

Last month's installment gave the highlights of the original Gee Bee Z's origin, glories, and—eventually—tragedy. Drawings for the Quarter Scale RC model were presented. This concluding section explains the important construction sequences in words and pictures.



Henry A. Haffke

GEE BEE Z

The finished City of Springfield Quarter Scale Gee Bee Model Z at the South Jersey RC Society flying field. Last summer the yellow and black beauty was flown in the National Contest at Westover AFB. The author's admonition: For best flying qualities, build it light.

THE BACKGROUND and history of the full-size and my model Super Sportsters were presented last month. Now, we're ready for construction. Before beginning, remember one very important fact: the model should be kept as light as possible. With its short moments, you could find it very tricky to fly if the wing loading gets too high. At 12½ lb. it's a very stable flier—very positive on the controls, without any over-sensitivity. With care, your model can be built even lighter than my prototype. The bulky fuselage has a lot of material in it, so use lightweight wood where practical. This can add up to a substantial weight savings when the model is

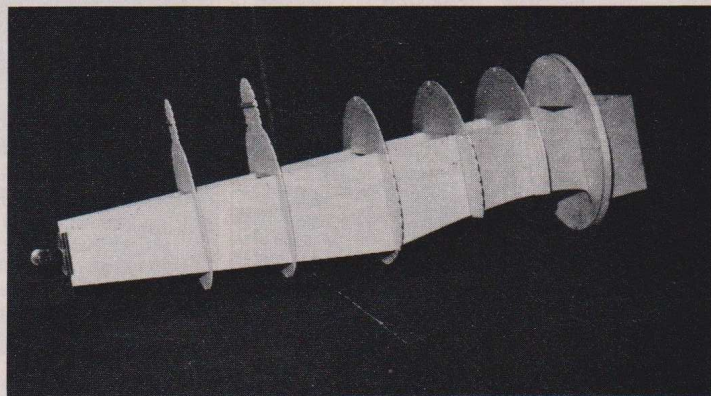
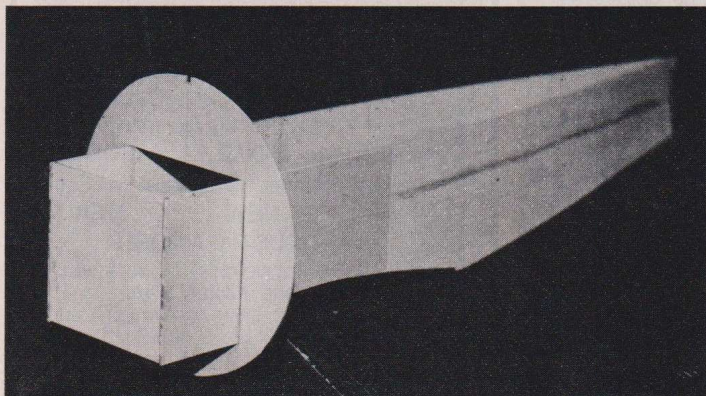
finished. Remember that weight and torque are the two big enemies of this aircraft.

Fuselage. Cut the sides from ½ x 6-in. balsa sheet, or you can edge-glue two 3-in. sheets together. Cut the forward doublers from ½ ply, and laminate these to the sides. In the bottom view, note that the ply doublers extend ¼-in. forward of the balsa sides and that they are on the outside of the structure. When this has dried, the firewall can be epoxied in place. The full-ply bulkhead, F-1, is also glued in place at this time. Clamp the tail end together, and make sure that everything is square while the glue sets. Triangle stock

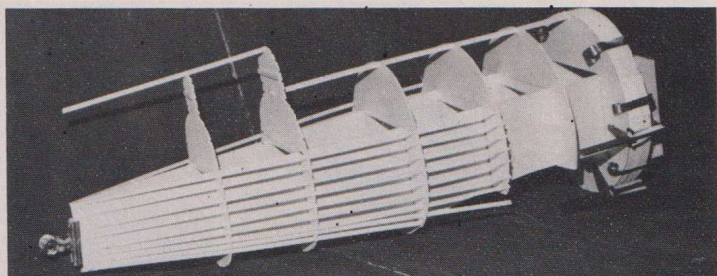
can be used behind the firewall to further strengthen this joint.

When the glue has properly cured, the remaining fuselage formers can be added, making sure that they are all square to the structure. Add the top, center stringer to the forward section of the fuselage. Also add the top turtledeck stringer. The fuselage aft end can be glued using a wedge to fit the joint. Add the side stringer from F-3 to the aft end. The ½-in. balsa F-1 formers are now added to the forward end. Make sure that these are clamped tightly to the ply F-1 until the glue dries.

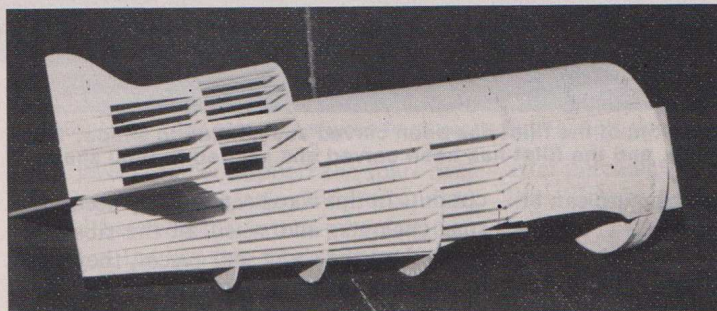
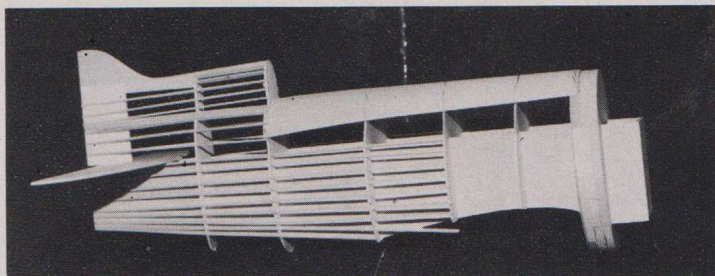
At this time the engine should be mounted to the firewall and the fuel tank



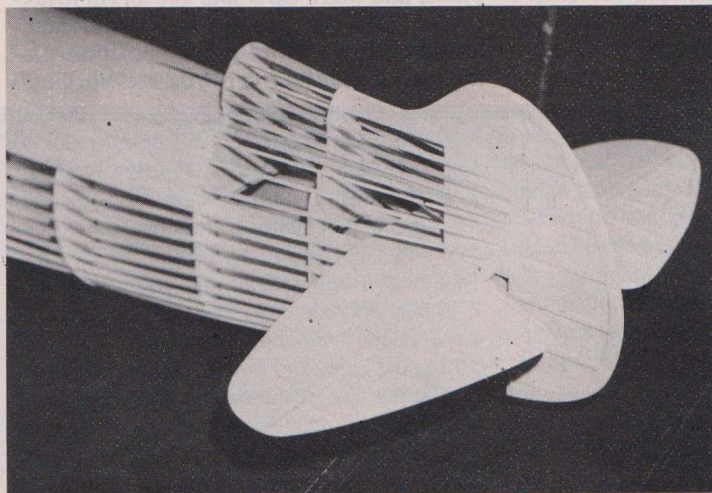
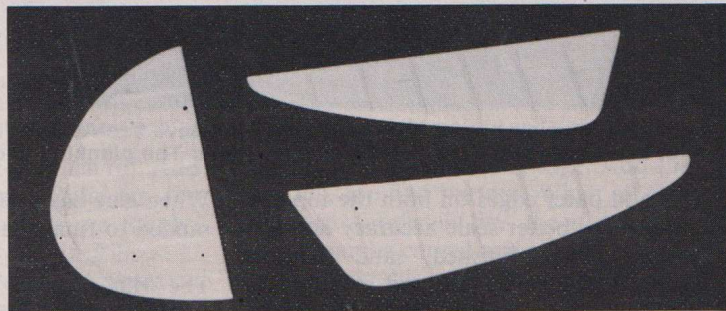
Left: First step in building the fuselage is installation of the firewall and F-1 between the basic fuselage sides. The plywood doublers are on the outside of the ½-in. balsa sides. Hold this structure square while the glue dries. Right: The remaining formers have been added to the basic sides. Note that the rear of the fuselage is still held together with a clamp (a paper clamp was used in this instance).



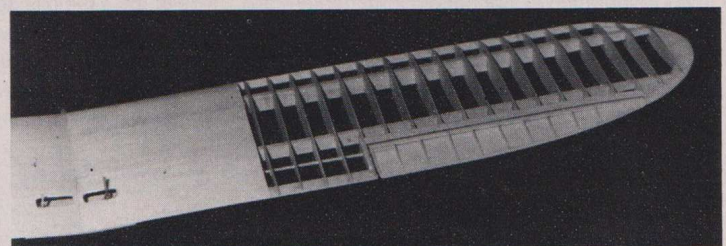
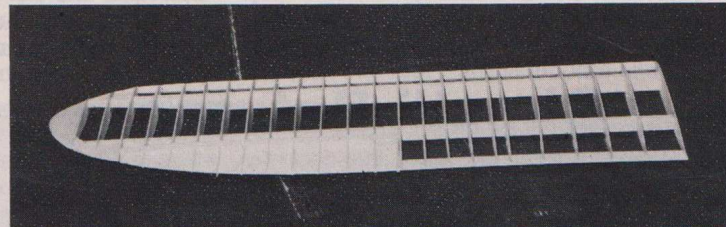
Left: A wedge has been glued between the rear fuselage sides, the clamp holding the joint together. F-1 1/2-in. balsa formers have been glued and clamped in place, and the side stringers and the very top stringer have been added. Right: The fin and stabilizer have been installed, and the top headrest stringers have been glued in place. The 1/8-in. balsa planking has also been started at the nose, top front.



Left: The 1/8-in. planking has been finished, straight pins used to hold the planks in position while the glue dries. Right: The rudder and elevator surfaces, shown here, were built-up on a 3/32 sheet balsa base. Ribs and 3/32 edges were added to the tops and bottoms, then sanded to shape. Author says that these surfaces could be cut and shaped from 1/4-in. very soft balsa if the builder wished to do so.



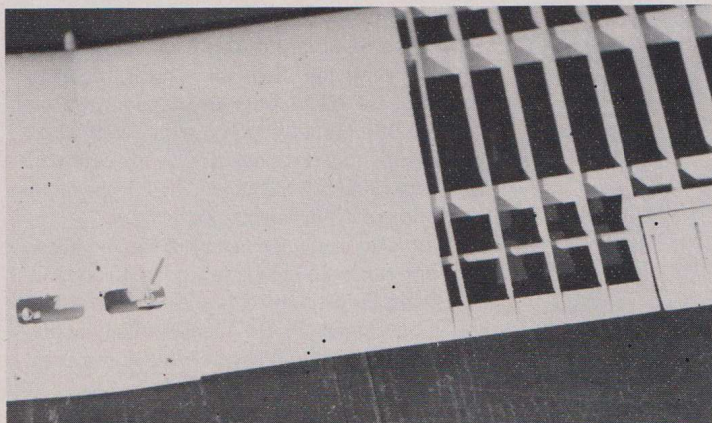
Left: The aft end of the fuselage has been completed. All the stringers and control surfaces are in place. Top Right: The basic wing structure. The aileron is tack-glued in place while the main structure is being built. It isn't cut away until after the completed wing has been sanded to shape. Above Right: The right and left wing panels have been joined with the dihedral braces, the torque rods and cranks for aileron control have been installed, and the center section has been sheeted. Photo credit: All photographs by the author.



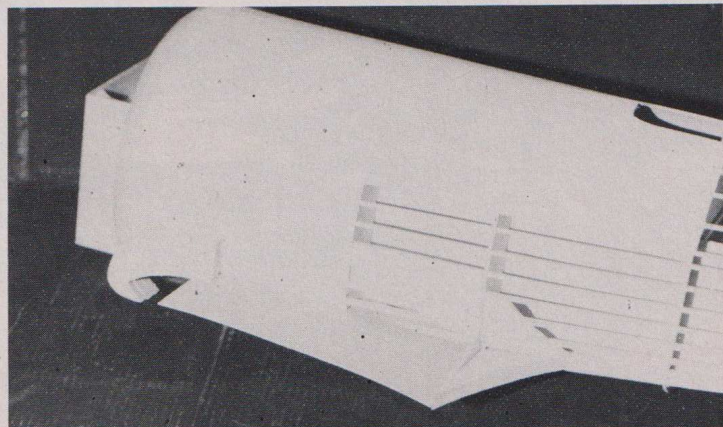
can be mounted where shown on the drawings. I would strongly suggest that you use a .90 glow engine as I did. The engine should be mounted on an Edson mount, using an Edson thrust wedge

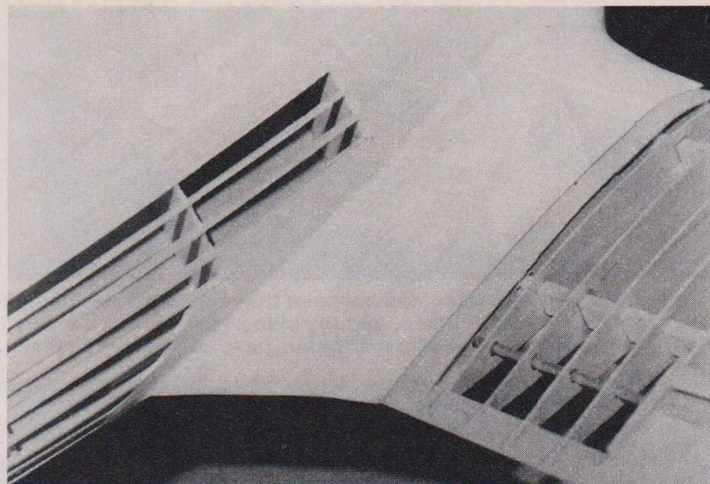
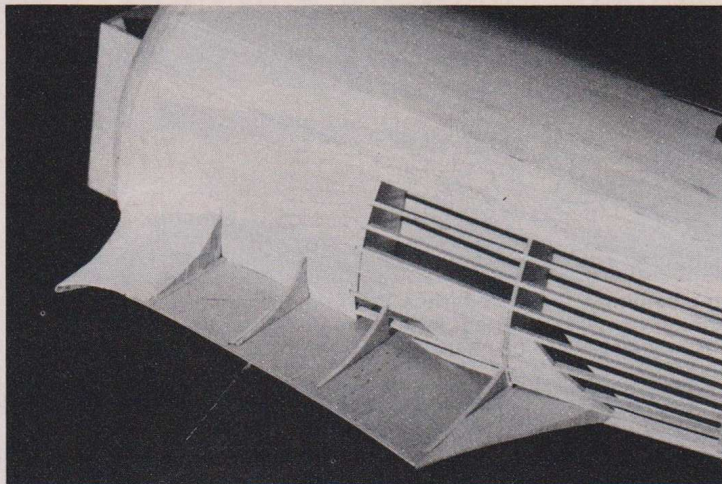
behind it. I later added a 1/16 ply additional wedge behind this to give a little more engine offset. This offset keeps the ship straight when sudden bursts of power are applied.

Build the stabilizer and fin from 1/4 sheet balsa. The rudder and elevators can be made of soft 1/4 sheet or can be built up as seen in one of the photos. I used 3/32 sheet for the basic structures and built up 3/32-in.



Left: Hopefully you can see the aileron torque rod and cranks a little better in this picture. Cutouts for the servos haven't been made yet. Two servos will be used, one for each aileron, connected with a Y-cord. Right: The wing fillet has been started by gluing the 1/16 ply base to the wing saddle. The rear fillet block has been glued in place as have the first few forward fillet blocks (WF-1, WF-2, and WF-3).





Left: The remaining front fillet blocks (WF-4s) have been added, and the front of the fillet has been carved and sanded to shape. The fillet is now ready for the 1/8-in. planking. **Right:** The planking is complete, and the fillet has been carved and sanded to final shape.

ribs and outer edges on both the top and bottom for better scale accuracy and less weight. When finished, sand to final shape, and glue the fin and stabilizer in position. The turtledeck stringers can be added at this time.

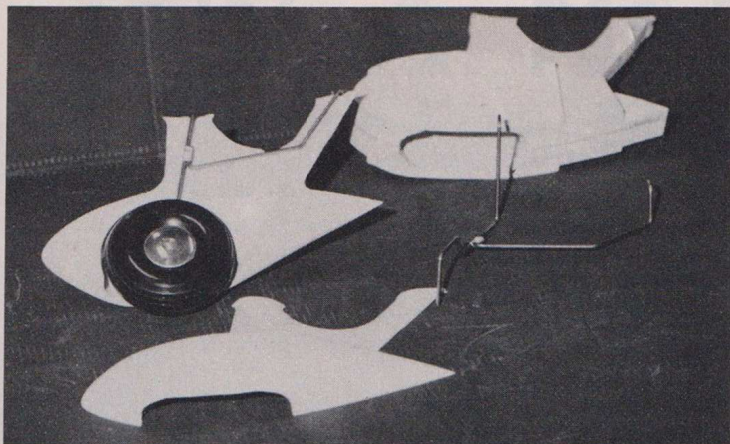
The forward end of the fuselage is sheeted or planked with 1/8 balsa. The top front of the model is planked back to F-5, and the sides are planked back to F-3.

When glue has dried, the structure can be sanded to final shape.

The wing must be built before the lower fuselage can be completed. Select a piece of hard balsa for the spars and the leading edge. Cut all ribs from the appropriate materials, and test-fit the spar cut-outs. I like to take a short piece of the spar material and slip each rib on it as the rib is

cut out. In this way I can get very accurate spar cut-outs, and when all the ribs are stacked on the short spar pieces, they can be sanded together very easily. The tip ribs, which have smaller cut-outs, cannot be stacked with the others, of course.

Trim the spar tips as shown on the plans, and mark each spar for all rib locations. Slide the ribs on the spars, and locate each rib in its proper position on the markings. Make sure you are working



Left: The landing gear wires have been bent to shape and the pieces bound together and soldered. One fairing is shown in the glued-up state, the other having been carved and sanded to final shape and the halves separated. **Right:** The completed and assembled airframe is a beautiful sight. It's almost a shame to cover it. But cover it, you must. Author favors Permagloss Coverite for light weight and appearance.

on a level surface. Support the spars over the plans on balsa blocks ($\frac{3}{4}$ sq. or similar) placed between the two A ribs and outboard in the last bay where the spars are still full depth (last two C ribs). Weight the spars over the blocks to keep everything true while gluing the ribs to the spars. Attach all ribs to the spars with cyanoacrylate (CyA) glue. Add the $\frac{1}{2}$ in. sq. leading edge and the trailing edge. Glue the $1\frac{1}{2} \times \frac{3}{8}$ -in. block in place at the rear of the ribs from outer Rib B to Rib G

after notching the block for each rib. Add the $\frac{1}{4}$ -in. balsa tip parts. Build up the landing gear mount blocks from $\frac{3}{16}$ ply, and epoxy them in cut-outs in Ribs A-1. Glue the $\frac{1}{8}$ ply wing wire mount plates on both the top and bottom of the wing.

Ailerons. Cut the leading edge for the ailerons from $\frac{3}{8}$ -in. balsa to the shape shown on the plans. Tack-glue this to the wing structure. Glue the $\frac{1}{4}$ -in. aileron base to the leading edge, centering it on both

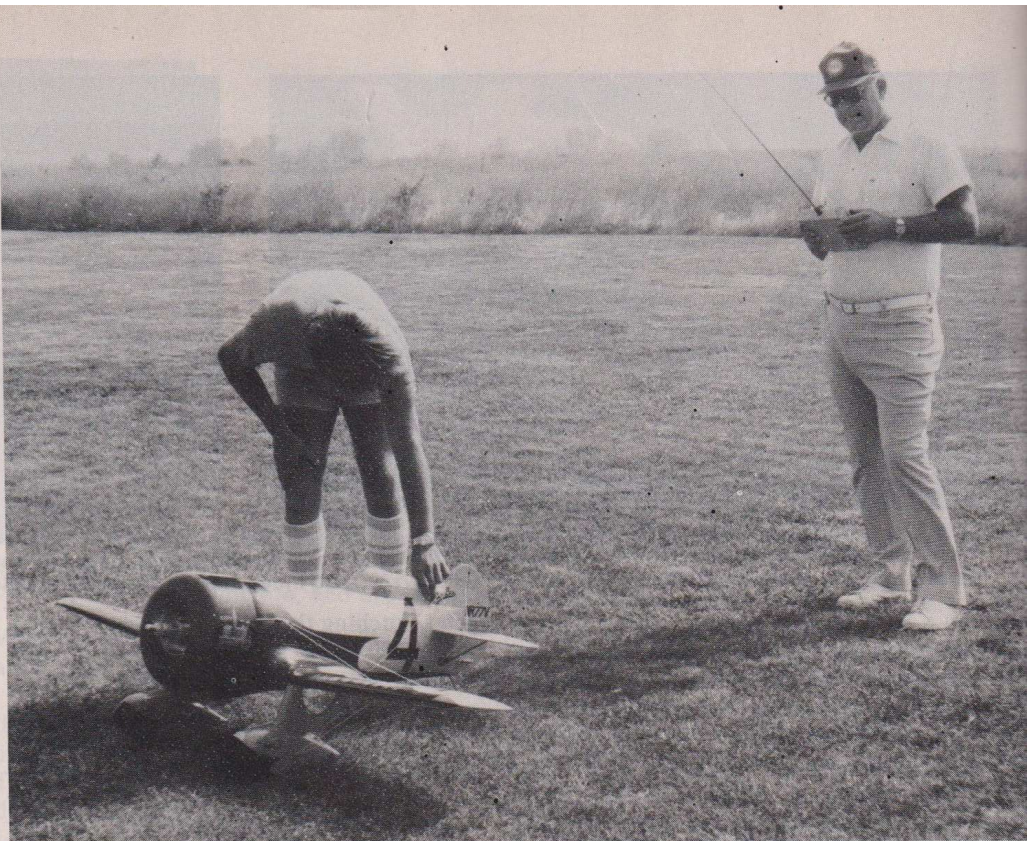
ends of the aileron leading edge. Add the half ribs, top and bottom. When all glue joints are completely dry, the aileron and tip area can be carved and sanded to final shape. When this has been completed, the aileron can be cut free of the wing structure. Glue $\frac{1}{4}$ -in. triangle stock to the top and bottom of the wing trailing edge block between outboard Rib B and Rib G.

Round the leading edge of the aileron as seen in the aileron cross section view. Add the basswood block at the inboard end of

the aileron. Make the torque rod of $\frac{1}{4}$ -in. aluminum tubing and fit it to the aileron. Plug 1 in. of each end of the torque rod with dowel. Drill a $\frac{1}{4}$ -in. hole squarely in the bass block. Install a wire hinge pin in the outboard end of the aileron, and a short piece of brass tubing in the wing tip to take the hinge pin.

Make a nylon bushing for each end of the torque rod as shown on the plans. A $\frac{1}{4}$ -in. hole can be drilled in a large control horn section to act as a bushing. Mount the bushing on Rib A and Rib B as shown. Install the torque rod, and secure it at the aileron by drilling and installing a sheet metal screw through the bass block and aluminum tubing. Drill the inboard end of the torque rod, and install a long 4-40 bolt as a servo crank. This completes the left wing panel. The right panel is built the same way except that the panel is built upside down on the leveling blocks over the plans.

When both halves of the wing are completed, they are joined with the $\frac{1}{8}$ ply dihedral braces. The dihedral braces give the correct dihedral to the wing structure. Glue the braces to one wing half. When dry, fit the other half of the wing. When everything has been trimmed for a good fit, the braces can be glued to the remaining half. Support one half of the wing on the leveling blocks used during construction, and support the tip of the other panel by blocking it up level to the work



It's do or die time. Henry's son, Raymond, holds the model while "Test Pilot Supreme" Syd Clements checks the controls prior to the first flight. Moments later, the model rose majestically into the air and flew perfectly. Takeoffs are easy with the Model Z, Haffke says.

surface while the glue dries.

Drill the leading edge and install the wing dowel. Finally, the center section is sheeted, top and bottom, with $\frac{3}{32}$ balsa.

Install a piece of $\frac{1}{8}$ ply, 1 x 8 in., on the underside of the trailing edge where the wing will be drilled for the nylon hold-down bolts.

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Gee Bee Z/Haffke

Black Baron Clear was sprayed over the paint when dry.

The large numbers (registration and racing numbers) were cut from a pressure-sensitive Mylar material and applied to the model. They are pin-striped with red striping tape. The rest of the small lettering was done by hand. The trim on the black painted areas was done with thinned K&B epoxy. The rest of the fuselage and landing gear markings on the yellow was done with Randolph butyrate dope, except for the rudder markings which were done with drawing ink. Clear Randolph dope was applied over the lettering to seal the edges. The finished model is very eye-catching with its bright yellow-and-black finish.

Detailing of a Scale model can be carried as far as the builder desires. I went all the way on this one, since I intended to fly it in the National Championships in Chicopee. Real Gee Bee country! Detailing starts with the installation of the flying and landing wires. These were made of elastic cord found in most sewing shops. Silver clevises were fitted to the ends of the top wing wires for attachment to an aluminum plate which extends about a half-inch through the fuselage skin. The plate is drilled to take the wing wire clevises and also to take the rod from the cowl which holds the cowl in position as it did on the original aircraft. A basswood fairing was carved to cover the wire attachment plate. This fairing is slipped in place after attaching the wing wires; the cowl rod fits through, holding it in place. Thin strips of Permagloss were cut with the aid of a metal straightedge and sharp modeler's knife. These strips were applied over every rib in the wing and tail surfaces to simulate the rib tape of the full-size aircraft. Streamline aluminum tubing was used for the stabilizer struts. A ply fairing was epoxied and held to the tail skid with three aluminum bands for a very realistic looking fairing.

The most difficult detailing to duplicate was the buckles which hold together the

metal panels just behind the cowl. These were regular trunk fasteners. After much thinking, I finally figured a way of making them. I obtained a real buckle and drew a 1/4-scale sketch of it. Using this as a pattern, I cut the flat base part of it from hard 3/32 balsa. The center raised part was made from a piece cut from basswood. I cut a flat-sided, oval-shaped piece from 1/2-in. basswood on a band saw and carved the top of this piece to look like the raised part of the real thing. When it was finished I sliced it off, carved the back of the lower part, and glued it to a base. A section of a regular paper clip formed the clamping wire over the top of it. A few drops of white glue simulated the screws which mount the buckle to the aircraft. It really wasn't as difficult as I had thought it would be, and I was almost baffled by its realistic looks. I was able to get all four parts out of the same piece of wood and had enough left over for a fifth part if it had been needed. These buckles were painted aluminum and epoxied to the model. They really attract a lot of attention.

The oil cooler is built-up from the patterns on the plans and has to be made removable. I installed a plate of 1/4 ply in the bottom of the cooler and drilled it to take a long sheet metal screw. This fastens it to a ply plate mounted in the structure under the wing-fuselage section. A 1/8 dowel near the aft end of the cooler keeps it aligned properly. A dummy engine was built-up of ply and balsa to form the crankcase. Williams Bros. Wasp Engine Cylinders were used around this crankcase. (Two cylinders were left off for engine cooling.) The dummy engine fits on three dowels which extend from the firewall. The dowels fit into receptacles on the back of the dummy engine. The engine is slipped into place on the dowels, and the cowl holds it there when it is installed. A dummy Curtiss prop was carved from basswood.

The cockpit cover on the full-size Model Z was formed from three pieces, and the one on my model was done in the same way. Patterns are given on the plans for the back section which is formed around the headrest bulkhead. A pattern is also shown for the bottom section

which curves around the cockpit opening back to the rear piece. These were installed using R/C 56 glue. The top curved part was cut from a molded canopy I got from Sig quite a few years ago. If you look around, you should be able to find a molded canopy that this place can be cut from. This piece was also glued in place with R/C 56 glue. When the glue was dry, I drilled tiny holes around the enclosure where the three parts overlapped each other and installed short pieces of common straight pin heads to simulate the screws which held the original one together. Don't forget to install a Lowell Bayles figure in the cockpit before installing the enclosure. Even though he is inside a closed cockpit, don't omit his goggles, since Bayles always wore them when flying.

Flying. If you have spent as much time on your model as I did on mine, you may hesitate to fly it. However, if you have built the model with no warps and have kept the weight down to 12 1/2 lb. or under, you will have no trouble flying it if you are a fairly competent pilot. Be sure that the model balances where shown on the plans, and *do not attempt to fly it if the balance point is behind where it is shown on the plans.* If everything checks out as above and you are still hesitant, it would be a good idea to get a good pilot of Scale models to test fly it for you. I know I am always too shaky with a new model, although I have done it a few times.

I really expected the Gee Bee to be squirrely because of its short moments. That did not prove to be the case. I was very surprised to find that it is one of the easiest models on the takeoff that I have ever flown. As a matter of fact, it handles just like my Quarter Scale Gee Bee R-1 (February 1983 *Model Aviation*) on take-off. Apply power with just a touch of up-elevator to keep the tail down as it starts to roll. When it gets moving some, let up on the elevator. The tail will come up, and it will run a mile (if you let it) on the main gear. It runs as straight as an arrow, and it will lift off only when you give a touch of up-elevator. Just make sure you don't horse it off before flying speed is attained.

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stable—not at all touchy on the controls. It really grooves and will surprise you with its fine flying traits. Bill Turner has told me that his full-scale Model Z replica is a very stable craft in the air.

Ground handling with the full-size one was a problem, as the rudder was completely ineffective below 80 mph. Steering with the brakes was a must. The model, however, has acted fine in all landings. Bring it in a little fast until you become familiar with its characteristics, and you should have no trouble. Just hold it off until it slows up and settles. Every landing it has made on grass has been perfect; and it has been flipped over only once—on one of my flights at the Nats. I brought the model in very smoothly to the touch-down, but the crosswind must have had it crabbing a little; as soon as the wheels touched, it flipped on its back. The only damage was some scratched paint on the top of the cowl and top of the fin.

I have really enjoyed flying the Model Z, probably more than any other model I have ever flown. I am sure that anyone who builds one will enjoy it as much as I have. If you wish to compete with your model, I will be glad to help with documentation. I have many original photos of the original Model Z and many more of Bill Turner's reproduction if you want to build one with a tail wheel (which he has on his). Contact me at this address: Henry A. Haffke, 1038 West Elmer Rd., Vineland, NJ 08360.

