PHOTOS BY AUTHOR

»» TIPORARE ««

By DICK HANSON . . . Currently the hottest pattern ship, the "Tipo" is being flown by many of the top competition fliers, including National champ and FAI Team member, Dave Brown. Build one, it's the best.

• Just exactly what is a Tiporare? If you are an active pattern flier you probably already know the answer: it's a Curare with a nose job, silicone shots and a fanny tuck.

We watched the championships at Ohio a few years ago and were particularly impressed with Hanno Prettner's plane, as well as his flying. Dave Brown was also impressed with what he saw and it wasn't long before little stacks of balsa and styrofoam were shuttling between his home and mine. When finished, I had a reasonably close example of a Curare.

We have built many pattern planes in the last five or six years . . . perhaps 150 or more. Big ones, little ones, bipes, .40 size, built-up wings, foam wings, etc., etc. But we really haven't come up with a bird that was as easy to fly correctly as the Curare.

Several more were built with various changes to see what would happen. Among these changes were side mounted engines with tuned pipes, decreased stab angle (cathedral), long ailerons, altered engine thrust lines, C.G. shifts, coupled flaps (Dave Brown and Tony Frackowiak both liked the coupled flaps, and I admit that the corners on the square eights were very crisp on Tony's plane when I flew it), landing gear relocation, thicker stab, and an old trick to artifically increase effective lateral area, a tuck down each side of the fuselage.

The plane as we show it here is our favorite arrangement of this design and is very easy to set up for Novice or Masters class flying, using any solid running side exhaust engine with a pipe. We feel you do not need or want the Tipo to fly at very high speeds. We have seen numerous pattern contests where good fliers have lost points simply because their planes flew so fast that the ballistic shot rolls and oversized loops and eights failed to impress the judges who were there to judge precision flying, not a one-man pylon race!

We have a few suggestions which should help you get the best results flying the Tiporare.

1) Select the lightest possible wood for all sheeting, leading and trailing edges, rudder and elevators, and fuselage blocks. Use medium wood on fuselage sides and use firm wood on the ailerons.

2) Avoid engines with high vibration levels. They will ruin your servos, among other things, and make it difficult to keep the plane in accurate trim.

3) Select a propeller which will give maximum vertical performance, *not* maximum speed out of a split-S.

4) Use a "dual rate" transmitter if possible, with rates on ailerons and elevators.

5) Use retracts or use itsy bitsy tires to eliminate the steering effect that can occur when you yaw the plane with the wheels down.

6) Do not try to redesign the construction to make the plane crash-proof. This is a waste of time and will only add weight, which is the enemy of any pattern plane.

7) If you end up with a Tipo which weighs over 9 lbs. dry, consider selling it and building another, lighter one. We can find no reason to build this design heavier than 8-1/2 lbs. We have built many of them at 7-1/2 to 8 lbs. finished, including pipe. Remember, a heavy plane will not fly better through any maneuvers, and excess power will simply make it faster, not better.

8) Balance is extremely important if you expect to realize maximum performance, especially in rolling or point maneuvers. A nose heavy set-up does nothing but screw things up. Sensitivity is best handled by an accurate dual-rate radio.

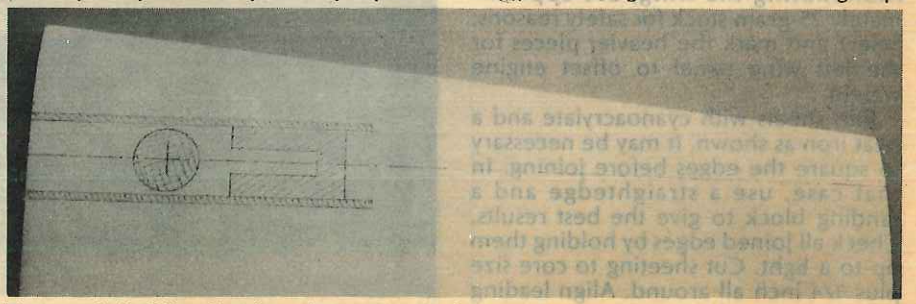
9) Flaps are a questionable feature. They do work, they are fun to play with, and they can be hooked up to be used as dive brakes (a la Curare) or as coupled controls with elevator (a la Dave Brown). It must be understood, however, that they can cost you 7 ozs. in weight penalty, they must be postively equal in operation, they can vibrate, they can be adjusted (misadjusted) to cause weird pitch control, and they require some good linkage fabrication to work properly.

Our personal recommendation is leave 'em off. The plane will be lighter and easier for most people to set up.

10) Do not worry about slight variations in wing size (outline) from the plan, but make certain both sides are identical. This rule also applies to stabs, elevators, ailerons, etc.

You will need only the usual tools plus some long, straight sanding blocks. If you are building a balsa fuselage, we recommend that you carefully fit all pieces and use cyanoacrylate adhesives as much as possible. The blocks (top, nose, etc.) are easiest to final shape if they are joined with polyester resin.

Buy, beg, borrow, or somehow obtain use of accurate gram scales and use them when selecting balsa. We will give suggested weights in each building step.



First step in building the wing, after cutting the foam cores, is to mark the locations of the stub spars, wheel, and landing gear plate.

CONSTRUCTION

Using the top and root outlines shown, make cutting templates and cut cores from 1-lb. styrofoam. Using a felt tip pen, draw stub spar, landing gear, and wheel locations on each panel. Using a straightedge and a sharp No. 11 blade, remove foam from spar slots and gear plate location. A carefully trimmed 2-1/2 inch dia. tin can can be used as a cookie cutter to make the wheel well outlines, approximately 1-1/4 inches deep. Remove foam using needle nose pliers and trim holes using a motor tool and flat grinding stones.

Install 1/4x1/2x12-inch hard balsa spars using epoxy (go easy on the epoxy!). Install plates using epoxy and sawdust to provide a bond between plate and spars. Wipe off all excess epoxy and trim parts flush when dry, using a sharp hobby plane. *Do not sand this area.* You will only succees in making a flat spot on the wing.

Prepare balsa sheeting using 1/16x4x36-inch sheets which weigh less than 24 grams per sheet. I use 16-gram sheets if I can get them. If you plan on Monokoting the wing, use approximately 25-gram stock for safety reasons. Select and mark the heavier pieces for the left wing panel to offset engine weight.

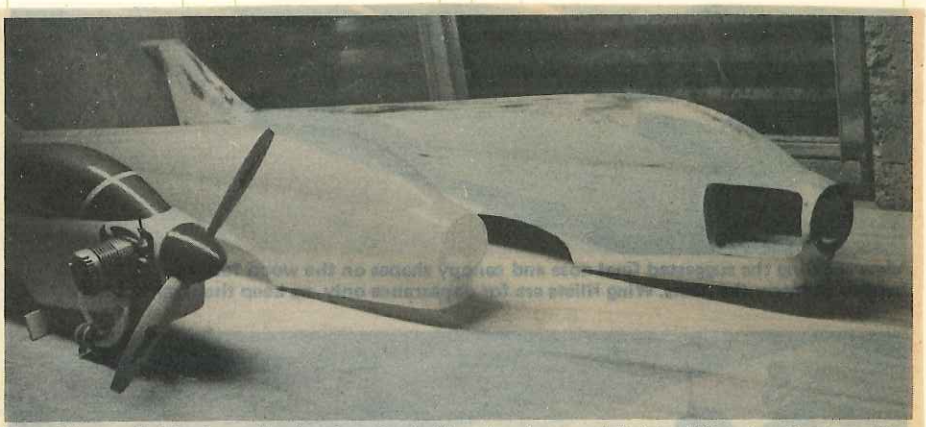
Join sheets with cyanoacrylate and a heat iron as shown. It may be necessary to square the edges before joining. In that case, use a straightedge and a sanding block to give the best results. Check all joined edges by holding them up to a light. Cut sheeting to core size plus 1/4 inch all around. Align leading edge with wood grain.

Pour some Southern R/C Products "Sorghum" or equivalent contact cement in an old dish, and using a piece of foam rubber, wipe a thin, even coat on all joining surfaces (don't forget to follow your left-right sheet marking!).

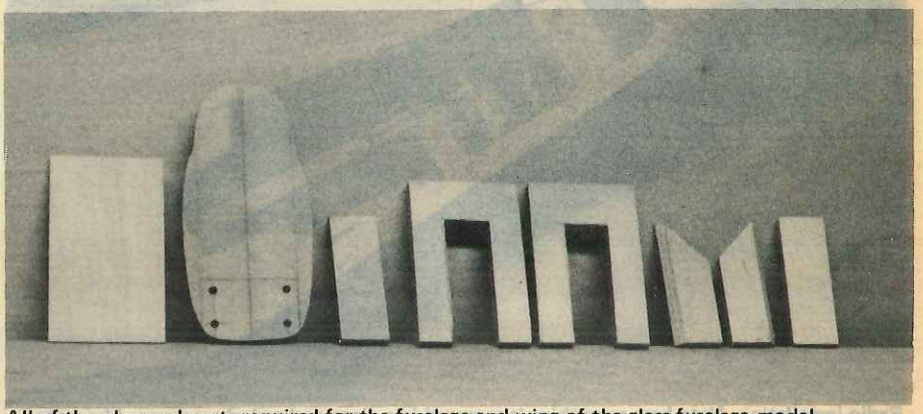
Join sheeting to foam on a perfectly flat surface starting at the trailing edge and join for approximately four inches forward, then attach sheet on opposite side in the same manner. If the trailing edge is not straight (bowed), bend carefully, then pat the remainder of the sheeting into place using palm pressure with the hands placed directly opposite each other on the top and bottom wing surfaces. Carefully trim sheeting to foam edges using a long, straight sanding block, then attach leading and trailing edges using white glue or whatever you like that won't attack the foam. When dry, trim edges with a hobby plane and sand as shown in the picture. *IMPORTANT!* At this stage compare halves and re-sand as required until halves are identical. Use a block for all sanding.

Now attach tips and shape them to whatever shape your little heart desires. It really doesn't matter, just make them identical and symmetrical.

Make a template of the finished wing root airfoils . . . both halves! Do this by tracing the wing roots onto a piece of graph paper. Use this template set to cut the wing saddles in the fuselage sides, ditto for stabilizer halves.



From l to r, a finished wooden fuselage, basic fiberglass fuse, and finished fiberglass fuselage. The fiberglass ones are available from W.K. Hobbies (see ad in this issue).



All of the plywood parts required for the fuselage and wing of the glass fuselage model.

Sand in dihedral and join panels with 5-minute epoxy (1-1/2 inches under each panel). Do not decrease dihedral unless you like weird flying airplanes.

Strengthen the center section with six-inch-wide fiberglass drywall tape and polyester resin squeegeed on as thin as possible. It may not be news to everyone, but the maximum stress is not on the center line of the wing, so don't simply tape the centerline. We tape out about five inches each way and put another band spanwise across the wheel wells and gear mount (about 24 inches long) on the bottom side only. If you really squeegee it on, there will be little or no sanding required. Try it, you'll like it.

Set the wing aside and build the stab using the same procedures outlined for the wing, but do not tape the center section. The cathedral angle is 4-1/4 inches total if you are putting the pipe under the wing as recommended. If you do not use a pipe, or if you use a rear exhaust engine, reduce the cathedral angle to 2 inches. Please remember that removing the pipe from the underside of the plane drastically alters the drag profile when the plane is skidding (yawed), and yaw is present to some degree on all rolling and point maneuvers. This is why the droopy stab must be set up differently on different designs. I have seen various designs with drooped stabs which were absolutely weird flying planes because the angles were excessive. 'Nuff said.

Shape elevators and ailerons from 1/2-inch stiff, light wood. Both elevators when shaped should not weigh more than one oz. combined. Typically we have a total stab and elevator weight of three to four oz.

Build the rudder from super light stock. The total weight when completed should be 10 to 13 grams.

Make both fuselage side pieces from equal grain and weight wood. Draw a straight line full length from each side using a felt tip pen to provide accurate reference for engine thrust, stab, wing, and side tuck location. I use the tuck line and measure everything from it.

Please note that the tuck line and the stab line are the same. The engine has down thrust and the wing has positive incidence relative to the stab and tuck. Do not change these angles or you will change the basic attitude the fuselage assumes in flight. This changes the drag profile and the effective rudder location just as surely as if you had changed the outline of the fuselage and tail.

By the way, raising or lowering the ailerons or changing the airfoil from exactly symmetrical to semi-symmetrical can do the same thing. We will discuss this further in "Trimming the Tipo."

Cut out doublers and attach with contact cement or polyester resin. Trial fit all parts and assemble over a centerline or the plan view using 90° braces to hold sides and tail post area exactly square.

I use polyester resin to attach top and front blocks, so all internal gluing must be with a compatible adhesive such as cyanoacrylate, 5-minute epoxy, poly-

ester, white glue, or aliphatic resin. Actually, the only incompatible adhesive I have found is a particular slow drying epoxy (Hobby Poxy No. 2) which is extremely good for many purposes, but it will not permit polyester to set up when in direct contact.

Add tail post and fin pieces and shape fin blocks using a sanding block. Frame the inside and add sheeting. Carve blocks to size using picture of fuselage as reference for desired shape. I use a profile comparator to keep both sides equal, but a good eye and close attention to glue lines also works to keep things equal.

The tuck in the sides is approximately 3/16 inch deep at the deepest point, which is just above the wing leading edge. Reduce the tuck to zero about 10 inches before the stab leading edge. After you have the basic contour equal on both sides, block sand nice, even blends into the top curve and sides.

Now fit the wing into the saddle, and using an accurate measuring scale, center the wing to the fuselage. Wing incidence should be correct at this time if you used the template trick suggested.

Mark the wing and add 1/2-inch dowels with 1/4-inch center holes so that they will fit the rear mounting saddle. Once the wing is solidly mounted, mount the stab on the previously established centerline. Be careful, as the drooped stab is easy to misalign. A centerline drawn on the stab leading and trailing edges will help here. Add wing fairing blocks. The wing fillets can now be added using 1/32 plywood bases on the wing (put wax paper on wing first) and tacking them to the fuselage sides with a quick-setting adhesive. Make basic fillets from a coarse mixture of micro balloons and polyester resin. Please note: fillets are of no advantage except appearance on this design, so make them fairly small. Actually, a very large fillet can decrease effective side area and add lotsa weight.

You're on your own as far as motor mounts and landing gear set-ups go. I prefer a very inexpensive landing gear actuated by a single servo. I steer the gear with woven fishing line Hot Stuffed to the servo arms and knotted to a bracket on the gear. You may spend as much as you like to do the job. Be my guest.

The Tipo can easily turn out tail heavy if you haven't watched things. We mount everything forward and use very light finishing techniques.

FINISHING

Scrape on a coat of polyester resin using a piece of 1/16 balsa as a scraper. When dry, block sand lightly.

If you have lots of time, scrape on another coat of resin with a scoop of very fine micro balloons mixed in. When dry, block sand thoroughly (wear a respirator also). Now, using a two-inch roller (yup), apply a heavy coat of K&B Super Poxy primer and micro balloons. Let dry at least 2 days, then block sand using approximately 280 grit open paper. Wear a respirator again! Do this sanding outdoors or somewhere that doesn't allow the dust to drift into the house. This stuff goes everywhere!

When properly sanded, you will have lots of primer on the rug and hardly any on the plane. Now spray on a light primer coat, and if it looks perfectly smooth, sand it and send for the painter. By the way, the model at this stage should weigh about 3-1/2 lbs. The final paint can easily add 4 ozs., so be careful.

TRIMMING THE TIPO FOR FLIGHT

This is the part that is most difficult for the novice and easiest for the expert. Sadly, it is the most necessary for the beginner and least necessary for the expert.

We will approach trimming a little differently by determining it in functions rather than maneuvers.

1) Proper center of gravity: 5 to 5-1/2 inches from leading edge of wing at wing center. Landing gear should be shimmed so that the plane just rests on its nose wheel with an empty tank.

2) Maximum control throws:

	Up	Down
Elevators	3/8	3/8
Ailerons	1/4	5/16
Rudder	2	2

3) Control surface centering: ailerons and elevators must center within 1/64 of an inch when checked by centering transmitter trims and moving trims back and forth. Rudder should center within 1/16 inch.

4) Elevator trim: this trim is affected by many items. Ideally, you want a level elevator setting on both sides for normal full speed flight. You can reduce any up elevator trim by slightly drooping both ailerons or slightly shimming trailing edge of wing down. Reverse this procedure if you have down elevator trim, but be sure you are correcting for a simple elevator trim setting and not a misaligned (crooked hinge line) elevator.

The plane should fly hands off in level upright flight at full speed and should require very little pressure to hold inverted flight.

5) Ailerons: aileron settings should require no stick corrections with model upright or inverted. Check for hinge line gaps, soft aileron(s), and misaligned hinge lines.

6) Rudder: this trim is difficult to correctly sort out and should simply be left *straight on* until the entire trimming process is completed.

FLIGHT TRIM PROCEDURES

1) Lateral balancing. A heavy wing will show up anytime the plane is rapidly accelerated (high "G" load) while up or down elevator is being applied, by dropping away from the intended track. Example: left wing drops on takeoff if plane is "horsed off." Same wing requires corrective aileron on downside of figure M maneuver. Same wing requires corrective aileron on loops.

Add smooth clay weights directly on tip of *light* wing and re-examine these maneuvers. When satisfied, fit lead weight into tip.

2) Axial rolling trim. With plane flying exactly level, and low, pull up into an exactly vertical climb and release elevator pressure and apply momentary full aileron deflection. (1/4 roll maneuver). Examine continuing flight path for any deviation left or right. Do this over and over until you are certain which wing drops. If neither wing ever drops, you probably have your aileron differential set correctly. The Tipo usually requires a slight amount of differential to provide more down aileron than up aileron. We use Du-Bro aileron clevises which move the pivot approximate 1/4 inch forward of the hinge line, and it is about perfect in most cases.

3) Thrust line. This model flies best with right and down thrust. It is not super critical, but *do not* allow left or up thrust to sneak in. Fly the model at full speed in level flight, chop the throttle and then after a couple of seconds, apply full throttle. There should be no noticeable "dipsy doodles" if you have followed all suggestions this far and if the plane is not overweight. Also pull the model vertical and reduce power. The plane will gradually drift over onto its back due to the trim required for level flight. This is normal and I know of no adjustment which can prevent it. However, if the model moves left or right during these tests, there is a possibility that there is excessive side thrust.

4) Yaw trim (wheee!). This one can really be a basket of snakes because almost anything can cause a dive and/or roll when rudder is applied, including the rudder itself! Do not make any radical changes while testing.

First try knife-edge flight with just enough rudder to hold altitude. Do this left and right, but do not use maximum rudder deflection! If you get left roll with left rudder and right roll with right rudder, try this: drop both ailerons a tiny bit. If you get left roll with right rudder (and vice-versa), raise both ailerons a bit. This correction also changes elevator trim and the pitch up (or down) accompanying the rolling will also change.

If you get a down pitch only with left or right knife edge flight, try a slight C.G. shift forward and retrim elevator. Reverse this for an up pitch problem. Also, not enough stab droop or a pipe that hangs too far down can cause down pitch.

Incorrect dihedral or a badly angled exhaust pipe can also screw things up . . . especially a pipe which is angled sideways. After you have the model handling correctly with moderate rudder deflection, try more and more deflection and add corrections as you go. But please remember these points: A) Extreme rudder deflection is unnecessary for current maneuvers with the Tipo, and B) When trimmed for best performance, you may still get some slight coupled responses because *the trim for level upright flight still provides force (lift) no matter what the aircraft position.*

I really hope you are as pleased with the Tiporare as we are. If the trimming info has helped you, pass it on to a friend . . . that's what it's all about.

Up, up and Awaaay! ●