comments.

The Nor-Ray foam cutter is shipped as a foam cutter KIT. The buyer furnishes his own 1/2" plywood base upon which to mount the cutter itself. The base used for the review was 1/2" x 24" x 60", and happened to be available in the Sawyer garage.

The kit comes complete with all of the hardware you need to set up the foam cutter, including steel wire (not Nichrome, by the way); wire supports that position and tension the wires properly; steel locating rods and mounting brackets; plastic gears (pulleys" with teeth); toothed plastic drive belts; and various nuts and bolts. Since we already had a power supply, we did not order the optional supply available from Nor-Ray Products.

PRINCIPLE OF OPERATION

Like all hot-wire cutters, this one uses electricity to heat the wire. UNlike other cutters, it uses TWO wires simultaneously. These two wires are carefully spaced apart, tensioned and electrically insulated by the apparatus. The core is set up and pulled through the spaced-apart wires by weights connected to the core templates via the toothed belts, pulleys and locating rods.That's right, controlled weight PULLS the core through (between) the wires. Top and bottom surfaces of a wing core are cut at the same time.

The way it works is this: you set up the apparatus according to the simple directions, position the core, and then turn up the heat until the core begins to move under the influence of the weight...and leave it at that setting. Typically, 12" of chord will be cut in about 60 seconds. It's uncanny when you see it in operation for the first time!

COMMENTS

The drawings, while simple, seemed unclear to me and required a bit of interpretation. They should (and will) be improved. The screws used to mount the hardware in the recommended 1/2" plywood base are not quite long enough and should be 1/4" longer. The insulator furnished with the kit to electrically isolate one wire support from the other when connected in series, needs to be improved because arcing took place on one or two occasions.(Ty's improvements to the apparatus took care of this problem.)

The Nor-Ray parts appear to be first-class quality and are neatly packaged for shipping (UPS). The rig is simple to set up and adjust, requiring less than an hour from start to your first core. The instructions are adequate, and the price is fair. YOU CAN CUT BEAUTIFUL CORES WITH THIS DEVICE! The unit has great flexibility because you can adjust the length of the wires to cut cores up to 50" or more in length, or you can cut shorter ones when needed. We set up the board to cut 46" cores, and even cut some that were only about 12" long. You can also cut TAPERED wing cores quite easily, with taper ratios varying from 1:1 (no taper; i.e., a "plank" wing) to a 2:1 taper. Various toothed gears (pulleys) and a table of taper ratios and pulley combinations are furnished in te kit to provide the taper you need between these limits. A 2# weight for each belt was found to be almost perfect for sure and smooth cuts. Although it is possible, according to Nor-Ray Products, to cut fuselages and other shapes we have not yet tried it - mainly beause we are having too much fun cutting up every piece of foam in sight!

The only difficulty we faced at first was cutting trailing edges thinner than about 3/16". We wanted feather-thin trailing edges, and it was this that Ty solved in a rather ingenious manner. Here's how he did it.

MODIFYING THE NOR-RAY FOAM CUTTER.....TY SAWYER

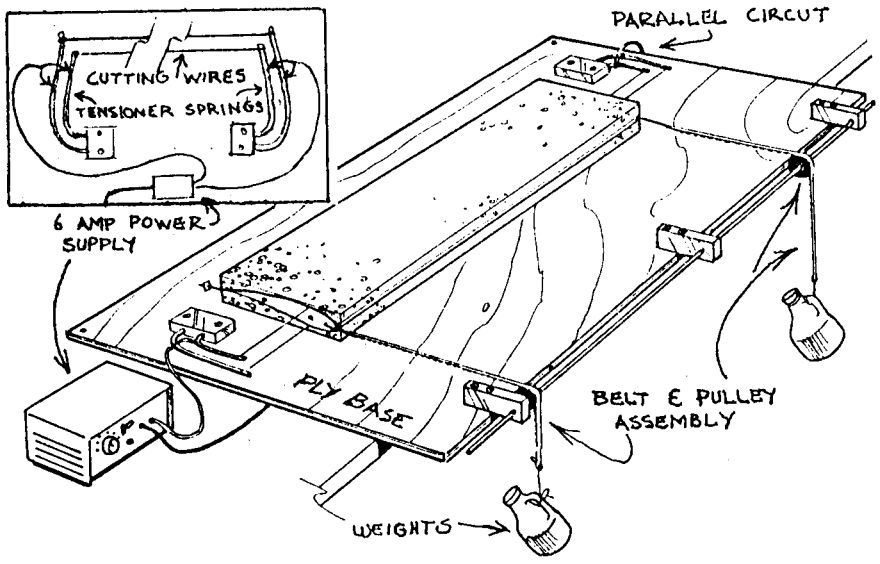
As received, the Nor-Ray foam cutter would cut trailing edges down to about 1/8" or so, which is fine for many applications...but where the trailing edge is to be replaced by balsa (as in my own sailplane) I had to try for a thinner trailing edge. After some experimenting (my basement is FULL of practice blocks) I came up with some modifications. In defence of Nor-Ray products, I must say that there are some drawbacks to my changes.

On the first couple of cuts with the modified foam cutter, there was some arcing which was cleared up by taping one of the tension rods at the end the power is applied. I used vinyl electrical tape for this purpose. Another method, which I now use exclusively, is to hook up the cutting wires in parallel instead of in series as suggested by the instructions. This is done by wiring the ends of BOTH wires together (already done at one end per instructions) and then attaching one power supply lead to each end of the cutter. In this way you won't have to worry about arcing, as it is impossible to short-out the wires. However, the disadvantage is that you will be drawing 6 amps instead of 3 amps current from your power source.

As received, the lower cutting wire is held in place by placing a preformed loop at one end of the wire into a groove at the free end of the tension rod. The upper wire is secured by a collar and set screw. The only reason I can see for the different method of retaining the wires is that the collar would seem to prevent the wires from touching. I removed the collar and made my own groove at the end of the tension rod using a Dremel tool and a Tuff Grind wheel. This allowed the two wires to pass without touching, and reduced the shorting/arcing problem.

The next problem occurs because the two wires can now come very close together, and the combined heat of the two wires tebded to melt out the thin foam between them at the trailing edge. To solve this problem, I cut another groove in the tension rods about 1" behind the original groove, and placed one wire in the new grooves. This separated the wires horizontally, lessening the combined heat, but still allowed the feather-thin cut at the trailing edge...sometimes down to 1/32"...but it wasn't consistent from core to core. It was too sensitive to temperature setting on the power source.

The instructions call for placing the cutter wires on the core trailing edge first, using the template to keep them apart. The reason for this is to achieve a smooth entry to the cut and to keep the wires from binding on the abrupt leading edge rise where the wires have to move almost vertically at first. However, it was my thought that if I cut leading edge first, the temperature would be stabilized better by the time the wires reached the training edge. So I cut all subsequent cores leading edge first, by aiding the wire travel over the first few difficult millimeters of the leading edge. Be careful to put pressure on the templates only, and not on the core, when helping ease the wires over the leading edge radius - otherwise you will bend the core and



probably ruin the wing contour. Using my method of cutting the leading edge first, I was very pleased with the results, but found that I still had to reduce the temperature of the wires (by reducing power) for the last 1½" or so of the cut at the trailing edge.

The disadvantage of spacing the wires like this is that when cutting tapered cores, both wires won't be properly timed to leave the blank at the same time (because one is leading and the other is trailing). I found this to be insignificant except when cutting small, sharply-tapered cores, such as for my tail and winglet portions. It seems possible to space the wires horizontally less than an inch apart, but I haven't tried it yet.

As a reference, I have been cutting the cores at about 6 volts and 6 amps for most of the core, turning it down to about 5 volts and 5 amps as the wire approaches the trailing edge. By leaving your cutter wired in series, Ohm's Law tells us that you'll be using twice the voltage at half the current to achieve the same power.

The instructions suggest using phenolic or formica for the templates. I used thin plywood (approx. 1/32") which works fine for about three or four cuts, but by then the resin cooks out of the plywood, and the wires catch on the vertical grain of the wood, resulting in cores that are not perfectly smooth.

No information is included about lead-ins or lead-outs with the instructions. Instead of cutting lead-ins and lead-outs from the template itself, I made leadins/outs from paperclip wire (DON'T DO THIS IF YOU ARE WIRED IN SERIES) which resulted in nice, smooth, thin lead-in/out. Here's how:

1. Straighten a large paperclip and cut it in half.
2. Drill a hole at each end of the template to accept the paperclip wire diameter. The location isn't critical.
3. Bend a 90-degree angle in the wire about 1/2" from each end of the wire.
4. Use CA cement to retain the wires in the template holes, so that they lead in and out exactly at the leading and trailing edges. Now cut the wires about 1½" from the ends of the templates.
5. Bend both ends up into a hook.

The last thing to discuss is how to stop the core after cutting is finished. The cut is made by a combination of heat and weight which pulls the core through the cutting wires. The instructions suggest that you cut a stick and place it between the core and a mounting bracket at the edge of the board. Some other options follow:

1. If (for example) you are cutting a core with an 8" chord, place supports 8" under the weights before you start cutting. These stop the weights from falling further, hence stop the cutting. (I used scrap pieces od board, stacked to the proper height. Cinder blocks awould work, too.

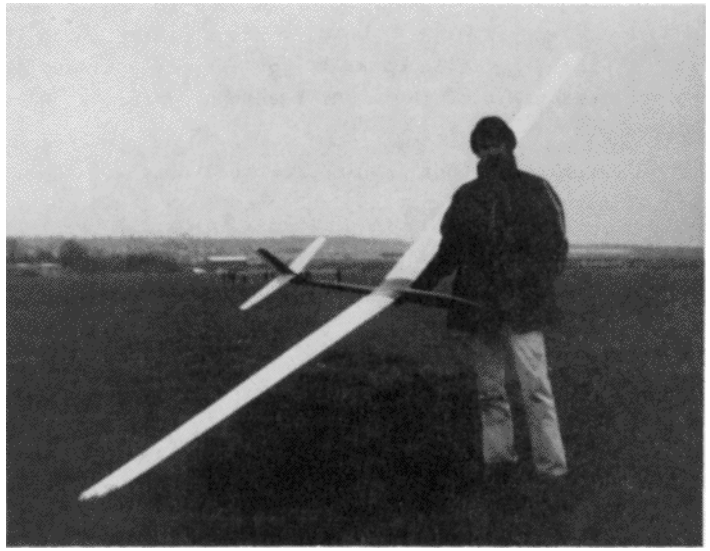
2. The easiest way is to let the trailing hooks catch the cutting wires. This may be the best bet for short cores, but on long cores it could cause more bow in the wire than the other options.

In summary, if your power supply is rated for high current, I'd recommend changing the wiring to the parallel arrangement instead of the series arrangement shown in the instructions and sketches, because it eliminates problems with shorting and arcing.

If you want thin trailing edges, then the other changes are needed; however, sharply-tapered cores will suffer a little.

I am currently experimenting with a tool for stringing the cutting wires to make the job of moving the low wire easier. Then it will be possible to move the low wire back to its original position for sharply tapered cores.

Ty Sawyer



LETTERS FROM READERS

HOWARD METCALF MODELS (remember the McDonnell-Douglas PHANTOM scale slope soarer?) may be putting out some new soaring machines in addition to the already announced TA-152 and Chance-Vought CUTLASS. One possibility is the 12-foot thermal machine shown here. It is very clean and light, and has been flown for the last three years on two channels. Suitable for complete novices, yet capable of winning contest performance, the improved and up-dated design should be ready sometime in 1986.

HEAD HUNTER

Don Chancey recently displayed a new fuselage plug for the new 1986 design he calls Head Hunter. This Austin, Texas pilot, designer, and builder of hot saiplanes showed his ship to some of the club members at a recent meeting. Rumor has it that the design will feature a slim pod-and-boom fuselage and wide-chord wings of low aspect ratio. Look for him at the Nats in Louisiana with his new machine. (Thanks to Charlie Keyes, editor of a zany sheet called Sailplanes, Soaring and Stuff, a supplement to the Aeromodellers of Austin Newsletter).

Charlie reports that your sailplane ought to be white if it's going to be out under the hot sun all day, because dark colors heat up tremendously. An ultra-violet barrier also should be used as a primer-surfacer underneath the paint. The BG ones do it this way, and Aircraft Spruce & Specialty recommends it in their catalog which might well be titled: The Composite builder's Book of Knowledge.

Oh yeah, one more thing: Don Chancey has flown his DOHLE to 17 first places, 2 second places and 1 third place in 21 contests. The 21st (count 'em up) was a minor crash due to a winch-line break on launch, and wasn't an official "flight."

The information about graphite, carbon and "S" glass appeared in this same newsletter of Charlie's club. Read and enjoy. You may subscribe by writing to Charlie Keyes, 13413 Sadleback Pass, Austin, TX 78736.

S-GLASS

S glass uses a different chemical formulation from standard E glass fabrics. S glass is stronger, tougher, and stiffer than E glass. One ply of S glass can easily replace several plies of E glass, resulting in a lighter, tougher, stronger structure.

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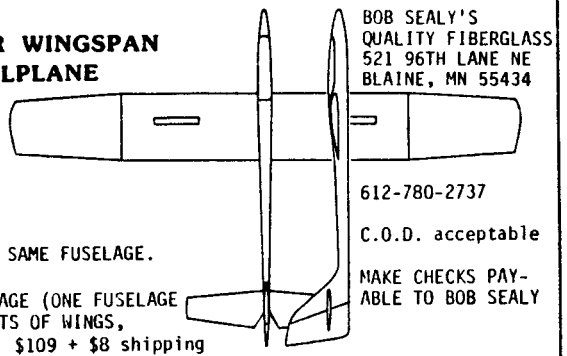

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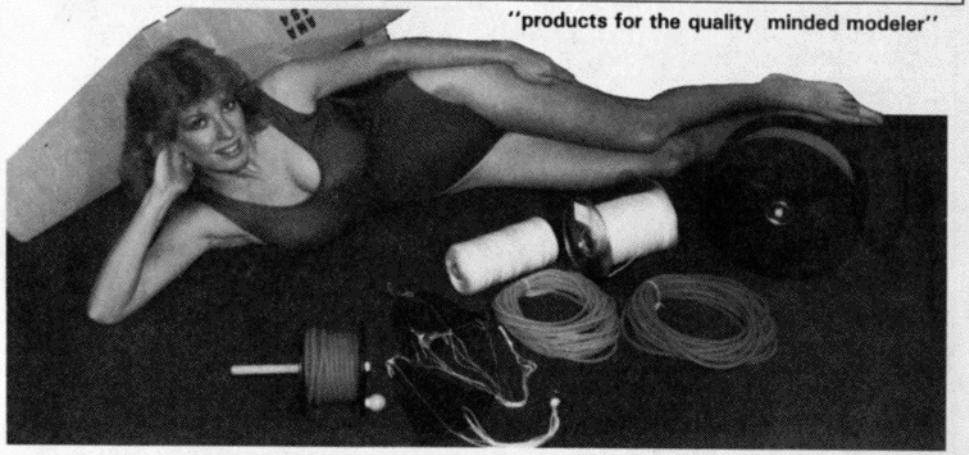

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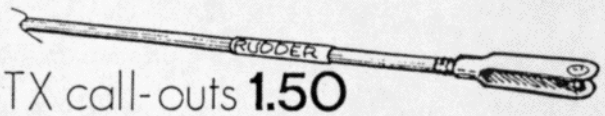

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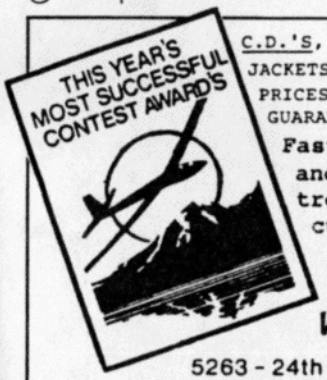

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