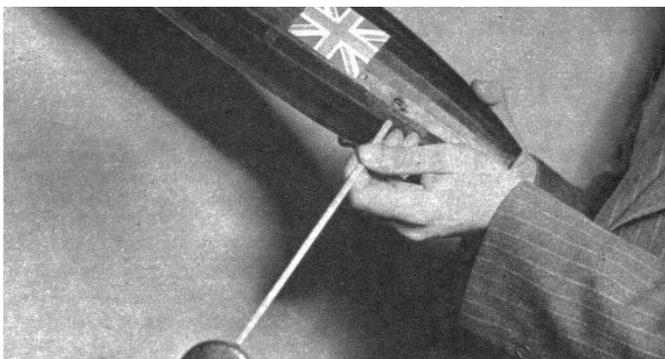




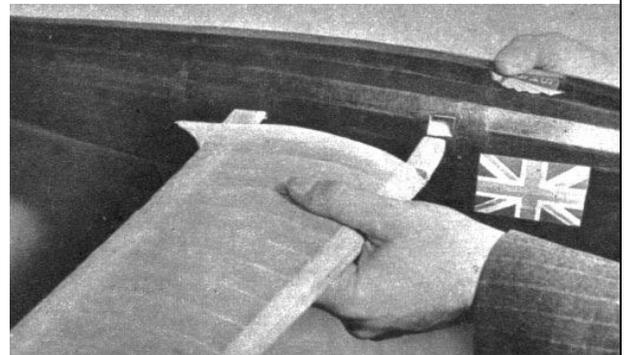
An ultra streamliner that set an international mark of 33:09 to win the King Peter Cup.

BY ROBERT COPLAND

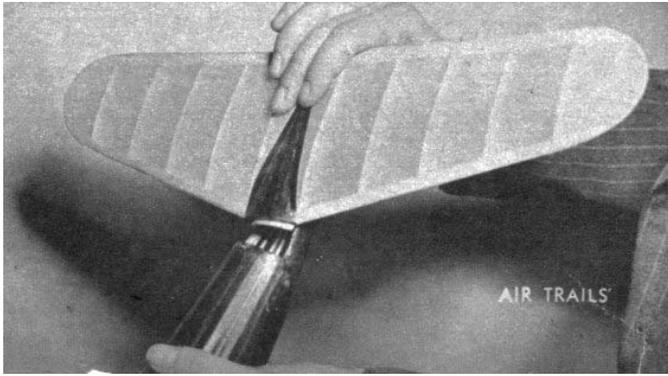
DRAWINGS BY PAUL PLECAN



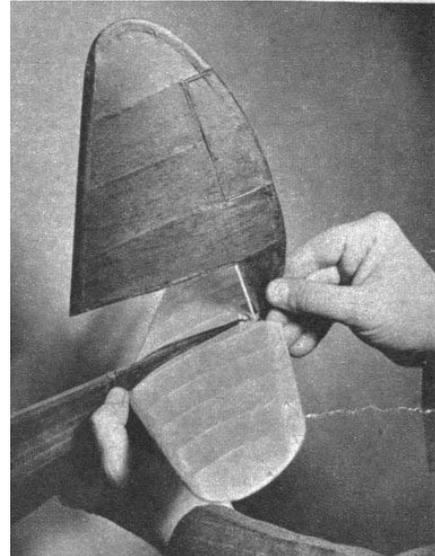
A one-quarter-scale side view.



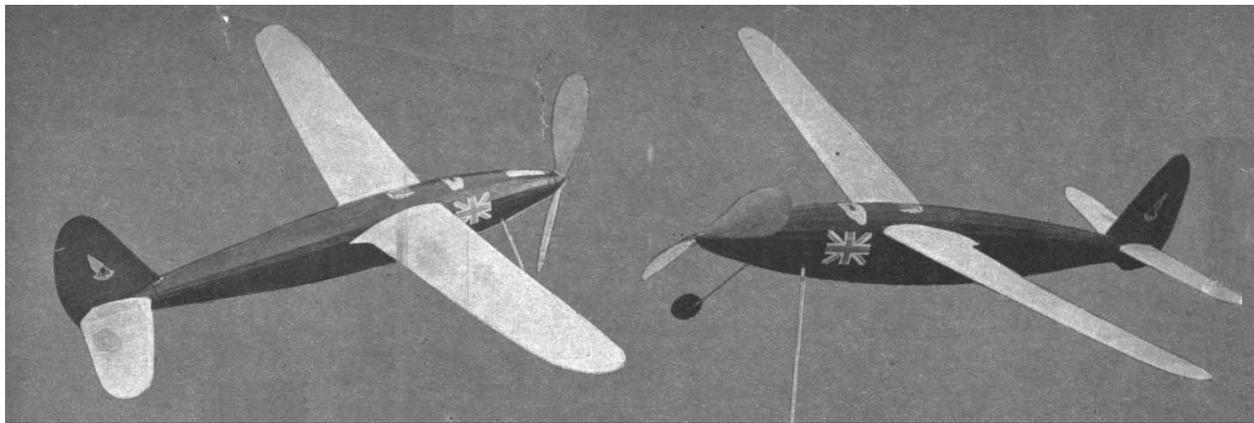
Butt ends of wing spars fit into sheet balsa boxes in the fuselage.



Stabilizer fits into last bulkhead; held down by detachable rudder.



Detachabale rudder fits into tubular stern post.



From spinner to tail fuselage is one unbroken streamline. Wings are carefully faired into fuselage.

Robert Copland has been hot on the trail of the Wakefield Trophy for the past five years. He's come close but has never finished in No. 1 position. In view of his record in other contests it seems remarkable, that he hasn't won it. He placed third at the 1936 Wakefield in Detroit. While in America that year he flew in our national contest and placed a good second in the Stout Outdoor Fuselage with 20:07. Back home in England that same year he won the 1936 British Cup Competition. The Pilcher and the Weston Cups were gathered into the Copland collection during the 1937 English campaign. In 1938 he set an international record for rubber-powered cabin fuselage with 33:09 at the King Peter Cup Competition in Yugoslavia. (This record stood until Korda's 1939 Wakefield flight.) Last summer he was fourth in the 1939 Wakefield finals at Bendix, New Jersey.

His outstanding work has been done with rubber-powered fuselage jobs. But he's also one of England's best indoor builders. His flights of over 18 minutes for hand-launched stick models are listed on the official English records.

Americans have come to regard Copland as a permanent member of the English Wakefield team. He was a member in 1936 and 1939 -- the two times the English have visited us for the finals. He takes his contest flying

seriously and works about the hardest of any contestant we've seen. When his model got off on a long flight at the last Wakefield contest, he didn't wait for help but dug in and did the roadwork himself in mighty fast fashion -- which is the acid test of one's model enthusiasm. Watching him in action gives the impression that sooner or later the Wakefield Trophy will some day bear his name.

The British Champ is the design that set the 33:09 international record mentioned previously, and that took fourth in the 1939 Wakefield. This ship was favored to win the Wakefield and had averaged well over, four minutes on all of its test flights, made the night before. That it did not place higher was due principally to the extreme heat conditions with which foreign contenders had no previous experience.

Having seen this job perform at Bendix, we wonder just what it would do with an American high-powered rubber motor. (Due to scarcity of thermals at English contests, the boys over there find low-powered, long-running motors to be best.) -- Gordon S. Light.

CONSTRUCTION

THE wing has to be constructed first, as it is used to place the wing mount channels in position. All the wing ribs are given full size, and both sets should be cemented to a sheet of stiff bristol board. After two of the # 1 ribs have been cut from 1/16" sheet, the template should be trimmed down with scissors or a razor to the next smaller size. Two ribs of each size (#2 to #21) are needed, and all should be cut from 1/20" medium balsa sheet. The wing tip is given full size, and should be cut from medium-hard 1/8" sheet. The leading and trailing edges should both be tapered to the sizes indicated on the plans, and it is a good idea to trim the trailing edge to the approximate finished cross section, as it is harder to trim it once it has been cemented in place. In assembling the wing panels, the leading edge should be raised off the work bench by inserting scrap bits of 1/32" sheet balsa at regular intervals along the length of the leading edge.

The trailing edge should be propped up with 1/16" scrap balsa placed under the front portion to keep it at an angle to the work bench while the ribs are being cemented in place. After all the ribs have been cemented in place, the wing panels should be left aside to let the cement dry completely, as the wings might warp if they are removed from the workbench before the cement has had a chance to dry. The trimming of the butt ends of the leading and trailing edges is shown on the plans, and should be done with accuracy and care. Both the leading and trailing edges are trimmed on the bottom to obtain 4" dihedral when the wing rests flat on the bench on the

portions that have been trimmed. Two channels, 4" long, are now made of hard 1/16" sheet. The inside dimensions of the leading edge channel are 9/16 x 5/8"; trailing edge channel, 3/16 x 7/8". Both channels should be wrapped with silk or bamboo paper, with an extra coat of cement applied over it. When trimming the butt ends of the wing, make sure that the wings fit snugly into the channels.

Fuselage. Draw a center line on a strip of paper 36" long, or directly on the workbench. Mark off the correct spacing between the bulkheads, and draw in the widths, which can be taken directly from the full-size bulkhead outlines. Cut the correct amount of each bulkhead (four in most cases) and cement two of each size together. Use hard 1/16" balsa for the bulkheads as they are narrow and would be slightly on the weak side if light balsa were used. Cut out only two #9 bulkheads of the narrow type, as the upper portion of #9 is different from the rest of the bulkheads. Each bulkhead is made up of upper and lower portions, each portion 1/8" thick, due to the fact that it is laminated from two 1/16" thick bulkheads. Since only the bottom half of the fuselage is built first, do not cement the entire bulkheads together. Pin all of the bulkheads in place, propping each one up with scrap 1/20" sheet. The proper steps in constructing the fuselage are shown under the side view of the fuselage. The top and side longerons are the first ones to be cemented in place, followed by a longeron between each side and top longeron. Remember that all longerons are cemented over all bulkheads except #1 and #16. On #1 and #16, the longerons are butt-

cemented against the bulkheads, the outside edge of each longeron being flush with the outside edge of the bulkheads.

In Step 2, the remaining longerons are cemented in place, two between the longerons already in place. Complete the tail end of the fuselage behind #16, and let the cement dry thoroughly before removing the lower half of the fuselage from the workbench. After removing the lower half from the bench, turn it upright and proceed to add the upper halves of each bulkhead. A typical bulkhead should now appear the same as Step 3. The longerons on the upper half of the fuselage are spaced the same way as those on the bottom, so repeat the procedure used in spacing the lower longerons. The nose and tail ends should now be filled in with scrap 3/32" balsa to provide surfaces to be gripped when the motor is being wound. The rear wing channel should be cemented in place in the space allowed in the cut-outs on pieces "T" that are cemented to the rear of bulkhead #9.

After the cement has dried, slide one of the wing panels on. Insert the front channel over the wing leading edge, and then insert the other wing panel into place in both channels. The bottom of the front channel should be 1-3/16" above the fuselage center line, and if it is, fill-in pieces should be cemented around it on both sides of the fuselage. If the front channel is too high, remove both wing panels, and correct the position of the "T" pieces by cutting them away and recementing them in place again, at an angle more parallel to the thrust line. Fill in the areas around the channels, trim the channels off near the fuselage, and sandpaper them flush with the fill-in portion. The landing gear struts are made of bamboo, and are of streamlined cross section, to keep them from revolving in the paper tubes into which they slide. Four layers of brown wrapping paper makeup the tubes. They are made right on each strut, cement being applied between each layer of paper for stiffness and strength.

The tubes are cemented to bulkhead #4 at the top, and are separated from the bulkhead with 3/16" thick blocks at their lower ends. As shown in the sketches, triangular gussets are cemented to the tubes at the upper and lower ends to take up landing shocks. A small area around the tubes should be filled in to provide extra strength. In the sketch of the tail end of the fuselage under the side view, note that there are hard balsa slabs cemented to the inside of the fuselage where the 3/16" dowel passes through, as this portion must be rigid to take up twisting strains and the

forward pull of the motor.

We used a rod of some plastic material like celluloid to anchor the rear end of the motor, but a wooden dowel will do, besides being more readily available. The 1/8 x 1/4" strips on the rear of the fuselage should be cemented in place now, followed by piece R-10, the top of which, should be flush with the top of the 1/8 x 1/4" strips. Cement R-9 in place now, and cut out a # 1 bulkhead from 1/32" plywood, which is also cemented in position. The fuselage is now covered with small squares of tissue, with the grain in the tissue running around the fuselage instead of parallel to the longerons, as commonly applied. Use small squares of tissue, about 4 x 4" on the front of the fuselage, as the curves are too sharp to allow covering with larger sheets. Larger sheets can be used near the tail (#12 to #16) as that portion of the fuselage is nearly flat, and almost half of the fuselage side can be covered with one piece. If your technique "isn't so hot," use small sheets throughout, as much neater results can be obtained that way.

Landing Gear. A full-size wheel detail is given for those who wish to duplicate the original "hubless" wheels. Procedure is simple. The disks #1 and #2 are cemented together first, followed by the insertion of the short tube, which is cemented and recemented to #1 and #2 until there isn't any more room left for more cement. The wire axle is inserted now, and a small metal piece "X" is soldered on. Disk #3 is hollowed out slightly in the center to allow space for the axle and piece "X." The wheel is now sanded to shape and doped with several coats of clear dope. The axle is now cemented to the bamboo strut, bound with thread, and cemented over again with another coat. The bamboo struts should slide into place snugly enough to make sure that they do not drop out in flight, as that is not allowed in contests, whether it is intentional or not. A few coats of dope will make the struts a snug fit if they are loose.

Stabilizer. The stabilizer is of ordinary construction, except for the fact that, like the wing, heavy leading and trailing edges replace spars. The small former "S" fits under bulkhead #16 when the stabilizer is in place, and "S-2" is of the same shape and height as #16. Small stringers are used to fair in the top of the stabilizer with the fuselage, but they should be added only after the stabilizer has been covered. While we are on the subject of covering, a few hints on the wing covering should be timely. The wing has an intentional warp in both panels, and by covering the wing with the grain of the tissue running

chordwise, the warp as used in the original model can be duplicated. When the tissue has been applied and sprayed, the panels are laid down flat on the bench and weighted down with small objects, such as an ink bottle, pliers, or anything that does not weigh more than about eight ounces. The entire leading edge should be resting on the bench, but the wing-tip portion of the trailing edge should be propped up 1/8" near ribs 18 or 19. The center section of the trailing edge should be touching the bench the same as the leading edge.

After the tissue is dry, the wing should be removed and doped on the undersurfaced part, this being done with a 3/8" wide brush for speed. The wing should be weighed down the same as before, and the upper surface doped. After a long period of drying, the wing should be removed to check up on the warp. Whether it is warped or not, the above doping procedure should be followed with two more coats. After the last coat, the panels should be left in the weighed-down position overnight to make sure that the warp doesn't fade away after the wing has been removed from the bench. If you are not successful in obtaining a warp in the wings, do not worry about it, as the model flies slowly under power. You need not worry about a stall under the initial burst of power, as a little right thrust will correct that. The purpose of the warp is to decrease the drag of the wing tips while gliding, as the wing is always at an angle to the airflow.

Rudder. All curved parts and ribs are given full size. Note how the hinges are made. The best material for hinges is aluminum, as it bends easy and is light. It is important that the ends of the hinges be twisted, as the trimming tab may slide off the hinges if they are left straight. Ordinary cement does not hold onto aluminum very well, as there are no large pores for the liquid to seep into and get a grip on.

Propeller. The propeller is carved in the usual manner, using the layout on the plans. The undercambered portion of the prop blade need not be carved

away excessively, as the original had but 3/32" undercamber. After covering with silk and doping, two small blocks on each side of the prop should be carved into a spinner, the rear of which is hollow to contain the free-wheeling unit. A full-size cross section detail is given, so all shaft and freewheeler parts can be bent to shape directly over the drawing. The front of the shaft is bent to shape first, starting with the winding loop. A small brass washer is soldered on the shaft behind the loop. Before sliding the prop into place, a tube should be inserted through it or bushings used to insure smooth rotation when the prop is freewheeling. The wire piece "U" is soldered in place next, after the prop has been slipped into place. After piece "L" is in place, twist the shaft clockwise (looking from the rear) to see if you can make "L" and "U" lock, as it should be under power.

Bend the front end of "L" over now to keep it from slipping off while you worry about the rest of the model. A ball-bearing washer is used behind "U," behind which the nose plug belongs. The nose plug is made from very hard balsa cemented together and also clamped with a threaded bushing. A bobbin slipped in place before completing the hook at the rear end of the shaft completes the prop assembly. For those who have been wondering why, the bobbin is used to keep the motor from bunching up on the shaft, an evil quite prevalent when the plain type of hook was used. Since the wing cannot be shifted forward or backward in adjusting, a weight which can be moved at will is attached to shift the center of gravity a wee bit for perfect adjustments. A sketch accompanying this article should help to clear up the idea. The climb should be long and gradual and the glide flat. On the original model, the fourteen strands of 1/4 x 1/30" rubber kept the prop spinning for 1-1/2 minutes, after which the model glided for 2-1/2 minutes, producing an average flight of approximately 4 minutes' duration. The maximum number of turns is 1,200, under ideal conditions.

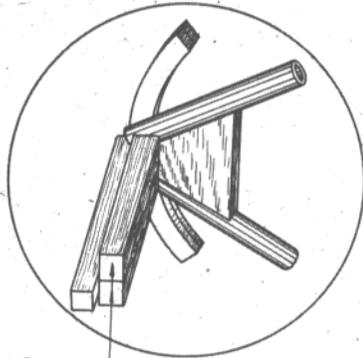
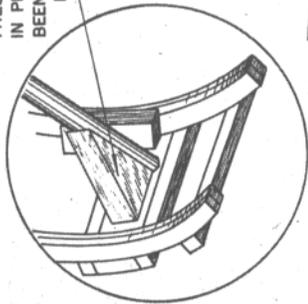
BILL OF MATERIALS

(Balsa, unless otherwise specified)

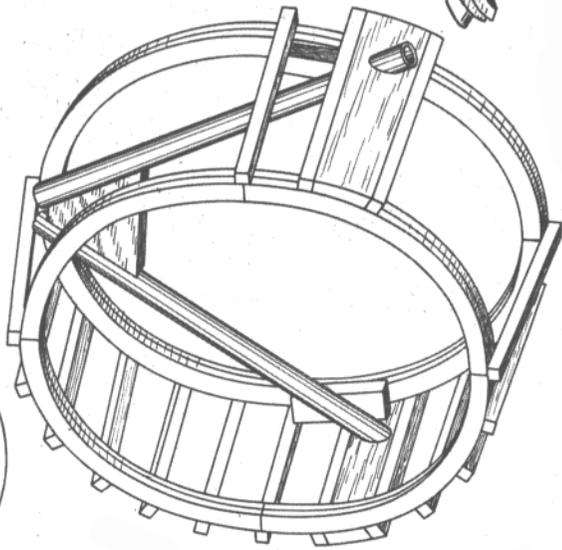
2 pcs.	1/16 x 3 x 36" hard balsa	bulkheads, wing channels
1 pc.	1/32 x 2 x 2" plywood	former #1. (1/20" plywood will do.)
24 pcs.	3/32" sq. x 36" medium balsa	longerons
2 pcs.	3/32 x 1/2 x 36" soft balsa	fill-in material
1 pc.	3/32 x 7/16 x 18",	stabilizer trailing edge
2 pcs.	1/8 x 1/4 x 11-1/4" bamboo	landing gear struts
1 pc.	1-3/4 x 2 x 18" medium-hard balsa	prop block
4-2/3 ft.	1/4 X 1/30" brown rubber	
3 pcs.	1/20 x 3 x 36",	wing, stabilizer and rudder ribs
1 pc.	1/4 x 5/16 x 18"	stabilizer leading edge
1 pc.	1/16" sq. or round bamboo, 18" long	stabilizer tips
1 pc.	1/4 x 3/8 x 7"	rubber leading edge
1 pc.	1/4 x 5/8 x 6"	rudder base rib
2 pcs.	1/32 x 3/16 x 1-1/2" aluminum or brass	rudder binges
1 pc.	3/32" diam. bamboo or dowel	rudder spar
1 pc.	1/8 x 2 x 6", medium-hard balsa	wing tips
2 pcs.	3/16 x 7/8 x 22"	wing trailing edges
2 pcs.	9/16 x 5/8 x 22"	leading edges
1 pc.	3/16" diam. x 2" long dowel	rear motor plug
4 pcs.	1/16 x 2 x 2"	disks #1 and #3 on wheels
2 pcs.	1/8 x 2 x 2"	disk # 2 on wheels
1 length	1/16" diam. spring steel wire	prop shaft
1 length	.040" diam. spring steel wire	"U" and "L" fittings, wheel axles
1	bobbin	
1	ballbearing washer	
1	threaded bushing	
3 sheets	colored tissue	
2	bushings for prop (or 1/16" inside diameter tubing)	
2" length	tubing	to fit over axles and fitting "L"

*Scanned from April 1940
Air Trails*

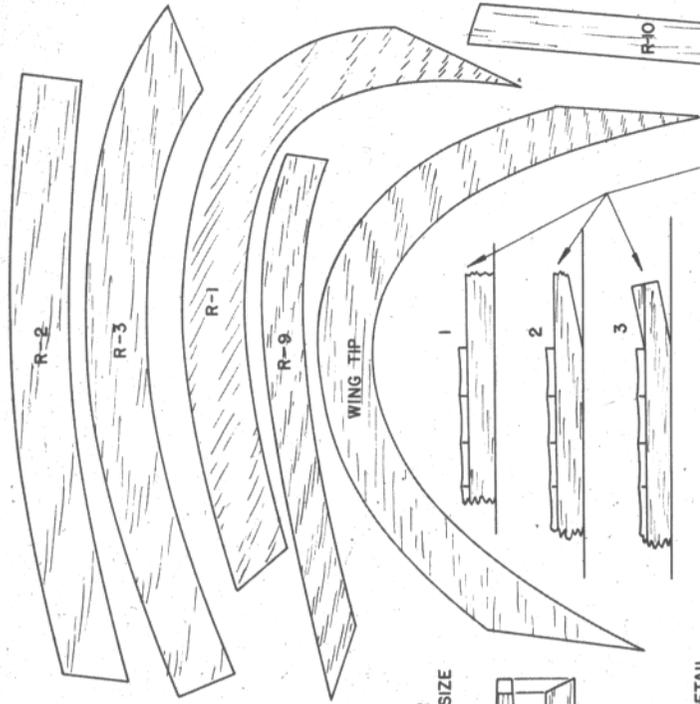
THESE BRACES ARE CEMENTED IN PLACE AFTER TUBES HAVE BEEN MOUNTED AS SHOWN DIRECTLY BELOW



LANDING GEAR TUBE ASSEMBLY DETAILS



DETAIL OF ASSEMBLED PROP SHAFT

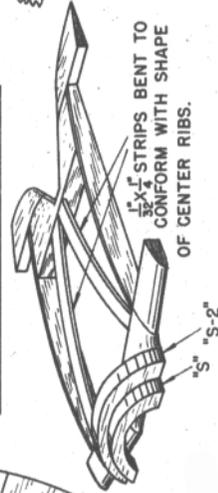


WING TIP AND RUDDER PARTS ALL GIVEN FULL SIZE



R-4

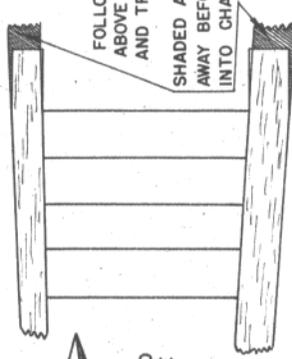
STABILIZER CENTER SECTION DETAIL



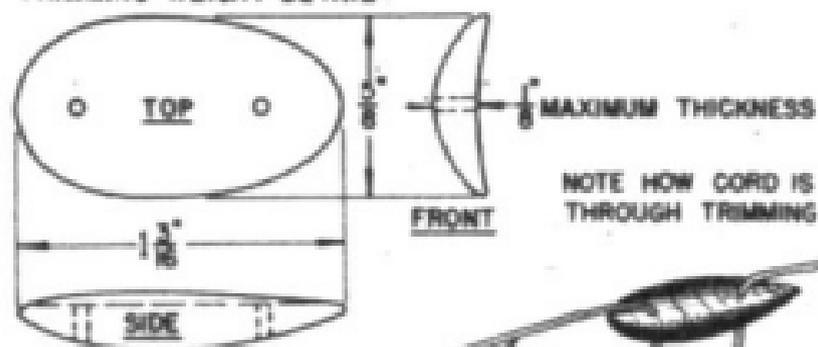
$\frac{1}{4} \times \frac{1}{4}$ STRIPS BENT TO CONFORM WITH SHAPE OF CENTER RIBS.

"S" "S-2"

FOLLOW STEPS SHOWN ABOVE IN TRIMMING LEADING AND TRAILING EDGES. SHADED AREAS ARE TRIMMED AWAY BEFORE TRYING TO FIT WING INTO CHANNELS ON FUSELAGE.



TRIMMING WEIGHT DETAIL



FISH LINE OR TOUGH CORD

FASTEN END OF RUBBER BAND TO BULKHEAD ID

RUBBER BANDS STRETCHED BETWEEN THESE HOOKS KEEP REAR OF RUDDER ANCHORED DOWN FIRMLY

DRESS SNAPS CEMENTED TO RUDDER AND FUSELAGE

TO MOVE TRIMMING WEIGHT, STRETCH RUBBER BAND, MOVE WEIGHT AND RELEASE RUBBER BAND. WEIGHT CLINGS TO BOTTOM OF FUSELAGE DUE TO THE TENSION IN THE RUBBER BAND.

