DRUINE

TURBULENT

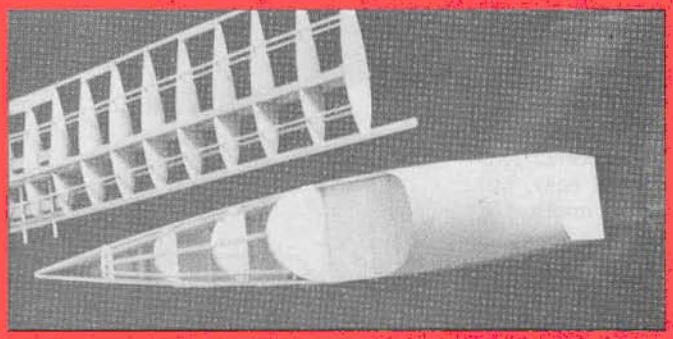
The original light plane was designed in the 50's in France and was later manufactured in England. Chuck has designed a .40 powered model of the Turbulent that has turned out to be a super flying machine.

By Chuck Cunningham

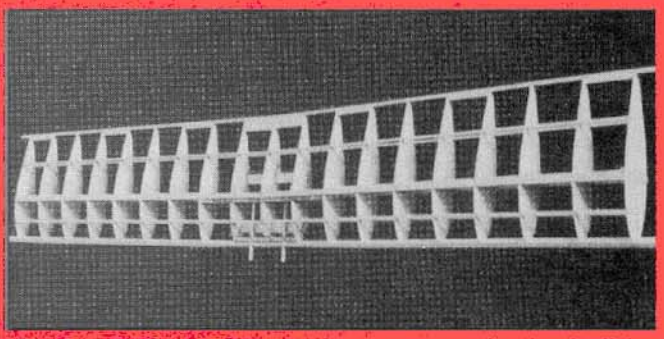
When I was looking around for a new model to design I was taken by the looks of the late Roger Druine's beautiful little Turbulent. I had eyeballed it several times before, but this time decided to do it. The decision has turned out to be a very good one. The original light plane was designed in the 50's in France, and was later manufactured in England. It is a small aircraft, having only a 21'-7" wingspan. It was powered by a converted 45 hp Volkswagen engine. Top speed for this little bird was 109 mph. It took its name, Turbulent, from the small slots located at the outer portions of the wing leading edge. These slots allowed the air to turbulate over the top of the wing at the tips, giving added lift at the tips, and a resulting lower stalling speed. It is a tiny, but beautiful aircraft.

I designed the first of my Turbulent series for a .60 engine. I wanted a bit larger than normal size, so opted for a 6' span. This aircraft is a super flying machine. I then decided that it would be nice to make a Turbulent in a .40 size, so scaled down the .60 bird to .40 size, but, again, just a bit larger than the normal .40 size machine. This second Turbulent, the one presented here has proven to be just as super a flying machine as its larger sister. In fact, these birds look so well, and fly so great that I have scaled it down one more time for a .19 size, and also scaled it up for a .90 size. If you think that I'm in love with the Turbulent, you're right.

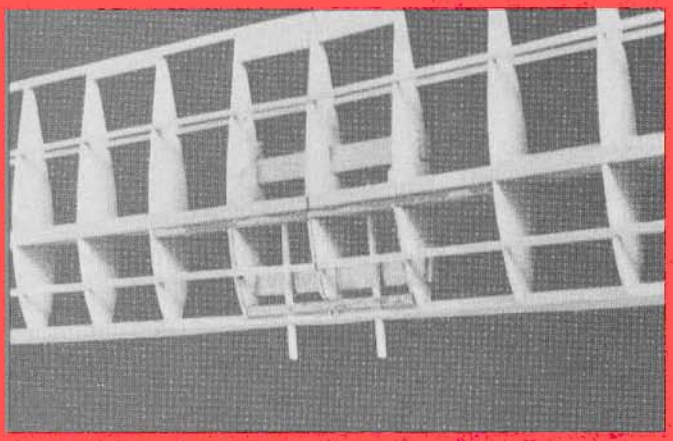
I wanted a model that would look good, would fly with the best of them, and yet would retain the good landing characteristics of the full size Turbulent. I wanted to use a fully symmetrical wing section, so chose to use the airfoil that had proven to be so good for my Hooker design. This airfoil is the "turbulated" type as it utilizes leading edge spars for strength rather than sheet balsa covering. This leading edge spar makes a turbulated leading edge, thus providing additional lift over all speed ranges. I also am hooked on slightly lifting airfoils for the horizontal stab, so a simple system was incorporated in both aircraft. The combination of the thick (20%) airfoil, turbulated leading edge, and slightly lifting tail has made a very super flying model which has no bad tendencies. It will perform any maneuver that you wish and, believe me, anything that uses rudder input really is something with that big flipper hanging on behind. Thanks to



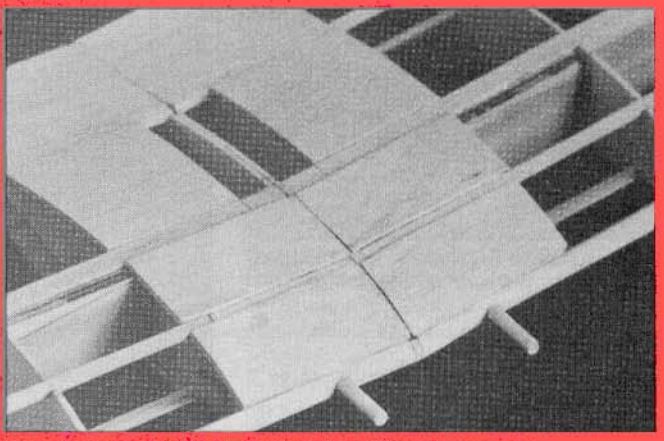
Wing and fuselage structure — light but strong.



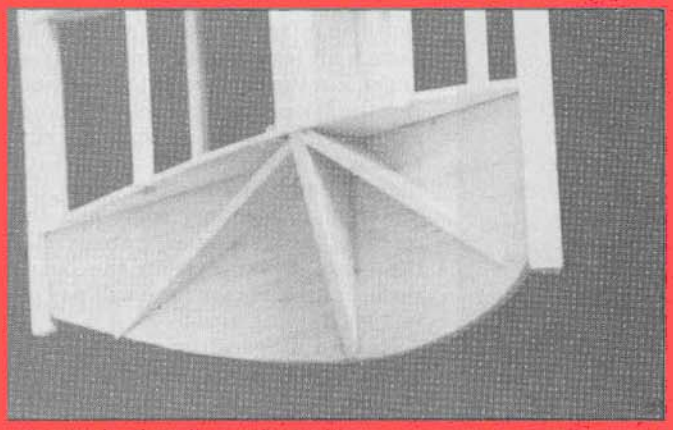
Wing structure has proven to be very strong despite the light weight.



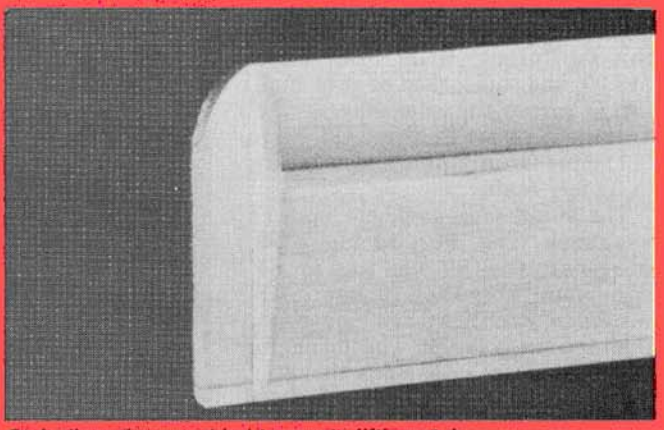
Center section of wing before sheeting.



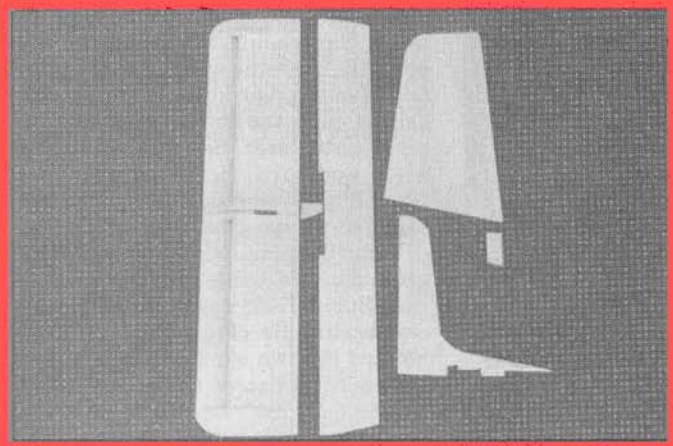
Sheeting glued into place. Need sanding to complete.



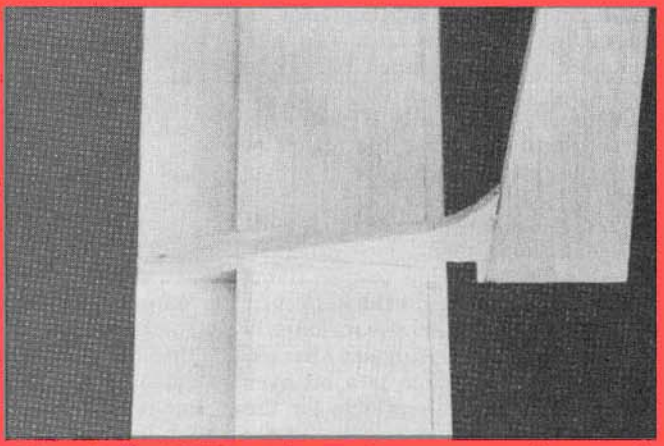
Wing tip in place in rough stages.



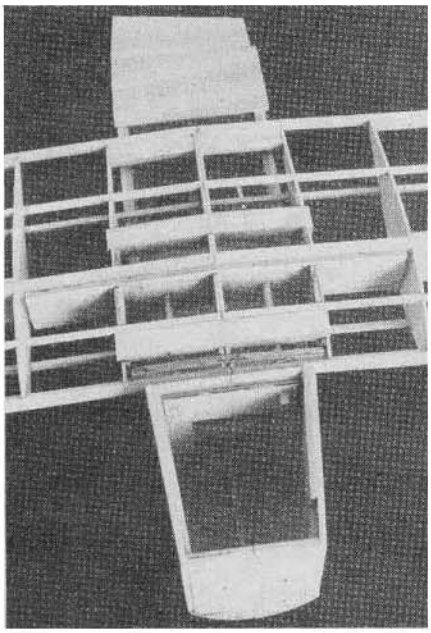
Stab rib and spar added to create lifting stab.



All the tail parts completed — note fin tab and slot in stab.



Shows fin inserted into stab — makes secure attachment and good alignment.



Wing mated to fuselage — note landing gear blocks installed in wing.

48½". Plan #701 $6.00).

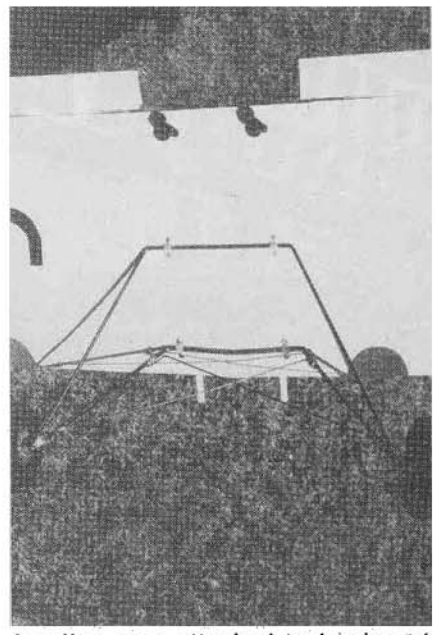
Constructing the Turbulent
General:

The entire airframe of the aircraft was constructed using Super T. This makes building quick and easy, but you can use your favorite method if you wish.

DRUINE TURBULENT
Designed By: Chuck Cunningham

TYPE AIRCRAFT
Stand-Off Scale
WINGSPAN
60 Inches
WING CHORD
10 Inches
TOTAL WING AREA
590 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
1¾ Inches
O.A. FUSELAGE LENGTH
45 Inches
RADIO COMPARTMENT AREA
(L)10" x (W)4½" x (H)2¾"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (incl. elev.)
6¾ Inches
STABILIZER AREA
133 Square Inches
STAB AIRFOIL SECTION
Flat Bottom
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7 Inches
VERT. FIN WIDTH (incl. rud)
6¼" (Avg.)
REC. ENGINE SIZE
.40-.45
FUEL TANK SIZE
11 Ounces
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Ail., Rud., Elev., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	**88 Oz.**
Wing Loading	**21.5 Oz./Sq. Ft**



Landing gear attached to hardwood blocks with nylon L/G clamps.

Mr. Druine's lovely design, it is a beautiful looking model.

Both the .60 size and the .40 size were finished exactly alike with colors and lettering borrowed from the Swiss. Several years ago RCM presented an absolute scale model of the Turbulent (RCM Plan #608, $19.00) and this looked so good that I had to borrow the color scheme. This Turbulent series is Stand-Off Scale, but more than anything else, it is "love to fly me" scale.

The .40 size presented here has a 60" wingspan. The .60 size has a 72" wingspan, the .90 size has an 84" wingspan, and the .19 has a 48" wingspan. Each just a foot longer span than the one before it. The .60 engine is turned on its side, while the .40 is upright. Each method has its good and bad points. The main plus for a side mount is that the exhaust exits underneath the bottom of the aircraft, while the upright engine tends to dump fuel in the cockpit. The side mounted engine is much harder to work on for idle needle valve adjustments, especially if your legs are beginning to show the effects of time. It's your option, turn it either way.

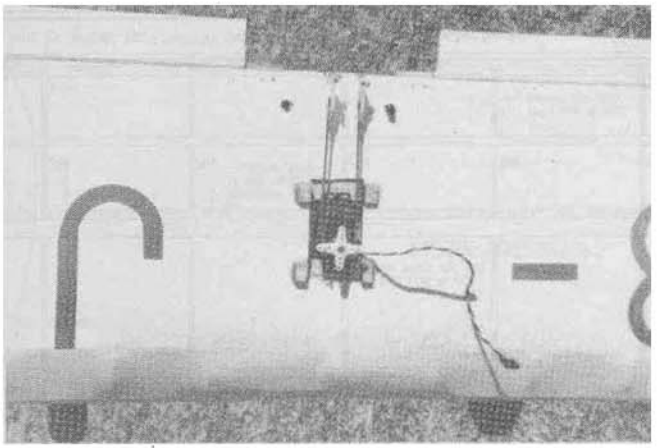
The .40 size Turbulent is just a bit over 23% of the full size aircraft, almost a Quarter Scale, so a Williams Bros. Quarter size pilot is a perfect fit for the cockpit. The .60 size machine is a bit over 28% of the full size aircraft, while the .90 machine is a bit over 32%. Plans will be available for the other three aircraft from Sky Master Industries, so if you are interested in the other sizes, write for prices (RCM has a .15 to .25 size with a span of

Wing:

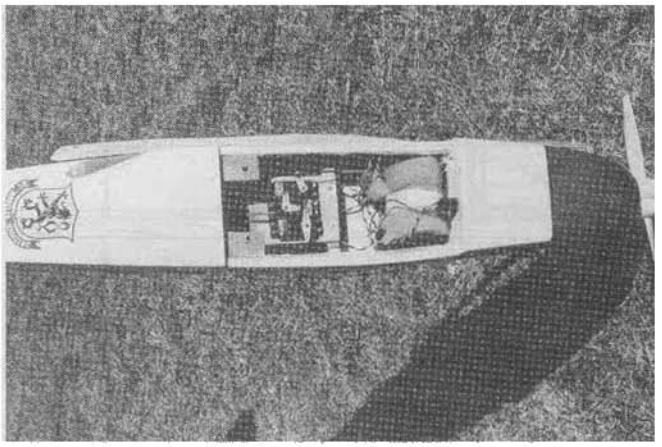
Build the wing first. The reason for this is that once you have the wing constructed it is easy to mate the wing mounting dowels into the fuselage while it is still pinned to the building board. Cut out the wing ribs from 3/32" balsa sheet. You can use either the "razor blade one at a time" method, or build a stack of balsa sheets and saw them out on a band saw. Make sure that the spar slots are not oversized. Sand the rib pack, and mark the top of the ribs with a felt marking pen. Do this so that you won't get them mixed up --- you could make them a bit less than symmetrical you know. Pin the main spar to the plans. Use the lower rear spar as a rib prop. Pin it to the plans so that the ribs resting on it are exactly square with the building board. In other words, the center of the leading edge, and the center of the trailing edge are exactly the same distance from the board surface. A bit of care here will pay off in a good flying model.

Make a dihedral jig with a bit of scrap balsa, and slant the center section rib to the correct dihedral angle. Glue each of the ribs in place on the main spar with Super T. Glue the top spar in place, and then the webbing. Glue the trailing edge in place, the leading edge, and the top spars. Remove the wing from the plan and glue the rear lower spar in place. Do not glue the lower front spar in place until later. Set this wing half aside and turn the plans over and build the left half of the wing on the back side of the plans.

When both halves are completed, glue the two wing halves together with Super T, clamping in place with clothespins. Be careful, not much is holding the two wing halves together at this point except the glue joint at the center wing ribs. Next, carefully cut a slot in the center ribs to accept the plywood dihedral brace, and glue in place with lots of epoxy. The reason that I don't use Super T at this



Aileron servo installation in wing.



Ample room in fuselage for all radio equipment.

junction is that usually on my aircraft there is a bit of slop in the parts fit, so I need the glop of epoxy to fill up all of these gaps. When this is dry, cut a slot for the leading edge dihedral brace and glue it in place also. Before installing these braces, drill the holes for the front dowels. Be sure and line up these braces carefully so that these holes are in the correct location. After the epoxy has set up on the dihedral braces, glue the plywood ribs in place that support the landing gear blocks. Then glue these blocks in place. Add the lower front spars and the sheeting around the center section. Glue the built-up tips in place with Super T. Sand the wing structure, insert the wing dowels and get ready for the next part.

Fuselage:

This is a simple construction job of standard method. It is sheet balsa construction. Cut out each side from hard 3/16" balsa. Make sure that you make both sides alike, and that you get the wing saddle exactly correct. (Many poor flying aircraft are created by an improperly aligned wing saddle.) Mark the inside of each side piece with a felt marking pen and glue the 3/16" doubler in place. Make a mark where each former or bulkhead is located. Glue the servo rails in place. Cut out all of the formers, bulkheads, and crosspieces. Make the firewall (B1) from 1/4" plywood and drill all engine mounting holes and glue blind nuts in position. Slide the plans to the edge of your building board so that the firewall, when in place, is hanging just over the edge of the board. Pin formers B2 and B3 in place on the top view of the plans. We are building the fuselage upside down so be sure to invert these formers. Next, pin all of the 1/4" square crosspieces in place on the plans. Glue each fuselage side to formers B2 and B3. Make sure that everything is exactly perfect.

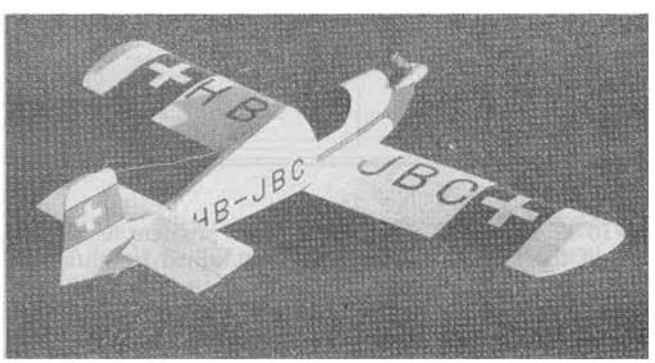
Glue the firewall in place. Since the nose is tapered, you will have to bring the sides into the correct location with a bit of masking tape and rubberbands wrapped around the front of the fuselage. Make sure that the center of the firewall is in exact alignment with the centerline of the top view of the fuselage.

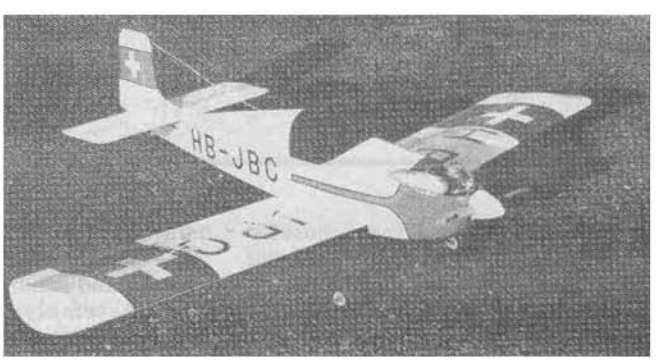
Next, bring the tail ends of the fuselage sides together, exactly over the centerline and glue in place. Also glue the fuselage sides to the cross braces. When all of this is dry, remove the pins holding the cross braces to the building board, but do not remove the fuselage. Install the cross braces on the fuselage bottom, and then glue the 3/32" bottom sheeting in place, cross grained.

Now, carefully fit the wing to the fuselage, while the fuselage is still pinned down to the building board. Make larger holes in balsa bulkhead B2 and fit the wing into place. Make sure that the wing is square to the fuselage, it's easy to measure at this time. Check that the wing incidence is zero; again, easy to measure the distance of the leading and trailing edges from the building board.

When you're sure that everything is correct, glue the 1/4" plywood dowel mounting plate B2A in place. If you have been careful, everything will come out just great. Now, glue the pieces of plywood and wing bolt blocks in place on the fuselage sides. Remount the wing, and carefully drill holes through the wing and into the bolt blocks. Thread the bolt blocks with a 1/4" tap, toughen up the wood threads by soaking them in Hot Stuff, and you've got all of the wing mounting work behind you.

If you've been careful, you have been able to get everything lined up while the fuselage has been securely tied to the building board. Next, remove from the board, add the bulkheads (FT2 thru FT6) and stringers. The 1/32" nose turtledeck is very easy to secure in position. Cut it to shape, then run a bead of Super T down the top spar and glue the turtledeck cover to this spar. Glue first one side and then the other to the bulkheads and fuselage sides. Attach the engine mount and engine in place, then glue the balsa nose blocks in





place and add the nose ring. Adjust for the engine mount and engine that you are using. Do not forget to allow for the spinner backplate which, in most cases, overhangs the engine thrust washer by as much as 3/16". Remove the engine, add the rest of the nose blocks and sand to shape.

Tail Assembly:

All of the tail surfaces are cut from sheet balsa, so no problem here. The lifting stab is obtained by gluing a spar in the location shown on the plans, and adding four ribs. The covering material forms the airfoil shape. Sand all of the parts and you're ready for finishing.

Covering:

Any of the covering materials can be used. My Turbulents are covered with white Super MonoKote with red trim. The nose of each aircraft was painted with Red Formula U right over the MonoKote. The cockpits are covered with MonoKote, and then painted with black Formula U. The inside of the engine compartment should be fuelproofed along with the inside of the tank area. I use large Klett hinges and recommend them to you. Once all of the surfaces have been hinged and the aircraft is almost complete, seal the hinge gaps with a 1" strip of MonoKote. Be sure to deflect the surface to the down position, then iron on the 1" strip to the top surface. When completed you cannot see this strip but the extra plus of smoother flying will be well-worth this small effort. The letters on my birds were cut out of black and red contact shelf paper, stuck in place, then given an edge sealer of clear Formula U. I have been using this type of letter since contact paper came out, even before the advent of MonoKote. They will peel off with time if the edges are not sealed. The landing gear is bent from 5/32" and 1/8" music wire. Solder with silver solder, and hold in place with Goldberg 5/32" and 1/8" landing gear clamps.

Flying:

Balance your model, without fuel, exactly as shown on the plans. Check that the wings are zero to the horizontal stab and that the wing blocks are securely glued in place. Your favorite radio should be located as shown on the drawings; the radio should be working, and all that is left is to go flying. Make sure that the landing gear system tracks as straight as you can get it. Make sure that the tail wheel is tracking straight ahead. If you're ready, fire up the engine, check the idle, and taxi out to the take-off location. Turn the aircraft directly into the wind, open the throttle, add just a touch of right rudder and hang on. The lifting stab will lift the tail off of the ground to flying position in about 10', and the aircraft will track straight down the runway into the wind. Remember, the rudder is large and has lots of authority. A slight touch of up elevator will gently lift your Turbulent into the air. Let her climb out, make a turn, come back over the runway and start checking out the controls. If everything is okay, then let it all hang out. Anything that you're good enough to do, the Turbulent will do for you. She is a beautiful flying bird and has the extra special plus of looking so realistic in the air that you will wish that you were up there in the cockpit flying her. I know that you will fall in love with the Turbulent as much as I have. You may even want to do as I have done and build her in several sizes. □

From RCModeler Sep. 1982