

Photos by the Author

# The Boulton-Paul "Defiant"

by Dan Reiss

**Adding a gun turret doesn't make for an agile fighter, but it does make for an interesting .60-powered model.**

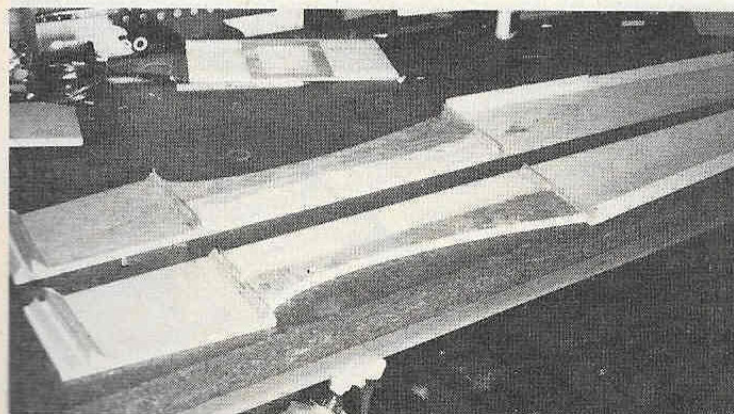
**B**e prepared to do a lot of explaining at the field with this aircraft. Not many people have heard of the "Defiant," much less ever seen one. If it wasn't for Profile 117 I probably would have missed this jewel too. What's so good about it? Well, as a full size aircraft it wasn't very successful. It was a British built airplane that the Germans used for target practice at the beginning of World War II. It wasn't meant to be that way, but that was the way it turned out. Since the Boulton-Paul factory was having trouble replacing them as fast as the Germans were shooting "Defiants" down, they were pulled from the front lines and relegated to less hazardous duties. You can get the full story in that Pro-

file. However, as an R/C model they're hard to beat. Their proportions are excellent, especially for a Stand-Off-Scale flyer like myself. So, with a set of plans in front of you and with the Profile as inspiration, clear off your work bench. You're going to enjoy building and flying this one.

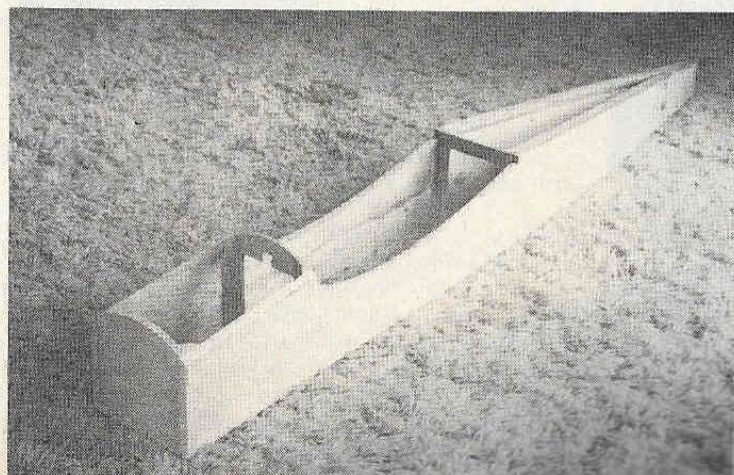
## Wing Assembly

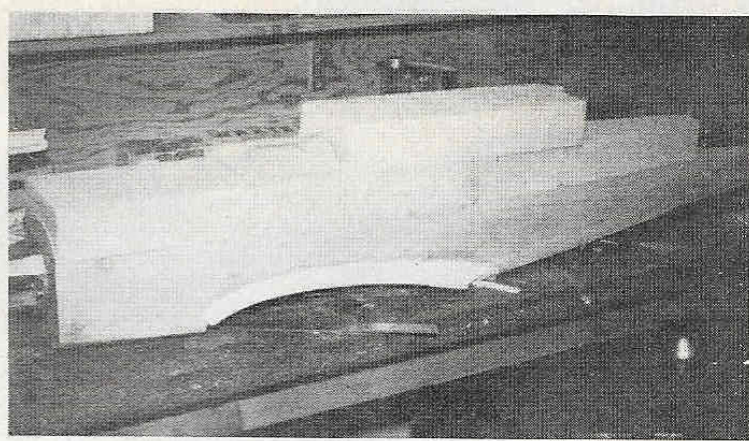
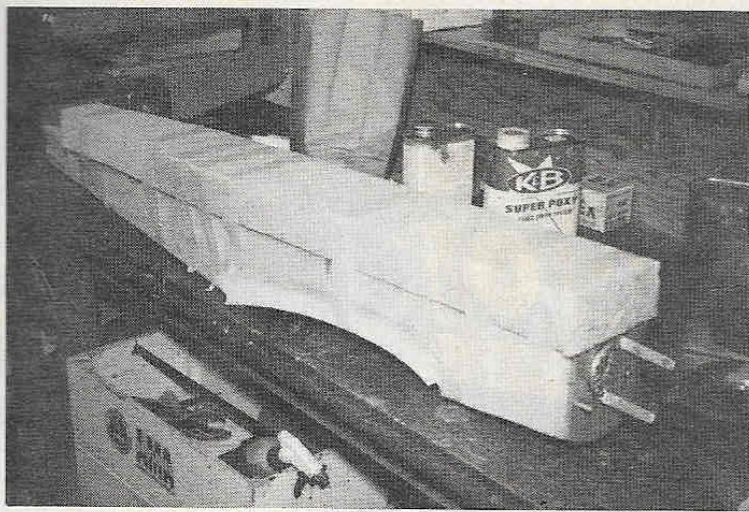
Start with the wing first. Use the templates shown to cut the three foam sections required (one center section and two tip panels). Trim off the trailing edges and glue on strips of  $\frac{1}{4}$ " by  $\frac{1}{2}$ " balsa. With masking tape on the foam to protect it, carve and sand the trailing edge to shape. Cut out the foam for the servo mount and

the two aileron bellcrank mounts. Install the bellcranks on their mounts and epoxy them into the wing. Hook-up the aileron pushrods noting that the small one to the aileron crosses the dihedral joint. Epoxy in the  $\frac{1}{8}$ " plywood rear wing dowel support and servo mount. Temporarily install your servo and make up whatever linkage is necessary to get from the aileron pushrod to your servo. Using your radio, vary the servo from full left to full right to make sure that there is no binding. Remove the servo. Cut out an indentation in the foam to receive the  $\frac{1}{4}$ "x $\frac{1}{4}$ " aileron hinge support. This can be done by using a piece of #16 copper wire, bent to the proper shape, and inserted in your soldering gun.

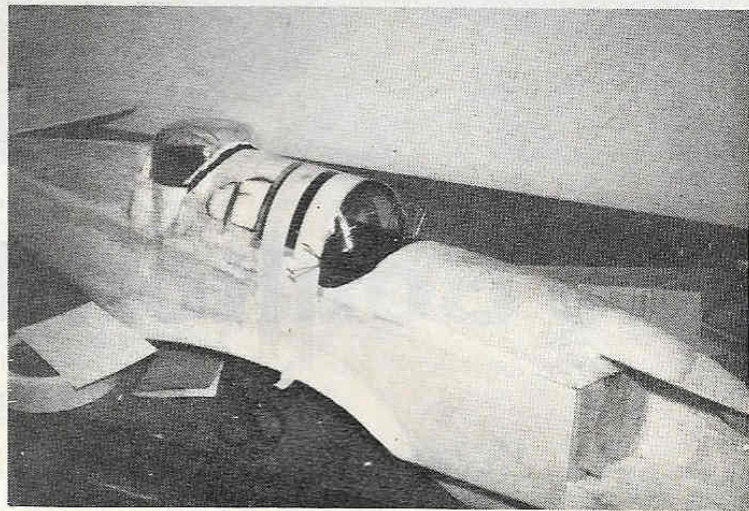
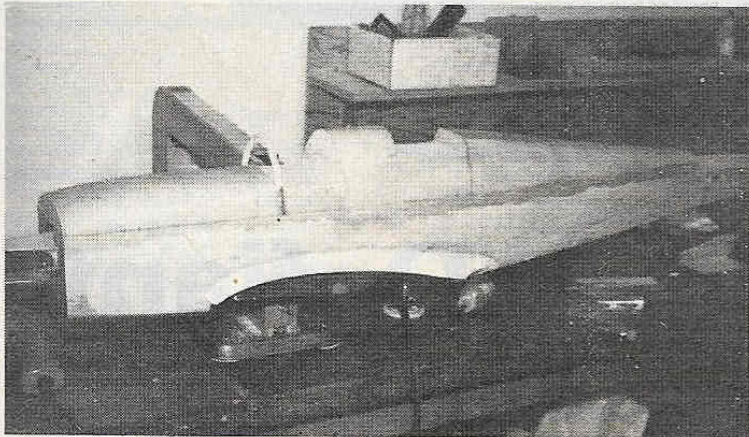


The basic siding seen, right and left, doublers, triangular stock. Easy! At right: The next step is to drop in the important formers, align all.

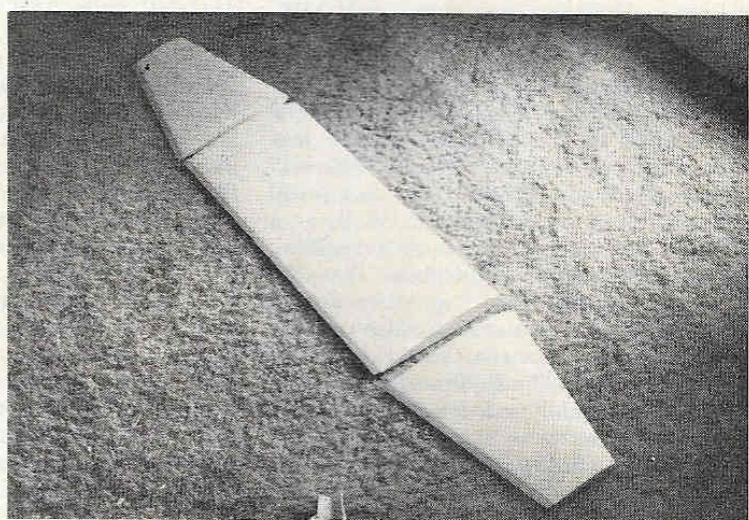
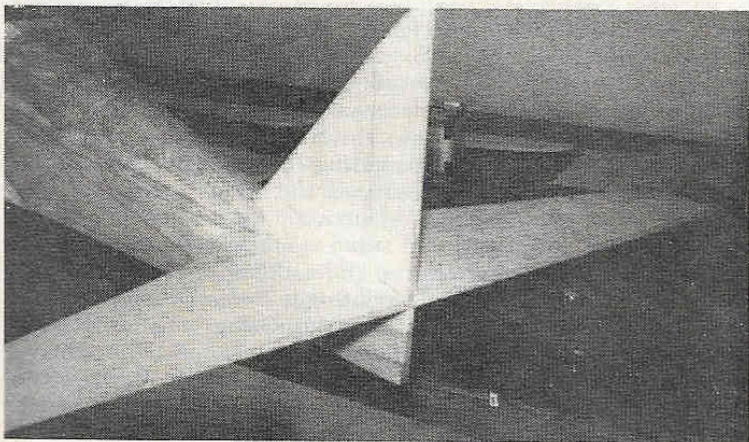




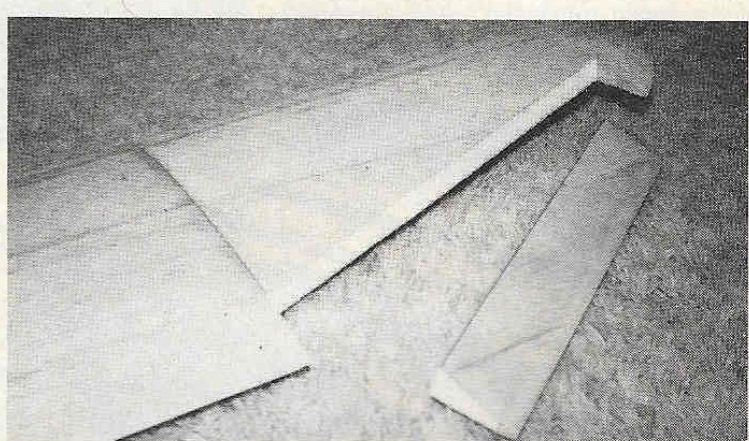
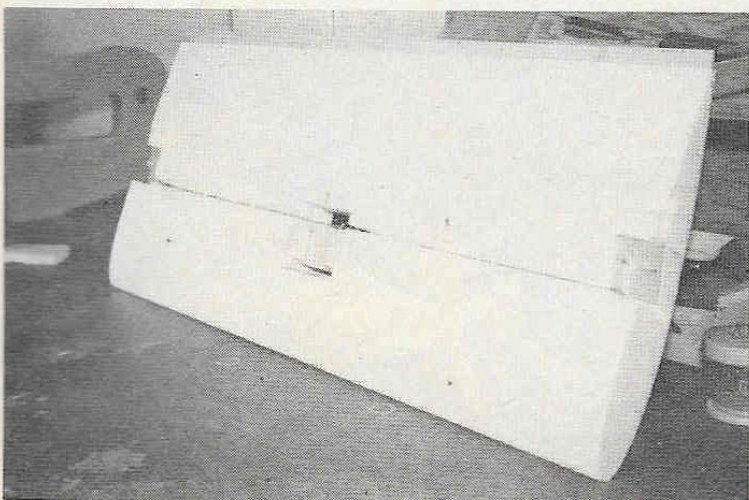
Wing fillet is visible here, built up to a concave scale-like fairing.  
**Left:** Top blocks of foam taped down while glue adheres. Trim to section.



With turtle deck rounded down and sheeted, canopy structure is built up.  
**Right:** Tape secures celluloid while drying without roughening up edges.



Test position the stab, sighting it against wing for alignment. Fin too.  
**At right:** The foam panels. Easily cut via the hot-wire method, sheeted.



The ailerons are cut free, trimmed with balsa and then hinged carefully.  
**At left:** The center core seen partially sheeted, cut-out for servos etc.

Make up a guide of aluminum or plywood and pull the heated wire through the foam. Lay up a veneer of  $\frac{1}{16}$ " balsa large enough to cover the top and bottom of the wing and contact cement these skins to the cores. Wetting the balsa skin at the leading edge will prevent the wood from splitting as you roll it around the sharp curve. Trim off the excess, then glue on the balsa wing tips and carve and sand them to shape. Cut out a groove on both sides of the dihedral joint to clear the small pushrod and epoxy the wing sections together with two inches of dihedral under each wing tip.

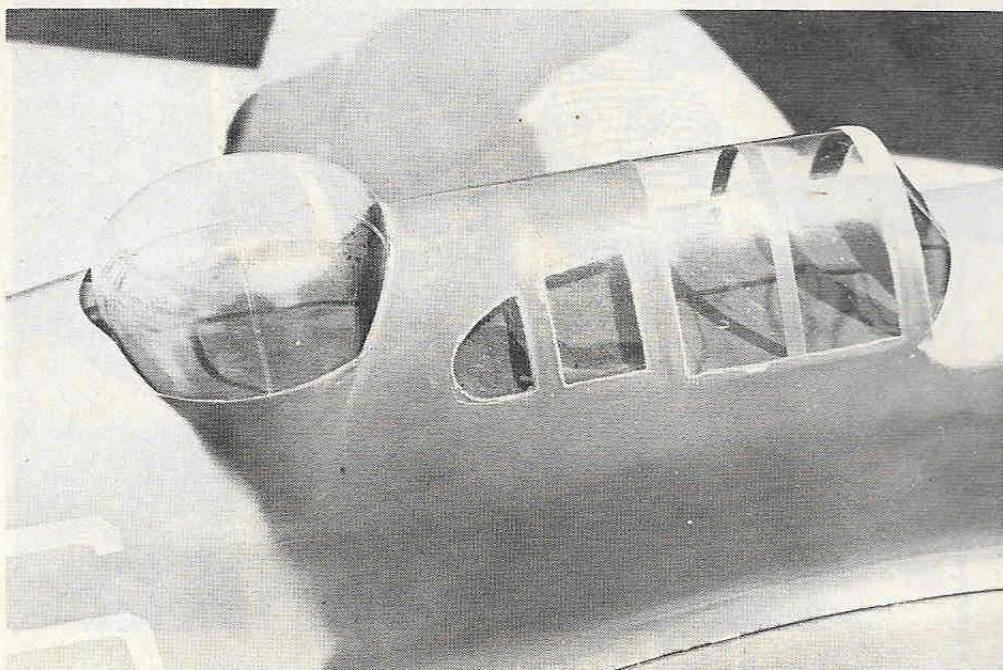
Cut out the ailerons leaving enough room for the  $\frac{1}{16}$ " balsa that will cover the exposed foam and a  $\frac{1}{16}$ " clearance gap. Re-cut the leading edge of the ailerons to allow for a 30 degree downward deflection. Next sand the exposed foam surfaces smooth and cover them with  $\frac{1}{16}$ " balsa. Check the fit of the ailerons and sand them where necessary, then resin on a two inch strip of fiberglass tape around the dihedral joint. Feather in the fiberglass to balsa wood junction with filler to yield a practically invisible joint. Cut out the indentation for the  $\frac{1}{8}$ " plywood aileron horn mount and epoxy it in place.

Accurately locate the center of the wing and drill a  $\frac{1}{4}$ " dia. hole from the leading edge to the rear wing dowel support along the chord line. Epoxy in the wing dowel making sure it is properly aligned and goes into the rear support. Cut a  $\frac{1}{4}$ " indentation into the leading edge around the dowel and epoxy on the forward wing dowel support, then glue a piece of  $\frac{1}{8}$ " balsa onto this and shape both to the air foil. Remove the balsa sheet where the landing gear blocks go, and using that soldering gun and copper wire, cut out the foam for the landing gear blocks. I've been using two pieces of  $\frac{3}{8}$ " by  $\frac{3}{4}$ " motor mount material epoxied together to make a piece  $\frac{3}{4}$ " square. A  $\frac{5}{32}$ " groove,  $\frac{5}{32}$ " deep is cut into the side, without the split, for the gear. Epoxy these in place.

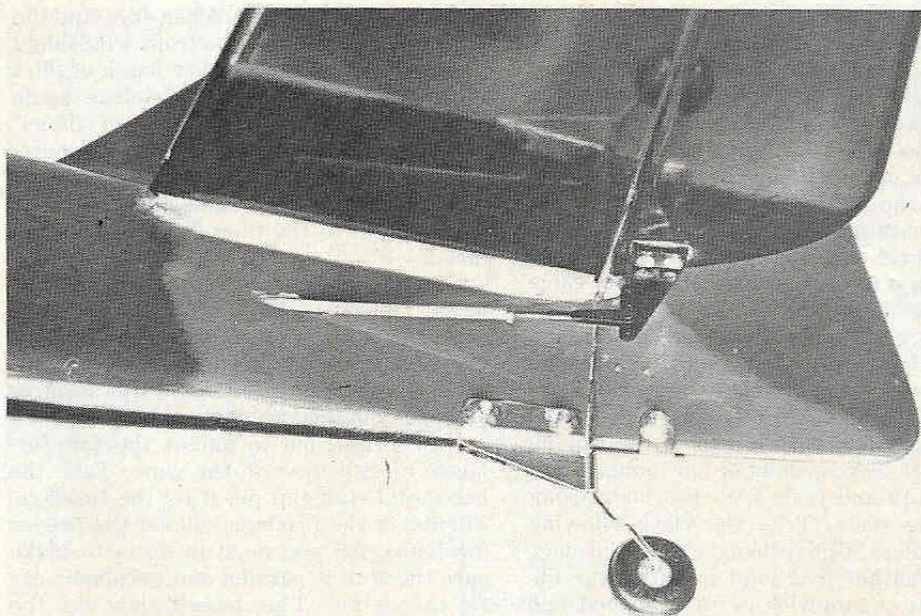
### The Fuselage

Begin the fuselage by cutting out the fuselage sides. Cut the right side  $\frac{1}{8}$ " shorter for some right thrust and angle both sides down  $\frac{1}{8}$ " for some down thrust. Epoxy on the  $\frac{1}{16}$ " plywood wing saddle doubler. Glue on all of the  $\frac{1}{4}$ " and  $\frac{1}{2}$ " triangular pieces using epoxy around the firewall. Cut out F-1 from  $\frac{1}{4}$ " plywood and F-2 and F-3 from  $\frac{1}{8}$ " plywood. Join the sides together once again using epoxy around the firewall. When dry, pull the sides together at the tail. Install the hardwood you'll need for your tailwheel bracket. Also, install the Sullivan N' Rods (nylon tube within a tube) pushrods at this time.

Check the fuselage to wing fit. Sand where necessary to make any minor adjustments. Cut out the  $\frac{1}{32}$ " plywood fillet support with the grain perpendicular to the fuselage and glue it in place using the wing to hold it. Accurately locate the wing in place with reference to the fuselage. You want it centered and perpendicular. When you're satisfied epoxy the fuselage wing dowel support to the front of F-2. When cured epoxy on the  $\frac{3}{8}$ " by  $\frac{3}{4}$ " hardwood wing screw blocks to the doubler. Relocate the wing properly and drill through the wing and the blocks. You want to be sure that the drill is perpendicular to the bottom surface of the wing and enters the blocks



A bit of vacuum forming know-how won't hurt you, elsewhere in this issue and preceding April FM. Below: Tail feathers in a typical arrangement. Elevator rod to horn, tailwheel installation seen.

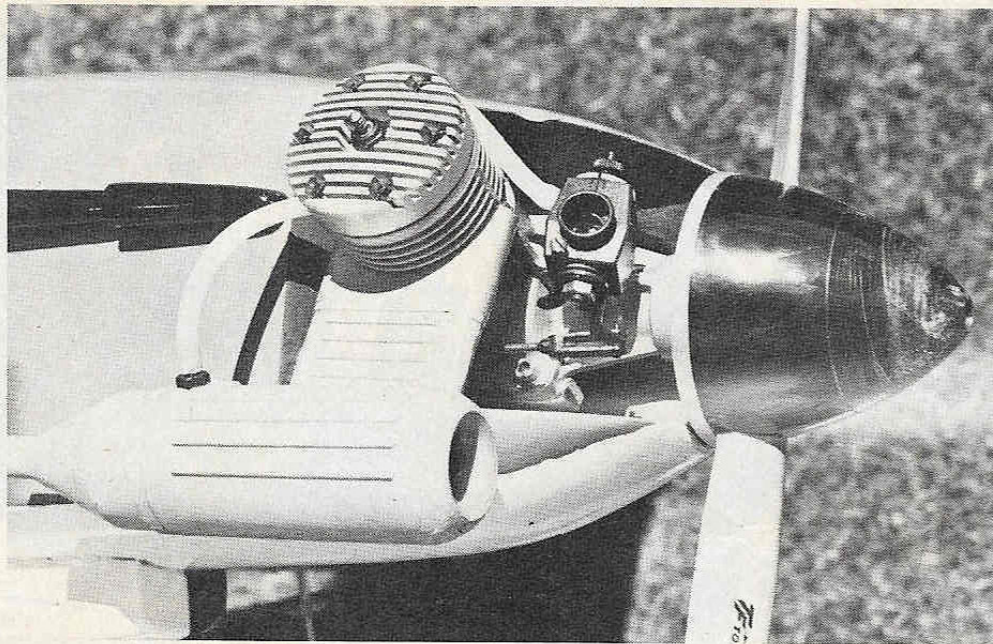


close to their centerline. Tap the blocks to receive the  $\frac{1}{4}$  x 20 wing screws. Cut the screw supports from  $\frac{1}{8}$ " plywood and drill a hole through the center for a snug fit over the screws. Open up the holes in the wing to have a little "slop" around the wing screws. Put the supports on the screws, like snug washers, and spread epoxy on their bottom side. Screw the wing on to the fuselage, once again, locating the wing very accurately, then tighten down on the screws making sure that the wing is in perfect alignment before the epoxy cures.

Now that that's done, back to the fuselage. Sheet the aft portion of the fuselage bottom with  $\frac{1}{8}$ " balsa. Run the grain across the fuselage. Cover the bottom of the fuselage between F-1 and F-2 with  $\frac{1}{32}$ " plywood using masking tape to hold it in place until dry. Install your radial mount and engine. Drill the holes for the mount  $\frac{1}{8}$ " to the left and  $\frac{1}{8}$ " above the centerline of the fuselage. This will place the center of the propeller where it be-

longs. Drill the holes for your fuel lines and throttle control.

Cut the foam turtle deck to its profile view. Use a foam that is easy to sand and is not attacked by polyester resins, something like Pro Foam. Material similar to this can usually be found in those foam/plastics shops around town. Glue the deck in place using that easy to sand surfacing resin and cement the nose blocks around the engine with the spinner backplate in place. Mark the diameter of the spinner on the blocks, then remove the engine. Cut cross slots in the foam and glue in F-1T, F-2T, F-4T, F-5T, and F-6T. Make the wing fillets using micro balloons, surfacing resin and a few educated fingers. Sit yourself down and start sanding the whole model to shape. There's a lot of work to be done here but it's well worth while as you see the fuselage taking shape. The shaping around F-5T takes a little "doing." Look through a Profile booklet and get familiar with the shape you're going to try to reproduce. The indentation of F-5T



The muffer might deviate a bit from scale, but it helps keep flying fields. Engine is accessible. Beneath: "Defiant" has a look all its own, not too difficult in trim department. Ample tail area.

goes back towards the tail, horizontal to the centerline of the fuselage. It also goes forward toward F-4T where it disappears into the rear gun turret. It's a straight line from the top of F-5T to F-6T with the curvature of F-6T beginning to influence the deck shape somewhere in the middle.

Once the turtle deck is shaped, cut out the indentation for the gun turret. Epoxy a  $\frac{1}{8}$ " sheet of balsa into the turret after detailing it to your desires. My turret came from the Wing Mfg. Co. kit for their A-30 Baltimore. Temporarily tack glue it in place. Using resin and micro balloons fill in the overhang of the turret shaping it towards the sides of the fuselage. When you're satisfied with the fit of the canopy remove it. Take a sheet of four ounce fiberglass cloth and resin it to the foam using surfacing resin. Trim the cloth allowing for about a  $\frac{1}{4}$ " overhang on the fuselage sides. Feather that joint in with your filler. Make a sandwich of  $\frac{1}{8}$ " plywood and cut F-3T to shape. Cut a slot in the foam where it belongs and glue it in place with

the balsa sheet forward. When dry, sand the balsa to the angle that the front windshield will meet it. Mix up another batch of filler and go around the entire fuselage again filling those uncountable number of "dings" that always seem to appear from nowhere. After it has cured, go over the fuselage again with sandpaper and apply another coat of resin to the fiberglass. Sand when cured.

Cut the tail surfaces from  $\frac{1}{4}$ " medium balsa. I always install my  $\frac{3}{32}$ " dia. piano wire elevator coupler before I cut the elevator into two separate pieces. This ensures a flat elevator. Sand the surfaces and epoxy in the  $\frac{1}{8}$ " plywood horn mounts.

Now's the time to mount the tail surfaces. First, screw on the wing. Take the horizontal stab and pin it on the fuselage. The top of the fuselage will set the proper incidence. All you need to do is to make sure the stab is parallel and perpendicular to the wing. The parallelity can be checked by stepping back and eyeballing the stab in relation to the wing. Sand the

stab saddle as needed to achieve the correct alignment. The perpendicularity is checked by making ruler measurements between the wing and stab. When you're satisfied, epoxy the stab in place, once again, eyeballing the alignment and holding it with pins, while the epoxy cures. When cured, epoxy on the vertical stab and you want this to be in exact alignment also. Once cured, epoxy in the  $\frac{1}{4}$ " triangular pieces on each side of the vertical stab. Using a filler, feather in the stabs/foam junction.

Cut out the air intake, oil cooler and exhaust stacks from balsa blocks, then carve and sand them to shape. Glue the oil cooler onto the wing and the air intake in front of F-2. Use some filler around these two pieces to cover any gaps. Finish the exhaust stacks separately and glue them on after the plane is completely finished.

The landing gear well covers are cut from sheet aluminum about  $\frac{3}{64}$ " thick. Make up some kind of strap to connect them to the landing gear wire. They are also finished separately.

### Finishing Up

You're basically done now. All that remains is making the plane look pretty. I did this by first applying two coats of surfacing resin. These were sanded well with #150 paper. Any spots that I missed or sanded through were touched up with some more resin and re-sanded until I was satisfied with the finish. Then, on went a "heavyish" coat of K&B primer. This was sanded with #220 until I thought it was ready for the color.

Before I put on the color, I hinge my surfaces. I copied the color scheme shown in the five view drawing in that Profile. I first sprayed on the white using K&B epoxy and when this was cured, on went the black using K&B epoxy again. I then shot on the olive drab using Sig's dope. The light brown was Aerogloss Camouflage Tan. All the roundels were made with Sig's solid color decal sheets. The letters T, P, and S were also cut from decal sheets. The serial numbers are decals also.

The landing gear is from Sig's "T-34" kit. They need to be re-bent slightly because of the lack of dihedral in the flat center section where they are mounted. The landing gear doors were mounted using some nylon brackets originally intended for  $\frac{1}{8}$ " dia. wire opened up to  $\frac{3}{32}$ " dia. The wheels were Universal's  $2\frac{3}{4}$ " size with the tail wheel bracket being Royal Products metal unit.

Install the rest of the hardware, engine, radio, etc. and get the plane ready to go. Balance her out in this condition. Although the plans show the CG at the 30% point (that's 30% of the wing area in front of the C.G.) I'm flying mine with the C.G. about  $\frac{3}{8}$ " further back from that point indicated on the plans. Don't forget to balance the airplane around its roll axis also. That offset engine really throws the balance off.

Well, you're finally ready. Make all your radio and engine tests before your first flight. You'll find that the work was worth it because the plane flies like a dream. She's rock stable and grooves like a pattern ship. Take-offs and landings are a breeze, especially with that wide track landing gear. I'm sure you'll enjoy this ship.

