We didn't dare to have Carl stand up or he would have gone right out through the top of the page and nothing would be seen of his compact and efficient scourge of the combat skies.

Super Twister

By CARL BERRYMAN

Have you the itch to be the best possible streamer chopper? If so, then build this exciting and efficient new Combat ship by the country's tallest and best of the Combat streamer choppers.

Roger Greene helping Carl get ready for one of his rip-snorting flights. Combat, as it is flown by our author, is reduced to the very basic chop or be chopped and he seldom loses.

I know that most of the U-control flyers have heard the free-flight boys make the statement: *"Anything* will fly if you put lines on it and whip hard enough." In a sense they are right. A rock on the end of a string shows this. *But,* to perform the job properly, even a combat job must obey the laws of aerodynamics. Fellas—here are the facts. The airfoil must be efficient at all speeds and not create too much drag at maximum lift. If you have a high drag-lift coefficient, the plane will slow excessively in turns. Also, the wing loading must not be too high. If it is, the model will not turn quickly and smoothly. I find that 1 oz. per 15 to 20 sq. in. loading works very well with a good airfoil.

The line rake must be just right so the plane will not wobble or come in on the lines. The stabilator movement must be just enough to get maximum turn from the wing at a given CG location, or else the wing or stabilator will stall and slow the plane. Preferably the stabilator should have an airfoil similar to the wing; they work together better if it does. All of the laws of aerodynamics must be obeyed in order to get a good performing u-control plane. And, as we put all these things together, we strive for an eye-catching appeal also. I was thinking of appearance *and* performance when I designed this plane. The semi-elliptical configuration gives this plane a nice look and yet all the little forces inside work together to give a good performance. The airfoil is graduated from 18% center to 20% at the tips to prevent tip stall and wobbling around in maneuvers. The wing is of equal length inside and outside to give a flat turn so as not to lose lift. The Super Twister goes together easy, looks good, flies well.

This model should be built from medium hard balsa. I don't recommend soft balsa. This plane comes out pretty light, anyway.

First, cut out all rib templates.

Probably the easiest way to keep everything lined up is to put the top view of plans on building board and wax paper over the plans.

Cut the trailing edge pieces to shape shown and glue together and pin on plan.

Pin the center bottom spar to plan. Pins required only to #4 rib location.

Cut out all ribs to conform to shape of templates; check to see that they will slip on the spar and still line up at the trailing edge. You may have to move lower trailing edge to line up properly with notches in ribs.

Now glue the #1 ribs in place and pin down. Slip a piece of motor mount between front end of ribs to make sure it will be a snug fit for the motor mount block which will be installed later. Position and glue

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ribs #2, 3 & 4 on both sides of wing and let dry.

While glue is drying, the top spar can be glued in place. Make sure ends are even with lower spar ends. Also, cut and glue in place the short center spar brace.

If you are going to use a metal tank, install it now. A Veco tank will fit snugly between spars. I like to run a 3 or 3½ oz. Veco tank as you get a better run from a smaller capacity tank; but a 4 oz. will fit between the planking okay. If you like to modify a tank, do so before installing; if not, install stock tank. If you want to run pressure, I would recommend a modified tank. Here is my favorite method for modifying a metal tank:

You will need a soldering gun or iron to modify a tank. Just warm the filler and vent lines and pull them out. Warm the front (it is easier over an open flame) and remove tank front and fuel pickup line. Use the hole in top of tank or punch new one with ice pick, for fuel pickup line to go through. If tank has baffle, use ice pick to punch hole for fuel pickup line to pass through baffle to reach rear of tank at the center of the "V" side. Run fuel pickup line through hole in top and on back through hole in baffle and bend the end toward front of tank. Check to make sure fuel pickup line is at rear of tank on "V" side. Solder line to top of tank. Now solder front on tank and seal hole with solder. Also seal bottom vent hole with solder. Now take a piece of soft copper tubing the same size as vent lines and bend to a round 90° angle. Insert one end just inside top of tank and solder well. Point open end toward front of tank. This tank will also run well without case pressure.

When cool, check for leaks by plugging fuel line with a piece of flexible tubing which has a small screw inserted in one end. Hook another piece of tubing to pressure line and blow in this line while holding tank immersed in water. If leak is present, bubbles will appear and this spot must be resoldered. Now you have a custom tank the same as pros use.

Slip tank into position between spars. Block in around back and front of tank with scrap balsa; also top and bottom of tank with scrap balsa sheet.

Now cut and install motor mount block. Glue well to ribs. Put glue in leading edge slots in ribs 1 through 4 and fit first ¼ sq. leading edge in place. Check to see that it is seated in slots. Now glue second leading edge piece in on the angle side. Glue only as far out as #4 rib. Do not bend curve in at this time.

Block lower spar ½" high on each end. Glue and pin ribs 5 & 6 in place.

Now pull top spar down to lower spar and glue and clamp at end.

Cut out the cradles shown on plan and insert in place under lower trailing edge. Bevel trailing edge pieces with sand paper so they fit together better at tips and glue and pin top trailing edge in place. Make sure trailing edge is on cradles and cradles are on building board.

This wing will have no warps if you check this carefully now and while glue is drying.

Cut out half-ribs and glue in place. Using a wet cloth, thoroughly moisten ¼ sq. leading edge pieces from #4 rib to tips. Bend first leading edge piece around in curve until it touches top and bottom spars. Sand the square edge off for a better fit and glue and pin and glue to ribs also. After glue has dried a while you can also pull angled leading edge around and glue and pin to first leading edge piece.

While everything is drying, you can cut out the booms, stabilator and bellcrank mount. Cut the motor mounts to shape. Also cut pod pieces and glue together. Carve and sand stabilator to airfoil shape.

Modify the bellcrank by cutting off the pushrod end just outside of the hole measuring ½ to ⅝ in. from center. Drill hole in bellcrank platform so that pushrod end will just barely clear center rib #1. This will give plenty of movement and yet will not let you over control plane. Install leadout cables. Wrap with fine wire and solder well.

Bend pushrod end to 90° angle and insert through bellcrank from bottom. Do not bend back end of wire at this time. Bolt bellcrank to platform, making sure the space is enough to clear pushrod underneath bellcrank. Glue bellcrank platform in place on top of lower spar. Glue in rear platform support also.

Now lay the leadout wires on top of wing and line them up with leadout guides on plan. Pull wires taut. Make each rib directly underneath wire. Use ¼ in. drill bit and drill leadout wire holes in center of each rib at marks. Now take ⅛ in. drill bit and drill leadout guide holes in tip. Glue and install leadout guides and

run leadouts out through holes and guides. Put bellcrank in neutral and bend leadout ends, wrap with fine wire and solder well.

Glue on the top motor mount and plank entire top center section. Start at rear of motor mount and let second sheet lap over trailing edge. Less cutting and shaping that way; same way on leading edge; saves time.

Drill 1/16" holes in booms as shown on plans and notch stabilator for hinge wire. Slip wires into booms and glue linen to one side of stabilator, then lap over wire and glue other side well. Glue hinge wire also.

If glue is reasonably dry on wing, remove from building board. Remove clamps and pins. Check from rear to front to see if there are any warps. If so, bend wing slightly to remove warps. Glue in the short lower spar brace.

Now double glue bottom of bellcrank platform also the nut and bolt end. Glue on lower motor mount. Use plenty of glue. Plank lower center section.

Sand entire wing smooth. Radius the leading edge about 1/8" and round the tips. If ribs are above spars, sand level, keeping the airfoil shape. Cover wing with your favorite covering material; also cover center section, as this adds greatly to the strength of the structure. I prefer silk for strength-to-weight ratio. Covering with colored silk makes an attractive model and also a lighter ship. Put one coat of dope on entire wing. Mount engine as shown and drill for blind mounting nuts. Hollow pod to clear crankcase and glue in place. When dry, shape and cover with silk or nylon. Glue and double glue stabilator booms and slip in place on center section. Glue a piece of linen top and bottom where control horn bolts onto stabilator. This keeps control horn from breaking out in a straight-in landing. Now cut out control horn or use a commercial horn. A horn with ½" to ¾" height works best. Put bellcrank in neutral and stabilator in neutral and bend pushrod to go through horn. If it is not in neutral, move control horn forward or backward to correct and then bolt and glue firmly. Now give booms and stabilator one coat of dope.

Put on about four or five coats of dope to seal silk and center section so fuel will not seep through and then trim with color dope. A word of caution—color dope adds weight, so use sparingly.

Whether you are a sport flyer or a competition flyer makes no difference. I think this plane will serve both categories well. It is different enough to draw attention and yet it is aerodynamically sound so it will also put in a good flight also.

I think when the crowd gathers and asks "What's that?", you can proudly say "Super Twister."