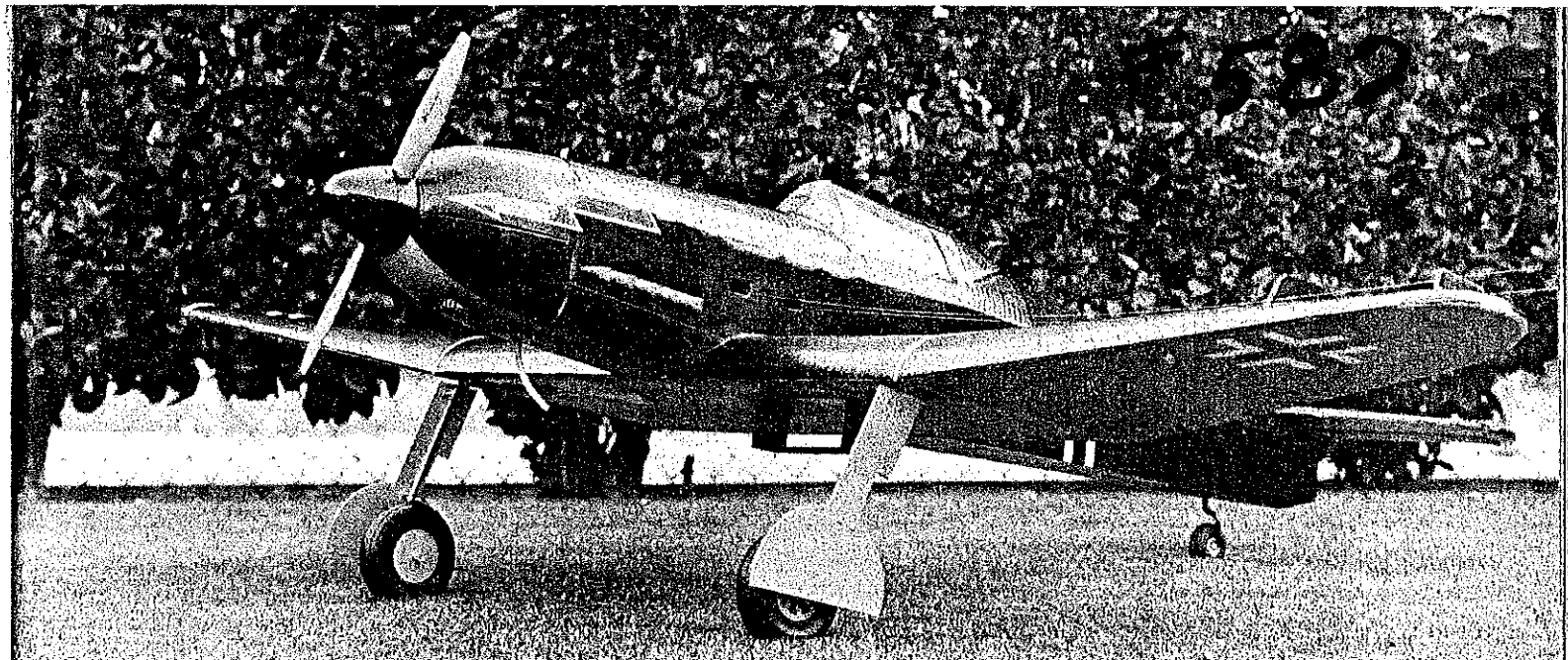
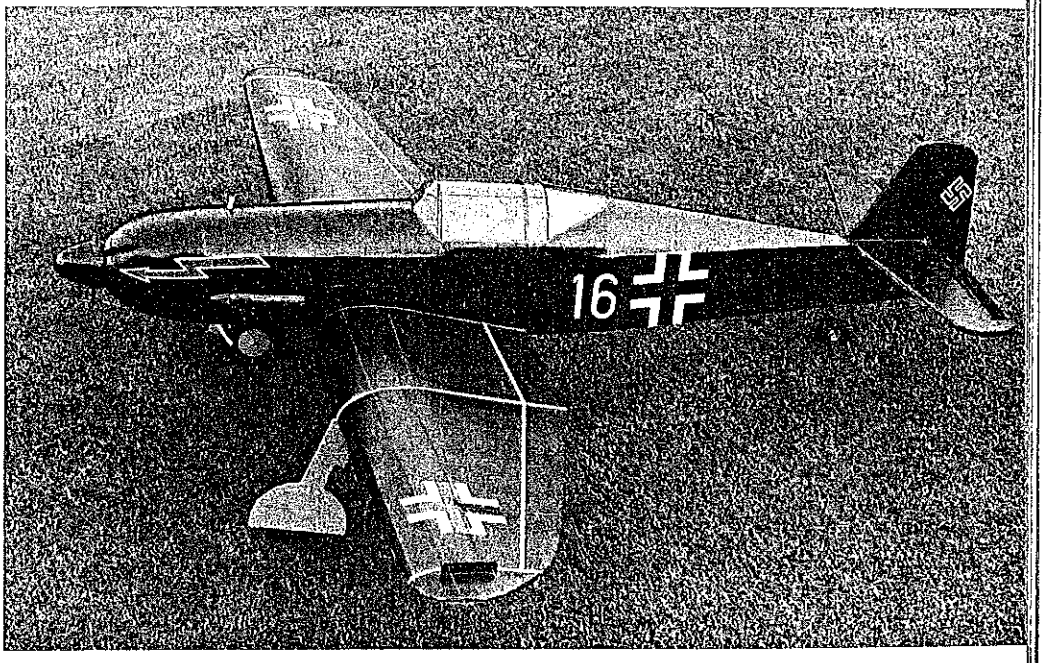


Heinkel 100

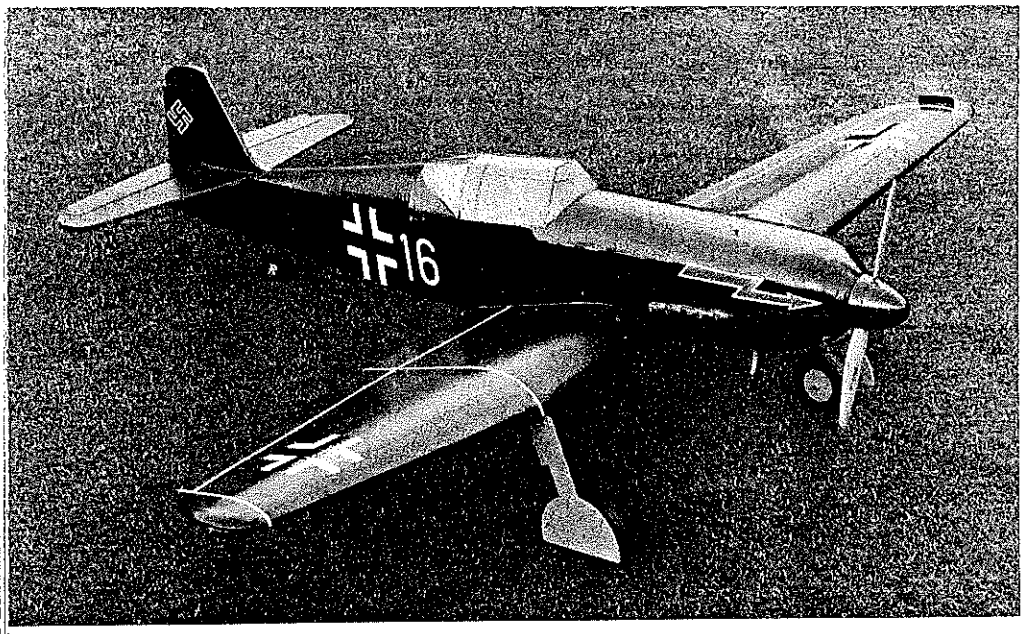
It's another of the WW II fighter designs that never made it into full production, but this Control Line model built mostly from cardboard gives its designer's dream a chance to live vicariously in flying circles everywhere. ■Chuck Felton

WHEN THE GERMAN military machine passed over Ernst Heinkel's He 112 in favor of the Messerschmitt Me 109, a disappointed but determined Heinkel made up his mind to build a fighter that was second to none. To prove his engineering talents to the world (and in particular those who'd picked the Me 109 over his offering), he made it one of his chief design aims to break the 450 mph speed record. The result of his avenging efforts was the He 100 fighter.

The design philosophy was simplicity of construction geared to facilitate easy mass production. It was to have all functional design features treated for ease of assembly line production, yet without compromising the desired high performance. When the He 100 made its first flight on January 22, 1938, it was obvious that its performance would be not just above expectations but superior to anything then flying. The plane was an extremely small and good looking fighter which went on to set a new world speed record of 464 mph in March of 1939. Twelve He 100s were used for fake propaganda photographs which fooled Britain into believing a new fighter called the He



Top: With a stance and sleek lines that make it look like its going 200 mph even when sitting still, the Heinkel He-100 is sure to bring out the onlookers when you set it down in the flying circle. Above: Using cardboard as the basic building material is not a particularly new way of constructing a CL model, but if you've never tried it, you don't know what you're missing.



The prototype shown here was finished with spray dope (see text for details), but almost any of the iron-on coverings can be used to produce a very attractive model. If possible, use cardboard that's constructed with white-finish paper on one side for a smoother outer surface.

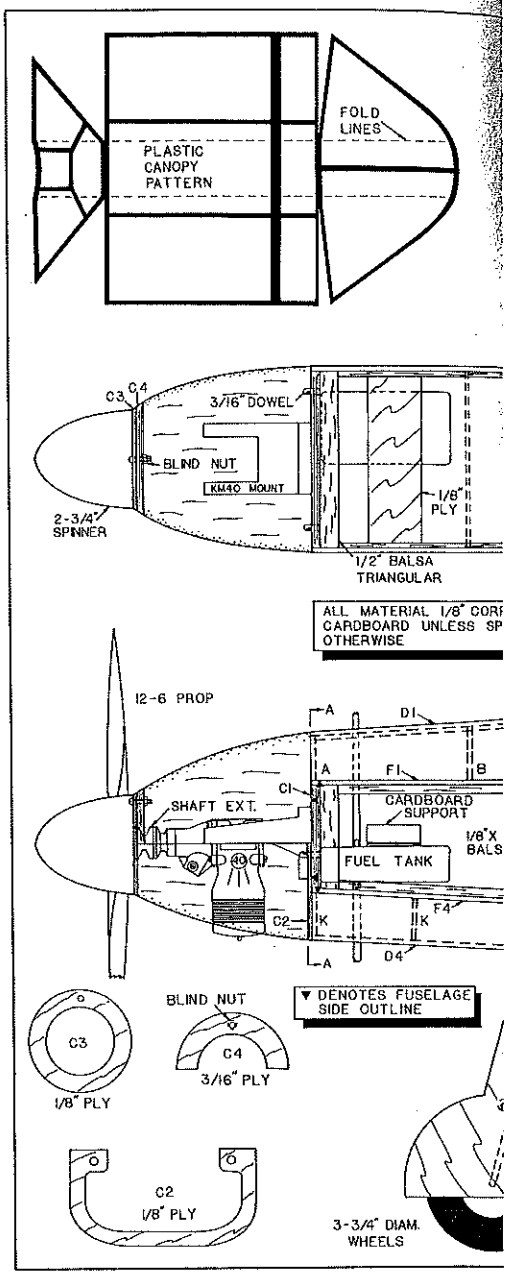
113 was in full-scale service.

Unfortunately (but fortunate for the allies), Heinkel never had any success in selling his He 100 fighter to the Luftwaffe. They had already based their fighter program entirely on the Me 109 and Me 110 aircraft, and were not anxious to introduce a new fighter. The Luftwaffe felt not only that the performance of their existing fighters was adequate, but that they could simply overwhelm the enemy with their sheer masses. After all, the war was expected to be a short one. Both Russia and Japan, however, purchased three He 100 aircraft apiece for design studies. They must have liked what they saw, for one can easily see the direct influence of the He 100 on the Russian Yak-3 and Yak-9 and the Japanese Kawasaki Ki 61 Tony.

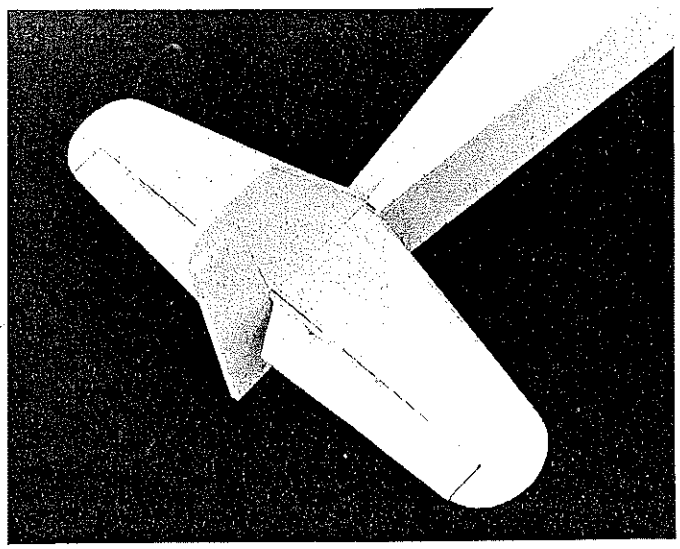
The model presented here is constructed primarily of ⅛-in. corrugated cardboard. This greatly reduces both the building time and the cost. The design makes use of cardboard's unique ability to be folded. The wing is built of two large pieces of cardboard, with cardboard ribs and a single balsa and spruce spar. The tail surfaces and fuselage are primarily cardboard with little internal bracing. The result is a low-cost, lightweight, fast-building model that has good scalelike appearance and is capable of taking plenty of punishment at the flying field.

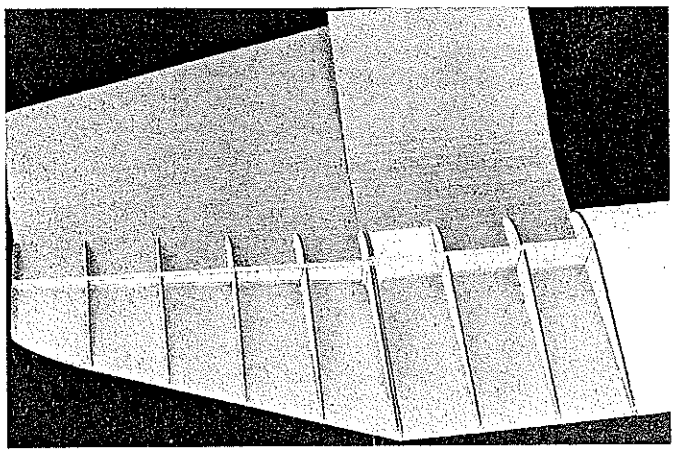
Cardboard varies in weight, but any ⅛-in. corrugated cardboard will do. Sources for this material include box manufacturers and local shopping centers where you can find stacks of discarded boxes. Look for cardboard with brown paper on one side and a white-finished paper on the other. The white paper on the outside of the model results in a smoother finish and neater appearance. The method of folding the cardboard and the use of gummed paper tape to seal the joints and exposed corrugations will be explained later in the construction hints.

The model is built to a scale of two inches to the foot, resulting in a wingspan of 61 in. and a length of 53 in. The bottom of the airfoil is flat with a curved upper surface, due to the scoring and folding technique employed. Engines of .30 to .40 size can be used. Its size and stability make it a good sport-flying model.

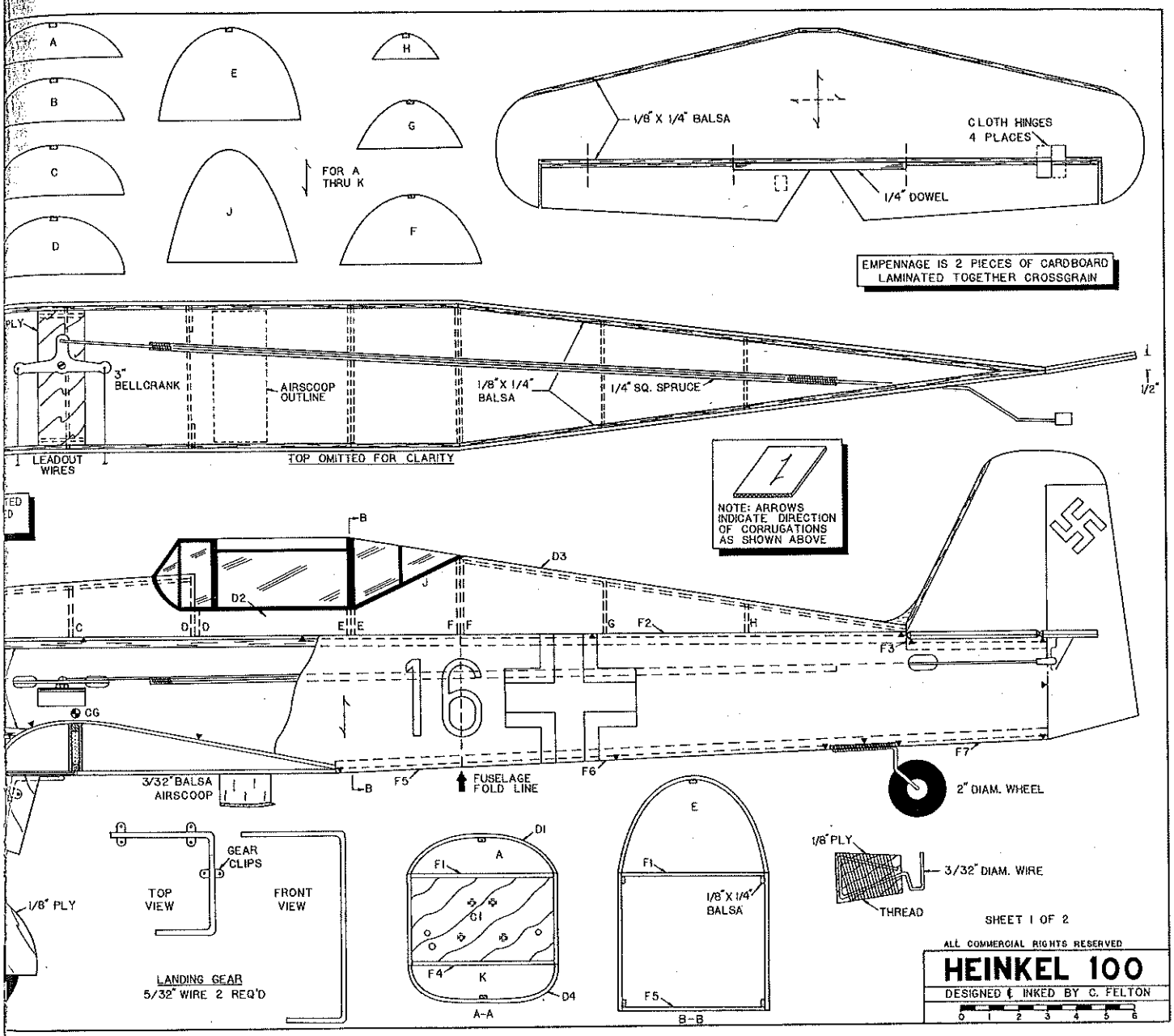


Construction hints. Before we begin, take





Left: The leading edges of the tail feathers are capped with a strip of ⅛-in. balsa to allow them to be rounded off. Above: The wing is composed of a single laminated spar (see plans), cardboard ribs, and folds in the leading edge to obtain the curved upper surface.

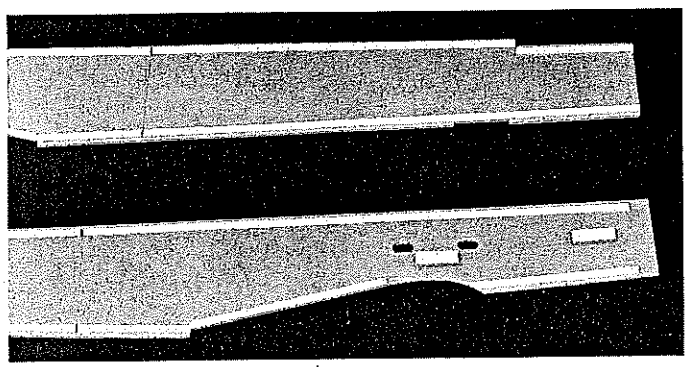


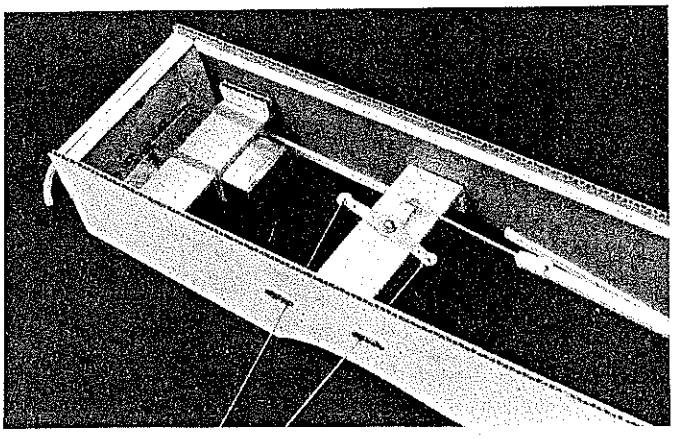
a look at these special tips for working with cardboard.

Glue: Water base glue, such as white glue or Titebond, is recommended. Contact cement is not recommended, since parts cannot be shifted when using it to glue surfaces.

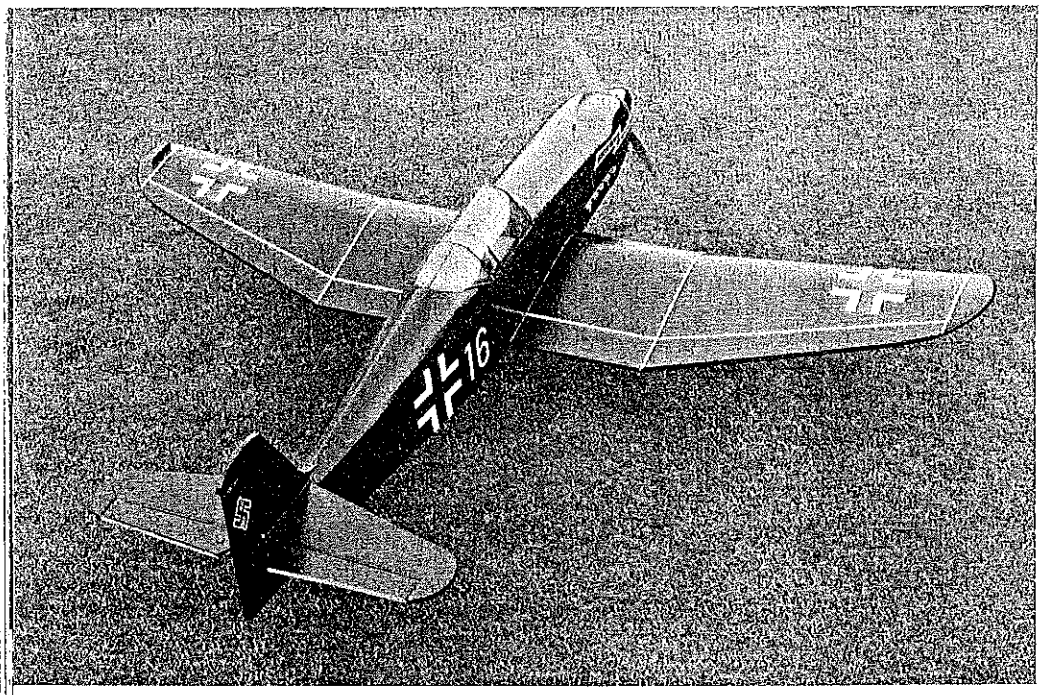
Folding: The scoring of the fold lines is done with a screening tool available at any hardware store. It consists of a handle with a 1½-inch-radius wheel at one end, which is run along a straightedge on the fold line.

Waterproofing of cardboard is quite simple and can be done to the raw material before you cut out the parts of the model. Simply mix 25% clear polyurethane with 75% paint thinner. The latter can be the cheapest hardware store variety, which is thoroughly mixed with the clear polyurethane. Brush the mixture liberally onto the cardboard sheet, and allow to dry for 48 hours. This adds no appreciable weight to the material, and renders the cardboard completely waterproof. In addition, when you start to cut the treated cardboard,

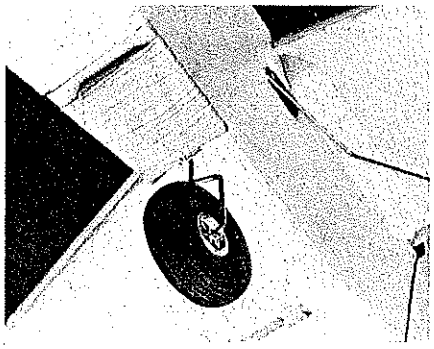




Above: The fuselage sides are lined with balsa strips. Cardboard supports are used to hold the bellcrank and fuel tank mounts. Right: The front builds as shown here and is both rugged and lightweight.



The prototype paint scheme was dark blue on top, and medium gray on the bottom. The outline trim, lines on the sheet-plastic canopy, and numbers were all done with MonoKote.

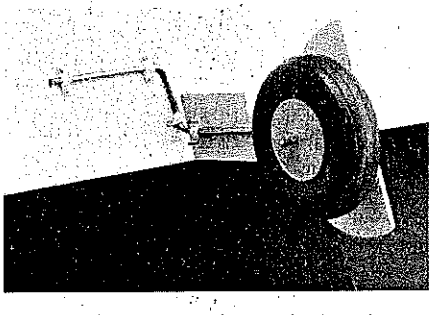


The tail wheel is attached to its ply platform by wrapping the wire with string and smearing it with glue. The plywood and landing gear assembly is then glued into the model. Tri-stock reinforces the stab/fuselage joint.

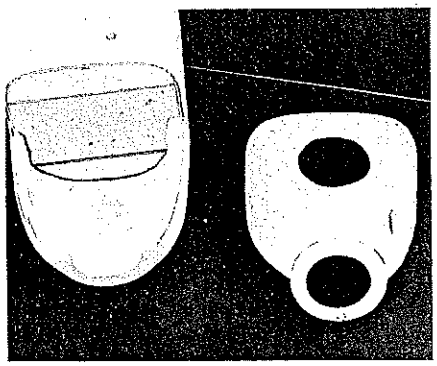
you will find that it is as crisp as wood and can be cut sharply and cleanly.

Paper tape: All seams, joints, and exposed edges of the model are covered with strips of gummed paper tape. (Obtain a 1-in.-wide roll from a stationery store.) Simply cut a thin strip to length, dip it in water, and smooth it over the seam.

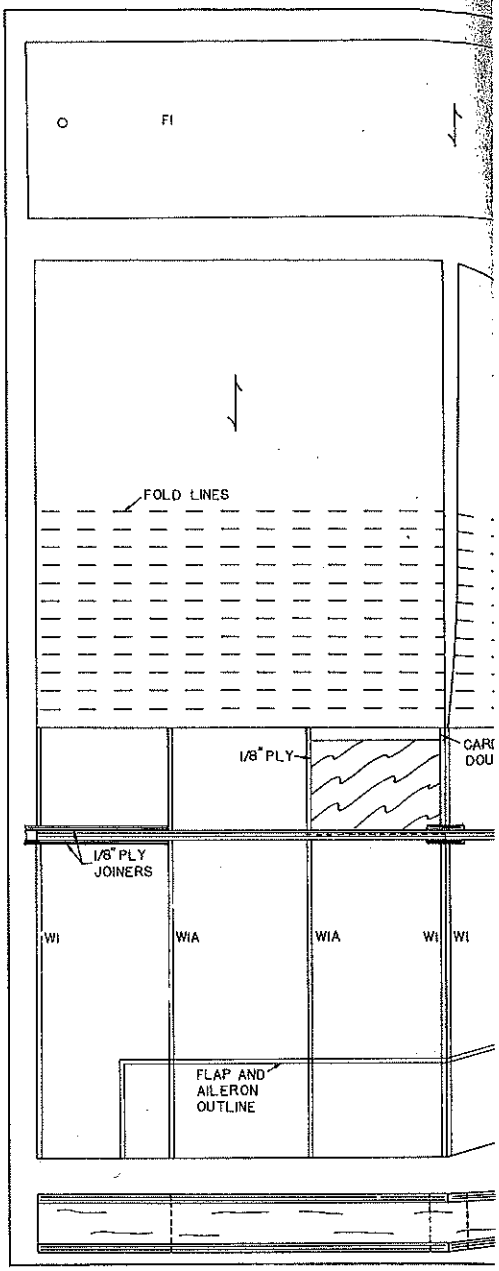
Finishing: Cardboard gives a solid surface with no open areas to cover, and it's nonporous. The easiest finishing method is to apply two coats of clear dope, sanding lightly between the coats with #400 sandpaper, followed by three coats of color dope. However, a wide variety of finishing materials may be used on the cardboard.



The main landing gear is attached to ply supports in the wing with nylon gear clips. The landing gear door is also made of plywood.

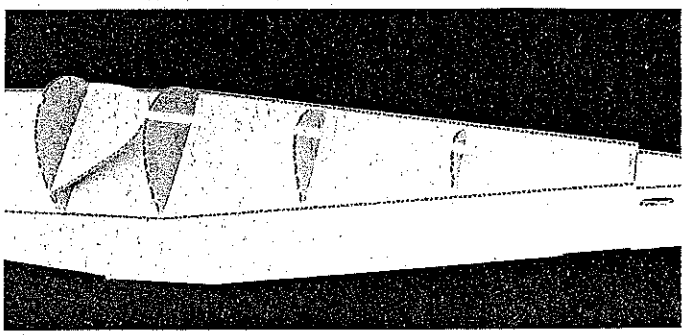


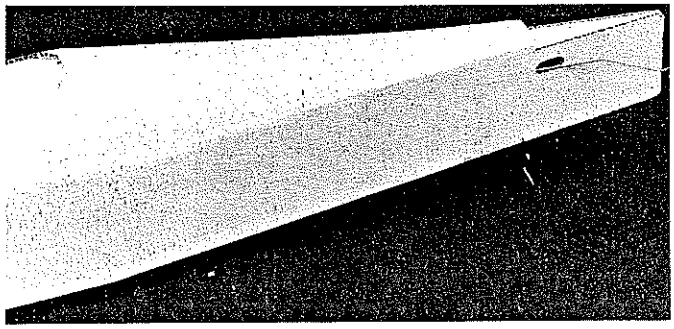
The cowl is made from two carved balsa blocks and reinforced with plywood formers.



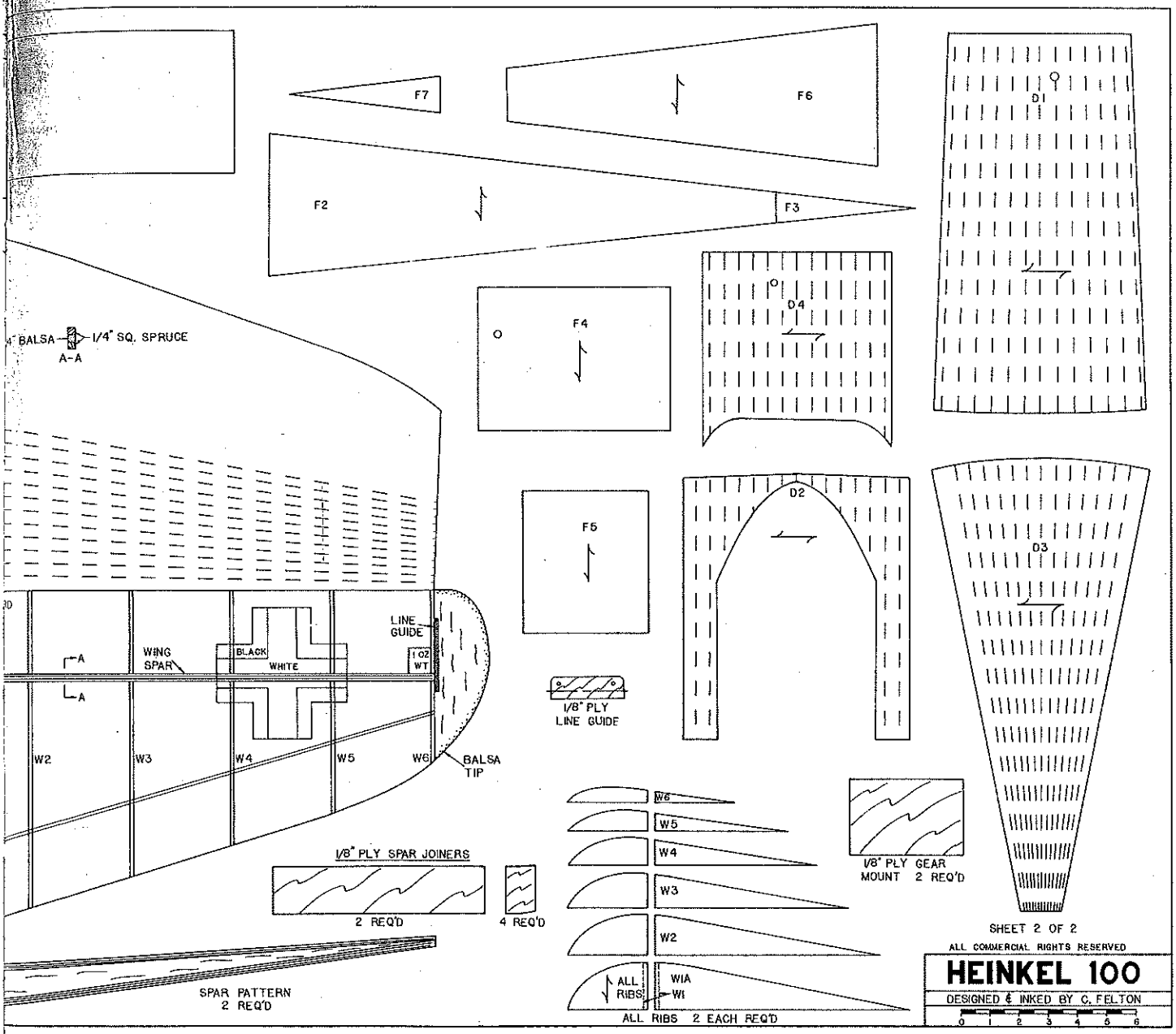
Coverings such as Solarfilm, MonoKote, and vinyl paper can be used. With any of these coverings, it is recommended that the surface not be doped, for a better bond.

Construction. Cut out all cardboard and wooden parts using the template outlines. Be sure to note the direction of the corrugations in the cardboard. Score and fold cardboard parts as indicated on the plans.





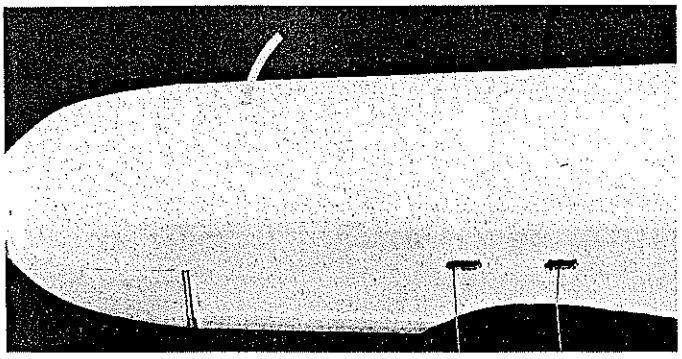
Left: The top deck is made up of cardboard formers and balsa stringers. Right: The top deck cardboard pieces are scored with a screening tool, then molded around the formers and stringers to achieve the desired shape. Bevel the balsa strips at the tail so the sides come together.

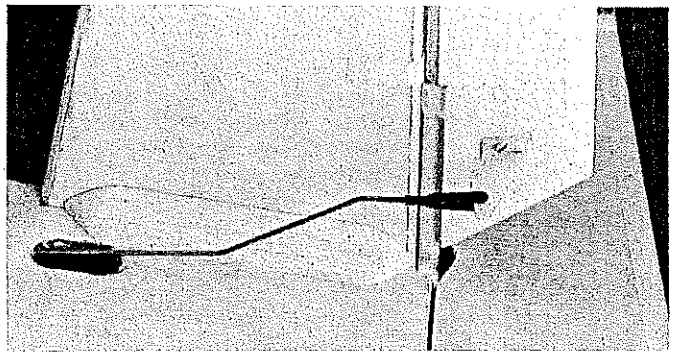


The fin, rudder, stabilizer, and elevator are each made from two pieces of ⅛-in. cardboard laminated together cross-grained, resulting in ¼-in.-thick surfaces. Add a ⅛ x ¼-in. balsa strip to the fin leading edge, and round it off. Add ⅛ x ¼-in. balsa strips to the stabilizer leading and trailing edges and round off. Glue the elevators to the ¼-in. dowel. Add ⅛ x ¼-in. balsa strips to the remainder of the elevator leading edge, and round off. Seal all raw edges with gummed paper tape. Hinge the elevators to the stabilizer with cloth hinges at four places.

Wing. Make the spar by capping each ¼-in. balsa spar half with a ¼ x ¼-in. spruce strip, top and bottom. Join the spar halves with ⅛-in. ply joiners front and rear at the centerline and at the dihedral break. Glue the ⅛-in. ply gear mount into each wing panel. Glue the right side of the wing panel spar onto the right-hand wing panel

Continued on page 164





Left: The engine cowl is carved from a balsa block. (See the text for more details.) Right: A dowel joins the cardboard elevator halves. Our author chose cloth hinges for his model. Gummed paper tape (from a stationary store) seals the exposed cardboard on the trailing edges.

any manner for proper fuel flow.

The entire model is covered with ¾-oz. glass cloth. The wing has a lifting-type airfoil section at the root with 1° of positive incidence, while the tip section is symmetrical with 0° incidence. The custom-made reverse monoline control unit is mounted to the aluminum plate with a 1/16-in. wire pin. (Check the drawing for more detailed information.) The model is balanced to hang about 1° nose out when suspended by the control line.

Charles indicated that the model flies and grooves well, but it has a tendency to climb when the engine shuts off. The fuel tank is a suction/uniflow system and seems to work quite well.

For more information concerning this model, write to the designer: Charles Legg, 11 Gayland Dr., Route 5, Box 58, Council Bluffs, IA 51501.

The next edition of the "CL Speed" column will cover the development of the Dyna-Jet engine.

Heinkel 100/Felton

Continued from page 69

from the centerline to the outboard W1 rib. When dry, glue the outboard portion of the spar to bottom wing from W2 through W6. Glue all cardboard ribs into the right wing. Add a cardboard doubler over the ply gear mount between ribs W1A and W1. Glue a 1-oz. weight to the right wing tip.

Glue the left wing panel to the left spar in a similar fashion. Add the ribs and gear doubler to the left wing. Apply glue to the top of the inboard wing spar from the centerline to the dihedral break, to the top of the ribs, and to the trailing edge of the inboard wing. Fold the top wing surface down, and pin securely in place until dry. Repeat the process with the outboard wing panels.

Add the balsa tips to the wing. Make a line guide from 1/8-in. ply. Cut a slot in the left balsa wing tip, and glue the line guide in place. Cover the trailing edge and all seams with gummed paper tape.

The fuselage sides are outlined with a triangular symbol on the drawing. Line the upper and lower edges of each fuselage side with 1/8 x 1/4-in. balsa strips, as shown in the fuselage side view. The strips are recessed 1/8 in. from the fuselage edges. Bevel the strips at the aft end of the fuselage so that the cardboard sides will come together. Add cardboard supports to each fuselage side above the fuel tank and below the bellcrank.

Make the firewall, C1, from 1/4-in. ply. Locate the mounting holes for a KM-40 engine mount on the face of C1. Drill the mounting holes, and install blind nuts on the back side of C1. Drill a hole in C1 for a fuel tubing exit, and two holes for the 3/16-in. dowels. Glue the dowels into C1. Line all four back edges of C1 with 1/2-in. triangular balsa for bracing.

Glue C1 to the right side of the fuselage. When dry, glue the left side of the fuselage to C1. Attach the fuel tank to the 1/8-in. ply support (using rubberbands is a simple and acceptable method). Make a pushrod from 3/32 wire and 1/4-in.-sq. spruce, and attach it to the bellcrank along with the lead-out wires. Install the tank and bellcrank assemblies by gluing the ply supports to the cardboard supports on the sides of the fuselage. Glue the fuselage sides together at the tail.

Glue F1, F2, and F3 in place to cover the top of the fuselage. Be sure to bring the fuel tubing fill and overflow lines out during all covering operations. Cover the bottom of the fuselage with F4 through F7.

Add bulkheads A through J to the top fuselage. Cover bulkheads A through D with D1, which has been scored and folded. Cover bulkheads D through F with D2. Cover bulkheads F through H with D3. Add the three K bulkheads to the forward bottom fuselage, and cover with D4.

The cowl is made from a hollowed-out balsa block. The top half consists of a hollow block with C4 (3/16-in. ply) glued to the front. Drill a hole in C4, and install a blind nut on the back side before gluing to the balsa block; then glue the block to the firewall. The removable bottom half of the cowl consists of C2, the hollow block, and C3. The holes in C2 must align with the 3/32 dowels in the firewall, C1. When aligned, glue C2 to the back face of the hollow block. The holes in C3 must align with the hole in C4 in the top block. When aligned, glue C3 to the front face of the lower block. Sand, carve, and hollow the balsa block to shape. Test fit the engine in the cowl, and drill the mounting holes in the KM-40 engine mount. Use a shaft extension to give adequate spinner clearance. Cut holes in the cowl block for the cylinder head, exhaust, and needle valve.

Glue the stabilizer to the fuselage. Add 1/2-in. triangular balsa stock to the bottom of the stab at the fuselage intersection for bracing. Glue the fin to the fuselage. Add the rudder to the fin, with the trailing edge offset 1/2 in. to the outside of the flying circle.

Make the tail gear from 3/32 music wire. Bend as shown, place on the 1/8-in. ply support, wrap with nylon thread, and smear with glue. When dry, glue into the cutout in the fuselage bottom.

Make the main gear from 5/32-in. wire as shown. Make gear fairings from 1/8-in. ply, and attach to the gear with nylon gear clips. Attach the gear assemblies to the 1/8-in. ply

supports in the bottom wing with nylon gear clips. Make the air scoop from 3/32 balsa, and glue to the bottom of the wing.

Finishing. Paint and trim the model before final assembly. The color scheme is dark blue on top and medium gray underneath. The lettering and trim are made from MonoKote. Make the canopy from thin plastic, and epoxy it to the fuselage. Outline the canopy with strips of MonoKote. The aileron and flap outlines are also made of MonoKote.

Final assembly. Glue the wing to the fuselage. Pass the lead-out wires through the wing tip line guide, and tie off. Attach the nylon control horn to the elevator, and hook up the pushrod. Attach 2¾-in.-dia. wheels to the main gear, and a 1½-in.-dia. wheel to the tail gear. Attach a 12 x 6 prop and a 2¾-in. spinner. Lastly, make sure the model balances at the point shown on the plans.

Your tribute to this rebuffed aeronautical engineer is now complete and ready the be tested at the flying field.

NMPRA Champs/Hager

Continued from page 80

Five more rounds were scheduled for Sunday. That would be 10 rounds altogether, quite a chore with 51 entries.

Placings were pretty much unchanged at the end of Round Five. But wait. Jessica Thurrott was in third place. Could this young lady be sneaking up on all the old-timers? With her times of 1:12 and 1:13, look out, guys! Don't make any mistakes or she might blow your wings off. (I made that mistake and was beaten by Jessica.) She is an excellent flier.

Round Seven: Gary Hover bested Henry Bartle 1:12 to 1:14. Dave Shadel and Jessica Thurrott both were only one point down—just waiting for Hover to make that one mistake.

At about this time Rich Tocci decided to land his beautiful Estralita in the surrounding jungle. Out came the machete, and the search was on. It was eventually found in the top of a tree. It was extricated with just a few nicks on the wing leading edge.

Heat Eight of Round Eight had Ron Mendel, Tom Strom, Norm Johnson, and Paul Benezra in a very fast race. Benezra won with 1:13. Mendel was second with 1:14, Strom third with 1:26, and Johnson fourth with 1:17. There were very few freebies at this contest!

The first heat of Round Nine had another exceptionally close one when Henry Bartle, J.P. Hanway, and Gary Gau were up. Bartle just edged out Hanway with 1:14.96 to 1:14.99. Seems as though Bartle likes 'em close—especially when he wins.

Gary Hover was still on top with one more round to go.

At this point it seems fitting to say that it has been a long time since I've been to a race of this size in which we were able to get in 10 full rounds in just two days. This was possible because of the great job done by Dave Tyson, his wife Doris, and all of the great workers—each just as important as the other, as it takes teamwork for a race to go as smooth as this one did. I join with the NMPRA in applauding all of you.

Jessica Thurrott won Heat Four of Round 10 thanks to the author's flying a short lap. Dave Shadel won Heat Five with a time of 1 min. 11 sec. He still was in second place. (Shadel's worst time for the meet was 1:12.49, with most of his times being from 1:09 to 1:11.)

All eyes were on Gary Hover in Heat Nine. If he didn't win this heat, the contest would be up for grabs. Gary pulled it off. That gave him a perfect score and clinched his 1987 Formula I NMPRA Champion title.

There was a flyoff for eighth place, with Lyle Larson besting Bruce Brown. Other ties were sorted out by the fliers' best time or best points. Dub Jett's 1:09.61 was still the best time when all the flying was over.

The top 20 in the 1987 NMPRA Championships were as follows: 1. Gary Hover, 2. Dave Shadel, 3. Jessica Thurrott, 4. Henry Bartle, 5. Gary Long, 6. Dub Jett, 7. Mike Helsel, 8. Lyle Larson, 9. Bruce Brown, 10. G.E. Jacobson, 11. Paul Benezra, 12. Ron Mendel, 13. Ed Rankin, 14. David Doyle, 15. Dennis O'Brien, 16. Pete Reed, 17. Gary Parise, 18. Gary Gau, 19. Thommas Strom, 20. Norm Johnson.

For those of you who did not come to the 1987 race, you missed a great one. Let's get started now for 1988. It should be held somewhere in Texas.

No-Cal Corsair/Lidberg

Continued from page 88

side that's covered), and glue on the motor stick. Position the stab and wing, and glue in place. If you like, fill in the gap under the wing. Add a loop of rubber (3/32 if your model is very light; 1/8 in. if you build heavier, as I do), and check the balance. Use some clay (it's most likely to be needed under the stab) to move the balance point to where it should be.

Flying. Try some test glides, adjusting the amount of clay to modify the glide angle. If everything is reasonably straight, a gentle turn will be present; either direction is OK as long as it's not too tight. Try about 50 turns to see what happens under power. If the model won't climb, add more turns and/or take off some tail weight. If it stalls, or just can't seem to pick a direction to fly in, add some downthrust. Bend the flexible prop hanger to correct a too-tight climb turn, but correct the glide turn first by warping the fin as needed.

As you get things sorted out, which should only take a few flights, add more winds. Use a winder from the rear; your helper can hold the prop hub. The F2G-1

Continued on page 166