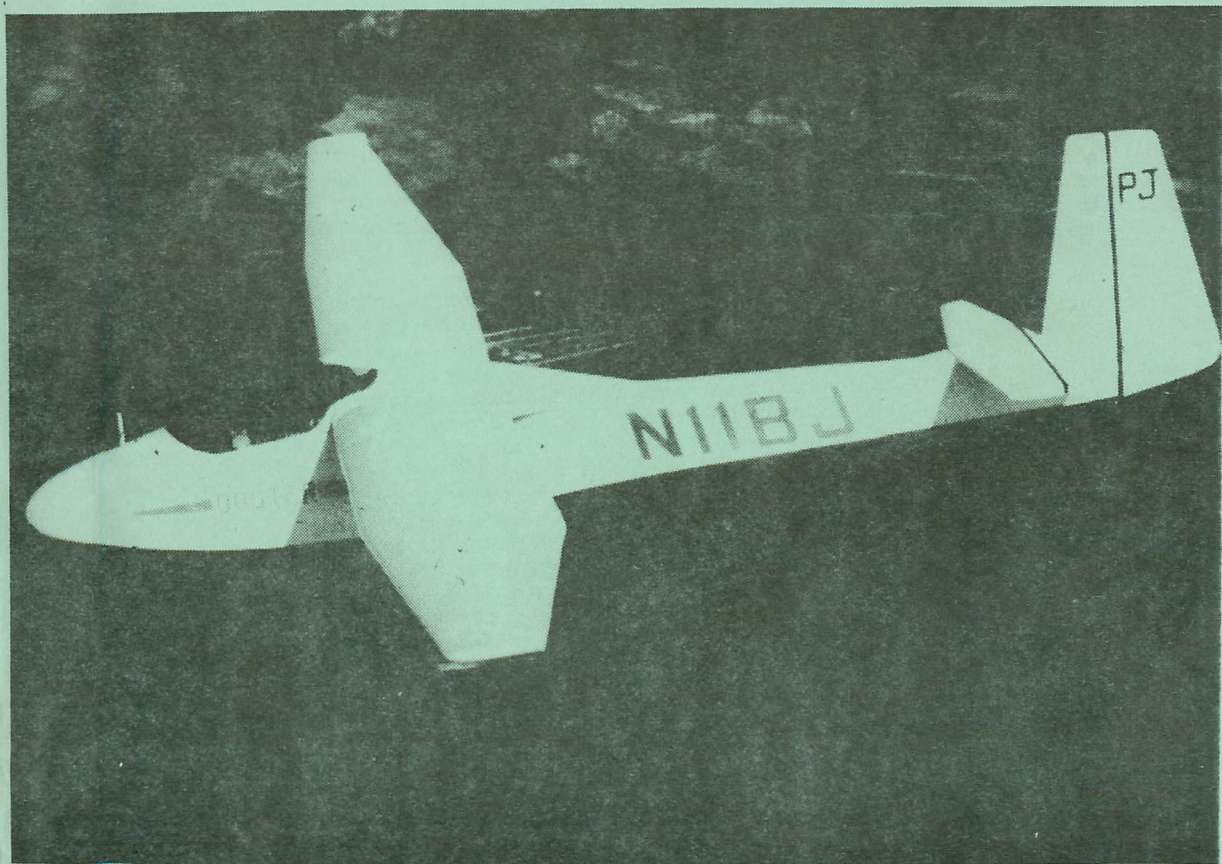
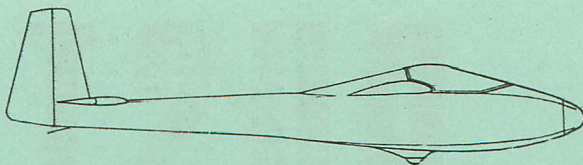


t H E

DUST

RAG





***** THE DUST RAG *****

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FROM THE EDITOR.....

For some of you readers issue number four will be the last Dust Rag you will receive unless you renew your subscription. There will be a box on the back page with an "X" in it if you need to renew before the next issue. The rate is \$3.00 for six issues. Please make checks payable to Bob or Ching Walters, rather than the Dust Rag, it makes banking a little easier. There are no copies of issue #2 available but we still have a limited number of issue #1 and #3 on hand.

We have not received any snapshots or building articles for this issue. My aircraft is almost finished and pretty soon I'll run out of things to say, so PLEASE send in pictures and articles. You may not think that what you have to say or have learned would be that interesting but we have subscribers who want all kinds of articles.

Many people have inquired about Al Nelson's Wortman airfoil. Some people are surprised that he is changing the wing since Hank Thor will not approve design changes. What Al is doing is building his own aircraft and taking advantage of the engineering talent of Mr. Thor and Janssen. It will not be an official Duster, and will not compete in the Duster Class. Hank Thor is not sanctioning these changes nor is Al counting on Hank to keep him out of trouble. As far as the FAA is concerned, they will let you build and fly almost anything, so do not count on them to insure that you have a sound design or even a sound glue joint. I am not qualified to make structural or aerodynamic changes to my aircraft so I haven't. My advice is to pick a good design (like the Duster) and build according to the plans. Hank Thor and Al Nelson will give you the same advice.

One reader asked about moving to an area with different weather before he is finished building. I don't see any great problem but it would be nice to close up as much as possible, especially things like the ailerons.

The plans for my audio variometer came from Technical Soaring (which is a magazine advertised regularly in Soaring) Volume I No. 4 c/o B. Palewonsky, 2303 Burning Tree Rd. Bethesda, Md., 20034. This article is too long to reprint in the Dust Rag but if you're interested, Mr. Palewonsky should be able to supply you with a back issue. It's a great publication anyway. The M.I.T. Motorless Flight Symposium has a good discussion on total energy compensation that you should read if you're going to build a venturi. It is available from M.I.T.S.A. Proceedings, Bldg. N-52-395, MIT, Cambridge, Mass. 02139

My aircraft is almost ready to fly. I need about 15 more hours to finish it up not counting a trailer. The next issue should have some "in-flight" pictures if i'm lucky. I hope to make some computer generated performance curves and check them against my Duster sometime this fall. If everything works out I should have some speed ring figures before too long !

The Dusters are here

Information Pack \$1.00
Plans \$75.00

California Sailplanes
Box 679, Huntington Beach,
Calif. 92648

Raw Material Kits
Complete Kits
Components

Duster Sailplane Kits
Box 1261, San Pedro,
Calif. 90732

ALL WOOD
LOW COST
13-METER
EASY TO BUILD
FUN TO FLY

***** ADVERTISEMENT *****

THE SELF LAUNCHING DUSTER

Many of you have asked about the Engine Installation on the Duster, so here's a progress report:

We got the engine installed, and the crop delivered the middle of July and had to make the choice of continuing work on the program or taking it as it was to the E.A.A. Convention at Oshkosh, Wisc.

We chose the latter, and towed it back there on the trailer. It caused quite a stir among the

airplane home builders, and there was lots of interest. I really think the powered sailplane is going to bring a lot of airplane pilots into Soaring. We are busy now finishing up instrumentation, muffler and exhaust, cowling etc. It ought to be flying about the time this issue of the Dust Rag goes to press, and the next issue should have a full story, pictures, etc.

Business is still brisk, the Duster interest still continues, we have Kits enroute to Hawaii and Australia. Our problems are not having a continuing supply of good spruce and leveling of prices with phase 6, 7 or whatever.

Best regards,

Jim Maupin and Norm Barnhart

DUSTER PRICES

Wheel package \$37.50 FOB. Includes wheel, brake, tire, tube, brake cable and grip.

RAW MATERIAL KIT: \$1595.00

Complete kit includes all the spruce, plywood, steel sheet and tubing, aluminum angle and tubing, uniball fittings, bronze bushing material, wheel, brake, formed fiberglass parts, acrylic sheet; all bolts, nuts, washers. Includes six, 1" x 6" spar blanks, tapered from 3/4" at root to 1/4" at tip. Wing attach steel sheered to 1 3/8" wide strips.

WOODWORKERS KIT: \$2495.00

Same as above, except all metal fittings are completely fabricated, machined, welded, and heat treated where required. All are cadmium plated, and ready to install. Includes all bolts, nuts and washers. Wood: all ribs and bulkheads are drawn full size on fir plywood as called out.

HARDWARE KIT: \$1395.00

Complete kit includes all metal fittings fabricated ready to install as in the Woodworker's Kit; wheel, brake, formed fiberglass parts, acrylic sheet, all bolts, nuts and washers. No wood.



HOW NOT TO MAKE A CANOPY !!

by Bob Walters

This article is called how not to make a canopy because it is intended to discourage you from trying. People have asked me to let them in on the secret of our success. We have developed many secrets, but not much success. Al Nelson and I got together on this project and have spent several hundred frustrating hours and several hundred dollars just to get a nice canopy. Here's how you too can fail.

Above: Al Nelson laying up mold

Start by deciding on a profile shape and make a canopy frame mock up out of plywood right on your fuselage. Put in at least one false canopy bow near the high point. Carefully shape the wood to define the shape you want, depending on desired headroom, etc. Now, fill in the plug with urathane foam. Fitting the foam is very, very difficult and will take several days. Al used 4 inch thick, 2 pound per cubic ft. density foam. There must be no gaps where it meets the wood. Don't try to get by using filler. The foam foam must be perfect. Now take your sur-form tool and sanding block and shape the foam to the desired contour. Here is where the "hacker" in Des Moines, Iowa will screw up first. Al is one of the two or three best known surf board shapers in the world. He has been shaping since the early 1950's and he says that the shaping of the foam plug is next to impossible for the average guy. One extra pass with the sandpaper will ruin the plug and you cannot, repeat cannot correct a dip with filler. After the plug was perfect, Al put on several layers of glass cloth. Now remove the plug from the fuselage and add several inches to the edges to form a skirt. Sand everything until it is optically perfect. This is the key to the whole thing and is beyond the ability of most people.

Next, coat the plug with PVA (Poly Vinyl Alcohol) mold release and lay up a female mold. Use cloth, followed by mat and/or woven roving to get 3/16" or more thickness. Re-inforce the edges with laminated wood clamping strips and glass them on securely. Now pop the mold off the plug and dress the inside with 600 wet/or dry sandpaper. Drill 3 or 10 1/16" air holes in the high point of the mold. Get some billiard felt and soak it in hot water and stretch it over the plug till it is dry and glue it inside the mold. Seal the edges with tape. This felt costs \$9.00 per yard. Get the picture on cost so far ? If you use cheap felt you get terrible mold mark off. Guess how we found out.....

Now, get every book your library has on acrylic forming and read it carefully. We built two ovens out of scrap wood and asbestos paper. One is tall and thin to hold the flat sheet vertically and the other is like a large dog house to hold the mold. Make a paper pattern and cut a sheet of .100 acrylic to fit the mold. Use a saber saw and special abrasive blade or a coping saw. This stuff is very expensive and cracks easily. Guess how we found out.....

Hang the flat sheet inside the tall oven using "C" clamps and clamping blocks on the edge

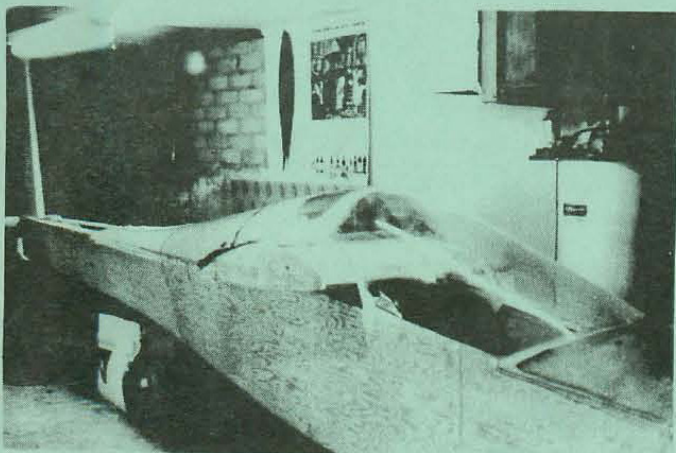
CANOPY continued.....

which will be trimmed off later. Weak clamping here will allow the sheet to fall as it gets hot. Guess how we found outin a basement of flaming plexiglass !

Put a 2 burner Coleman stove in the bottom of the oven and cover the burners with metal deflectors to keep the fire off the plastic. Make the oven so the gas tank is outside and keep a wet rag on it. The only thing we haven't done so far is blow up Al's basement.

Stick a probe type candy thermometer in the oven and heat the glass to "Soft Ball" or about 240 degrees f. Remove it using cotton gloves and quickly bend a simple curve in it and put it in the inverted mold. Clamp the edges using many "C" clamps and pressure strips inside and out while it is still hot. When it cools, unclamp it and seal the edges using high temperature masking tape. You will fail using regular tape because the adhesive gives up at about 250 degrees F. Guess how we found out..... We also found out that a perfect seal is mandatory so tape carefully. The high temperature tape is expensive but is good up to about 350 degrees F. Reapply the clamping strips and clamps over the tape seal. Turn the mold over and support it on blocks so that the two ends are at the same height so you can best trap the heat under it. Make some sort of plenum chamber over the air holes so that you can attach your vacuum cleaner to it. We used an old funnel. Now drop the dog house oven over the mold. The air connector should stick out the top. Cut a peep hole at each end and slip the stove under the edge. Make sure your heat deflector works well enough so that you don't burn the edges close to the stove. Guess how we found out.....

Heat the whole thing to about 250 degrees F and remove the oven to tighten the clamps while the plastic is hot. This is a very important step. Now set up the oven again. Turn on the stove and heat the oven to about 320 degrees F. If you have trouble getting this high, throw a couple of wool blankets over the oven. Keep pumping the gas tank and don't forget to keep it cool. The plastic should sag at about 270 degrees F. but don't worry. Turn on your vacuum cleaner at 315 degrees or 320 degrees and pull the plastic up to the mold surface. You should need only partial vacuum. At this point the edges will slip out from under the clamps and ruin the canopy if you don't use enough clamps. Guess how we found out..... When the plastic has stretched to fill the mold, turn off the heat. While holding partial vacuum, direct the vacuum cleaner exhaust into the oven to cool it. The thick mold will retain a lot of heat. Remove the ruined sheet of plastic and save it for laughs. Keep trying and ironing out details til you get a good one. Trim it and mount it without cracking the thing and you're all done.

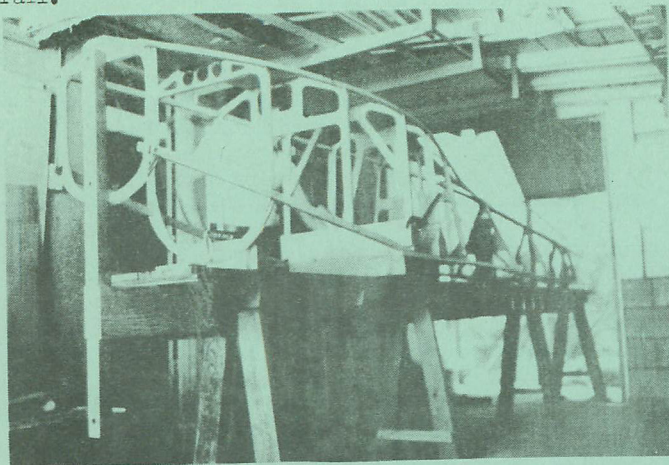


This whole thing sounds pretty easy but is by far the most difficult, expensive, and frustrating part of my sailplane. What happens if by some chance you do wind up with a canopy, but your plug was not optically perfect? Think about it !!

A fancy canopy won't do a thing for performance. It just looks pretty. This method will work but don't expect it to be easy. I would recommend that you make the stock canopy but hot-form it. Make a plug with a simple curve out of sheet metal. Heat your plastic to about 240 degrees and wrap

Y continued

it over the plug. You can use cheap felt at the lower temperature if you wish. This will give you a stock canopy shape but without the terrific stress buildup associated with cold-forming. It will only cost about \$7.00 extra for felt and asbestos paper, and should take only evening. Good luck and let me hear from you whether you succeed or fail.



BUILDING THE DUSTER FUSELAGE

by Jim Maupin

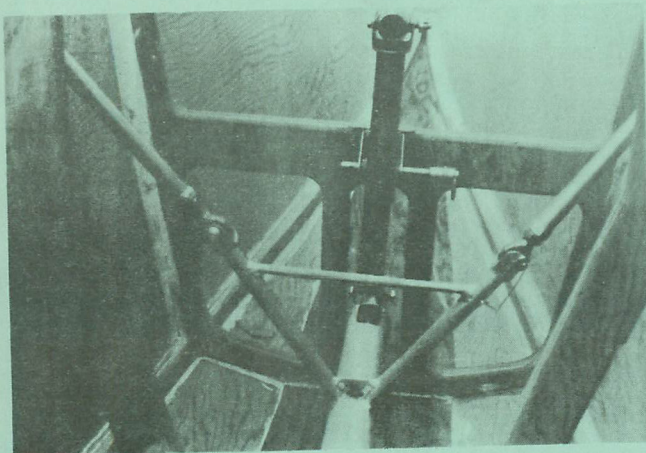
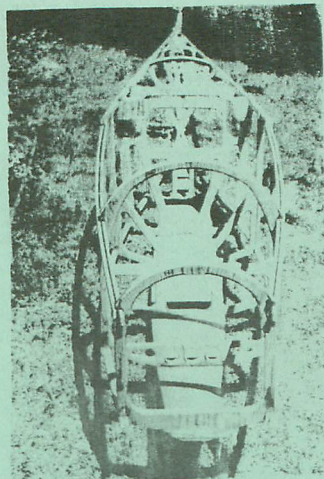
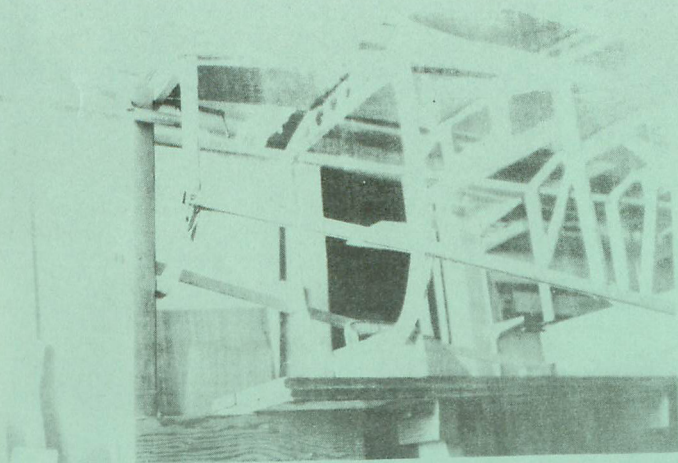
The first step in building the fuselage is to cut and shape the frames. The dimensions on the drawings are the largest side of each frame, and they are beveled a way from these dimensions. When cut out, the reinforcing cap strips should be glued on the 1/4" frames, and the curves on the inside can be made either with a router, or file and sandpaper. We found it easiest to make most of the outside bevel angles, by measuring the angle of each with a try-square, sometimes

called a T Bevel, on the drawings, then setting the table of the Disc sander to the angle measured, and sanding the frame to the desired angle. This will produce almost perfect angles, and any small corrections can be made with the frames in place on the table.

Next, mark the frame locations on the table, and block up each frame in place. They will have to be blocked up above the table. We did this by building the frame holders out of 1" x 3" pine bought at the local lumber yard. You have to make a brace for each frame in such a way that they will not interfere with the skins. ALIGNMENT IS CHECKED WITH FISHING STRING, STRECHED TOP TO BOTTOM ALONG THE FUSELAGE. Next clamp the top longerons in place to the fuselage, cut the bevel angle in those where they are spliced at the rear of the cockpit area, and glue up these straight, so that when you pull the curve into them, they will take a smooth bend the whole length. Shape the notches in each frame carefully with a file and sanding blocks, and glue both these longerons in place at once so the pull to bend them is equal on each side of your fuselage.

Now glue all 4 of the 3/8 x 3/4 lower longerons together to the point where they separate. Fit them to the notches carefully in each frame. Now glue these to the rear frames and tie the outer two up out of the way to the roof of your shop, and bend and glue the inside two in place to the fuselage. When they are set, bring the two outside halves into place and glue them to the first two. A lot of little clamps helps here, but lacking this, I wound a handfull of rubber bands around each one, and this will give a fine glue joint, although the cleanup of glue afterwards takes time.

Now, bend the 1/2" keel piece in place, and mark it from the inside at each frame. Draw the outline and saber saw it to approximate shape, clamp in place and finish it to approximate bevel cuts with a draw knife, plane, sure-form, file etc. Make sure the frame bevels fit nicely, and glue it in place.



FUSELAGE...continued.....

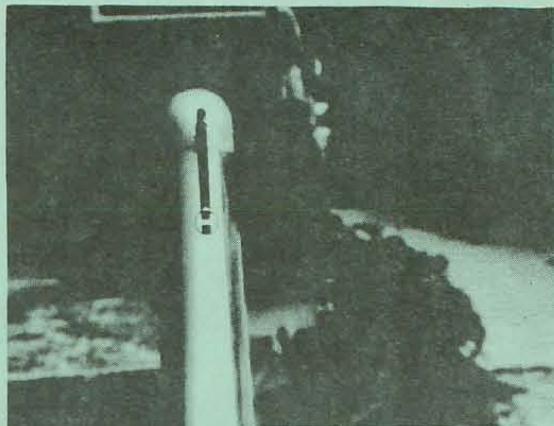
Finish the keel, frames, and longerons now, so that the skins will fit well everywhere and start skinning from the tail forward. We used 1/16" ply scraps and 9/16" stapler for fuselage skinning.

The only part where anyone found trouble was at station #72.125 Frank Savoie used the following idea and it worked like a breeze. He cut two 1 x 4 pine pieces to match Station # 72.125 from the outside, drilled two 1/16" holes through the skins on each side of the frame. Put a piece of baling

wire through and around the two 1 x 4s, put a stick in the wires and draw the skins together tourniquet fashion. It pulls the skins home for a perfect fit.

The only other point to pass along is to install the rear stabilizer bracket before the second skin is put on. Otherwise you have to cut quite a hole in one of the skins. I strongly recommend that you make up two simple racks to hold the fuselage up at a comfortable height at this point. You are going to spend quite a few hours bending over the fuselage working inside with intercostal bulkheads, seats, instrument panel, and controls. It sure helps to work at a convenient height. You can install the wheel and skid now, but there's no real hurry. You will roll the fuselage over several times more during sanding and finishing before you are through.





***** TOTAL ENERGY COMPENSATION *****

by Bob Walters

A number of readers are interested in how I beat the cost of a \$40.00 total energy venturi. The basic idea behind total energy is to take out stick thermals. In other words if you are cruising between thermals and feel a bump that might be lift you usually pull back and slow down, right ?? Without total energy you show a terrific rate of climb even if you have hit sink. Total energy allows you to evaluate lift during the pull up. This is done by connecting the static side of your vario to a low pressure source. This holds the vario flask at lower than ambient pressure. As you pull up the air normally flows out of the flask because of climbing into air of less pressure. It tends to do this with total energy also but because you also slow down during the pull up you lose some of the suction from the venturi. This gives the flask a tendency to suck in air because of the decreasing amount of suction. Now if everything works right these two tendencies cancel each other out and there is no air flow in or out of the flask. If the air mass is rising or sinking the glider will tend to rise or sink and this will effect the flow out of or into the flask. The vario will of course measure this flow and indicate lift or sink. Simple, huh ?

The problem is to get the right amount of suction. Engineers tell us that the formula to compute this magic suction has a $1/2 V^2$ in it. If you remember all those High School Physics energy formulas, they also have that $1/2 V^2$ in them someplace. So does the formula for airspeed calculations. It works out that the suction we want is equal to, but of opposite sign from pitot pressure. Hook up the venturi to the static side of your airspeed indicator and a pitot tube to the pitot side. Alternately place the venturi or pitot tube in a source of steady air flow and check the readings. They should read the same. While one is in the air flow the other should be subjected to static pressure. If you don't have access to the Berkely Wind Tunnel, try hanging them out of your car window. Rapid alternation of the venturi and pitot tube and multiple readings will take care of the wind and speed variations.

I made a copy of the Althaus type. It has a tube of just under 1/2 inch dia. with round studs of about 1/8" dia. to decrease the area. One stud is solid and the other has a hole to get the suction to the vario. They are mounted opposite each other about 40%

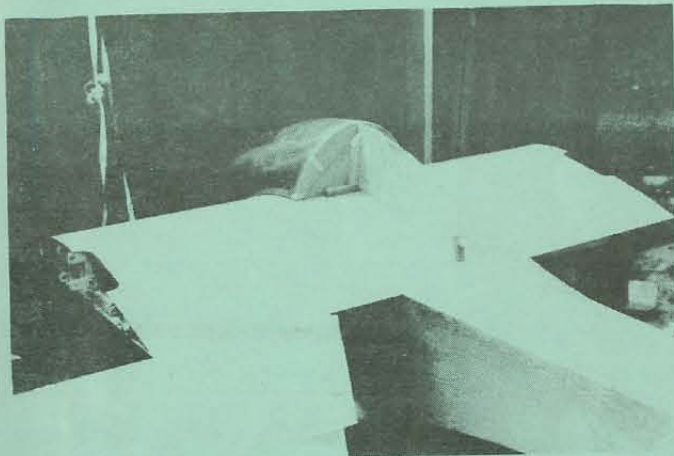
TOTAL ENERGY.....continued

back in the large tube. The large tube is about 1 3/4" long. Your hobby shop will have a selection of brass tubing which works great. I used soft solder but silver solder would be better. Adjust the distance between the two studs to get the desired suction. Be sure to keep all edges sharp and square. I made a fin mount with a pitot tube mounted above. Look at other sailplanes and ask the 1-26 drivers how they make them. Most glass ship pilots buy them, but a large number of us poor folk have built ventures and they work.

MOULDING THE TURTLE DECK

by

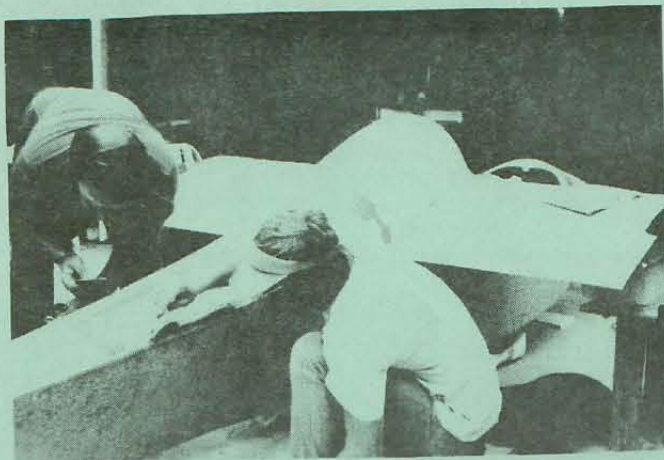
Bob Walters



Since Al Nelson and I will not have stock canopies we built special turtle decks. Start by fitting plywood mock ups on the fuselage to define the shape you want. Fill in between the plywood formers with 4" urathane foam using the same method used for the canopy plug. The fit is not as important because it need not be optically perfect, but any gaps that are filled later will still cause headaches. Take time to fit the foam ell. Glue it in place and sand it to the desired shape. I again called Al in for the final shaving at the cost of several dinners and several cases of beer. Take your time to get a nice shape. Don't put on the wing fillets yet. Now cover the plug with a layer of glass cloth. You can make the wing fillets out of foam or micro balloon filler. Fit them in place and make sure you have a nice transition from wing to turtle deck. At this point, hot coat the whole thing with glossing resin and sand to a nice finish. Correct any dips or bumps with filler and coat the plug with FVA mold release. Don't be tempted to fall for the Johnson's Paste Wax hoax. Now lay up several layers of glass cloth using laminating resin. I used 4 layers of 6 oz. cloth but you could get away with three layers I think. When it is cured, hot coat it to fill the weave and sand while it is still on the plug. Pop



Al "the hacker" Nelson shapes turtledeck



TURTLEDECK continued.....

the turtledeck off the plug and remove the plug from the fuselage. Try to save the plug. You may trim the turtle deck to fit your fuselage and either screw and tape it on or glass it on. I elected to make it permanent by glassing it on my wing and fuselage. If I ever have to remove my wing centersection I can cut the turtle deck at the wing trailing edge. If you want to fly open cockpit you may want to make it more easily removable.



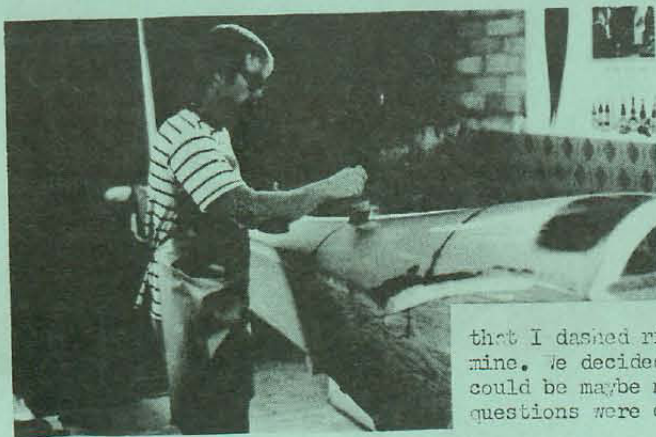
Making a turtledeck in this way takes more time but you can improve the lines of the Duster quite a bit. You can use this technique whether you use the stock canopy or a compound curve molded one.

LETTERS TO THE EDITOR.....

Aug. 17, 1973

Dear Bob,

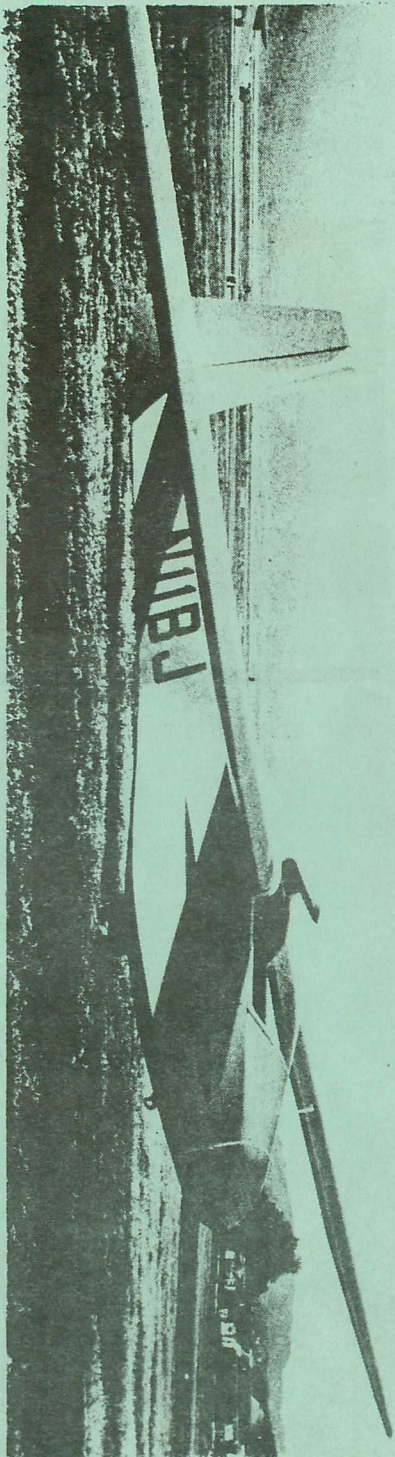
For the benefit of those who are buying parts, hardware, etc. for their construction project, the Rodend RE3M6, which ordinarily in the \$2 to \$3 bracket, are being unloaded by Stits Aircraft Covering at the low price of 30 cents each. Since eleven of these jewels are called for in the plans this could provide quite a saving.



I met Norm at the EAA convention at Oshkosh and saw the engine pod mounted in place. Also, while in Idaho last week, I visited with John Sinclair and saw his Duster. He estimated another two weeks before flight and it looks fabulous. It fired me up so much that I dashed right home and got to work again on mine. We decided that first Duster get together could be maybe next summer. A number of cloudy questions were cleared up during that visit.

Frank Mc Donald

9. 1401 Brentwood St., Ft. Collins, Co. 80521



SUBSCRIPTION EXTENDED

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THE DUST RAG

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