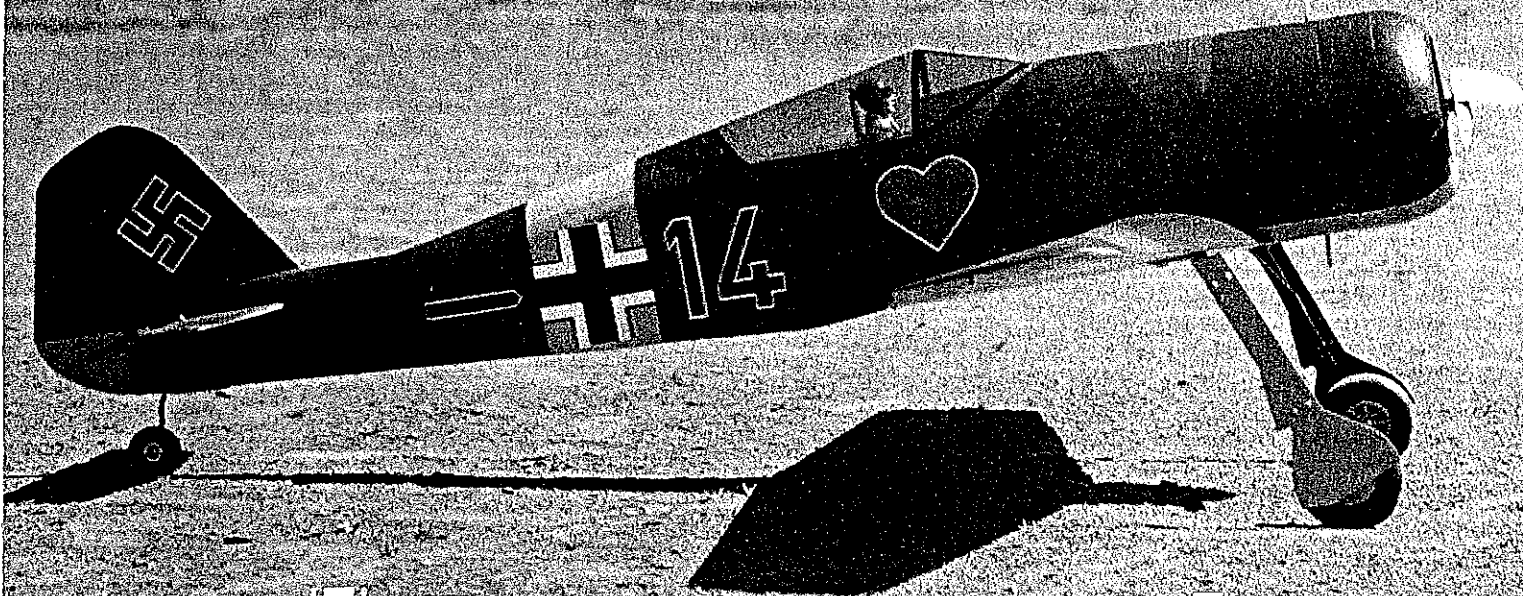
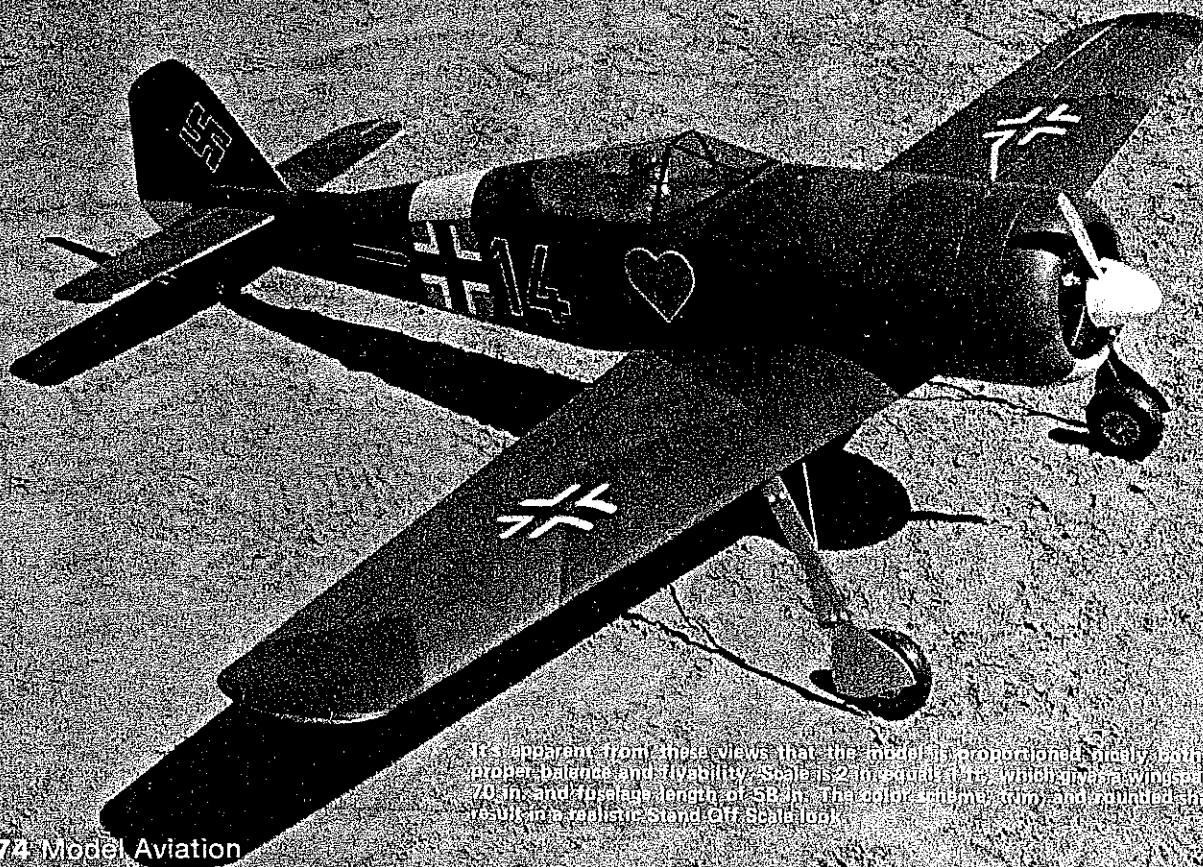


Without close examination it's hard to tell that this .60-size CL Stand Off Scale model is built mostly of corrugated cardboard. This material is economical, strong, and it builds quickly. ■ Chuck Felton



+Cardboard+

FW 190



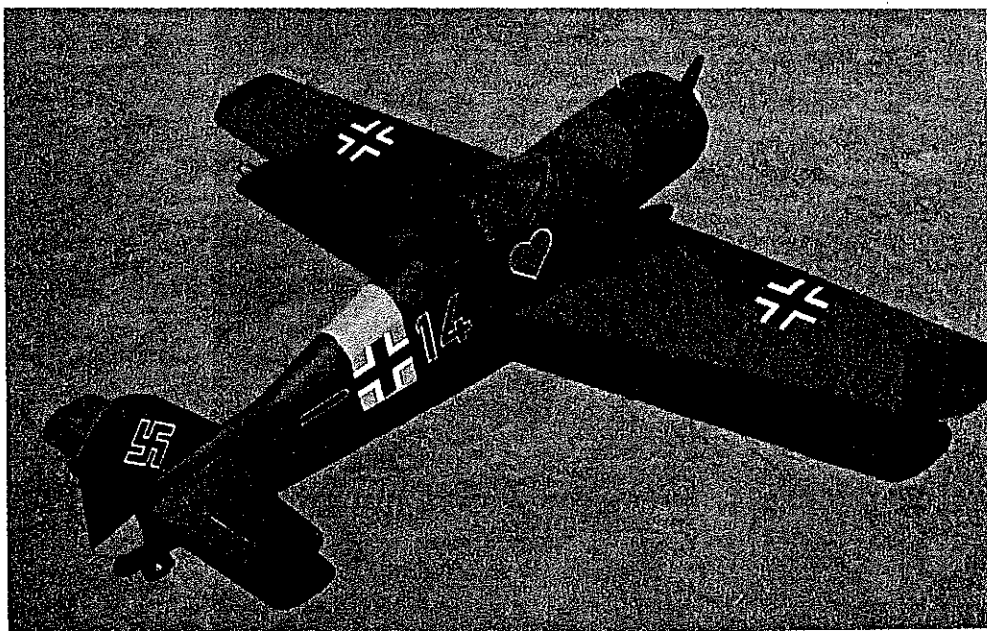
It's apparent from these views that the model is proportioned nicely both for proper balance and stability. Scale is 21 in. equals 1 ft, which gives a wingspan of 70 in. and fuselage length of 58 in. The color scheme is trim and rounded shapes result in a realistic Stand Off Scale look.

THE FW 190 WAS DESIGNED for those who would like to try their hands at building a large Control Line model without spending a lot of time or money. To meet these goals, the model is constructed primarily of 1/8-in. corrugated cardboard which greatly reduces both cost and building time.

The design makes use of cardboard's unique properties. The wing is built of two large pieces of cardboard with cardboard ribs and a single spar. The fuselage, built primarily of cardboard, consists of an inner box structure with fuselage formers covered with cardboard to achieve the required round fuselage shape. The result is a low cost, lightweight, fast-building model that has good Sport Scale appearance and can take plenty of punishment at the flying field.

The material used for the FW 190 is 1/8-in. corrugated cardboard. Cardboard varies in weight, but any 1/8-in. cardboard will do. Sources of cardboard include box manufacturers or any local shopping centers—which usually have stacks of discarded boxes. Look for cardboard with brown paper on one side and a white-finish paper on the other. The white paper on the outside of the model results in a smooth finish and neater appearance. The method of folding the cardboard and use of gummed paper tape to seal the joints and exposed corrugations is explained in the construction hints.

The model is built to a scale of 2 in. equals 1 ft., which gives a wingspan of 70 in. and a length of 58 inches. A 60-size engine provides ample power. Throttle control is definitely recommended for a model of this size. The smooth and stable flight characteristics in conjunction with touch-and-goes and taxiing via the speed control



The simple technique of folding 1/8-in. corrugated cardboard at 1/2-in. intervals is used for the rounded fuselage and wing shapes. Include a pilot figure for best realism.

make it a fun sport flying machine. If you have any questions or comments, write to me in care of *Model Aviation*.

Construction hints. *Glue.* Water-based glue, such as white glue or Titebond, is recommended. Contact cement is not recommended since parts cannot be shifted when gluing surfaces.

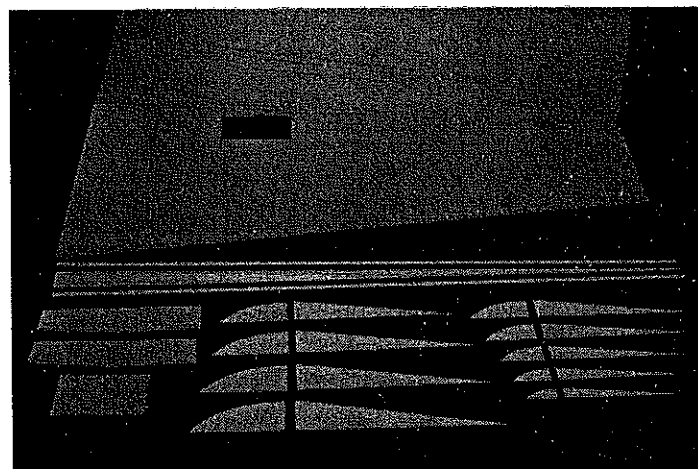
Folding. The scoring of the fold lines is done

with a screening tool available at any hardware store. It consists of a handle with a 1 1/2-in.-radius wheel at one end which is run along a straight-edge on the fold line. The top layer of the cardboard is crushed down, which allows the surface to be folded.

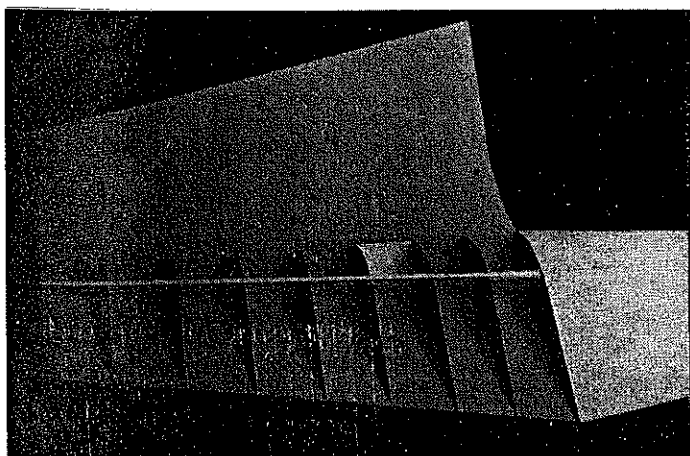
Finishing. Cardboard gives a solid surface with no open areas to cover, and it is nonporous. The easiest method is to give one coat of clear



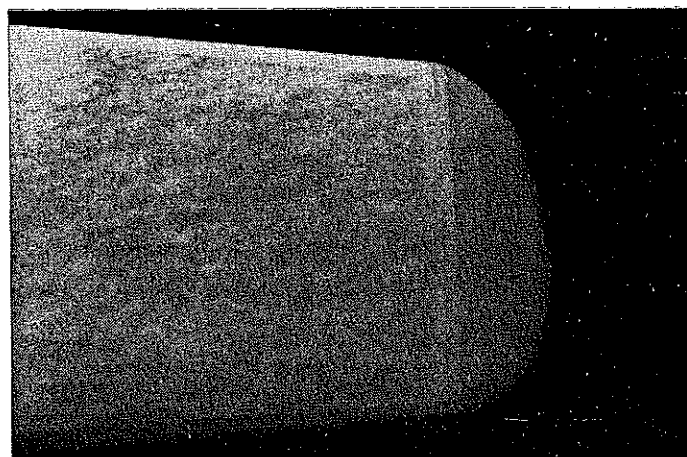
This is how to score corrugated cardboard for making folds. It takes a screening tool and metal straightedge.



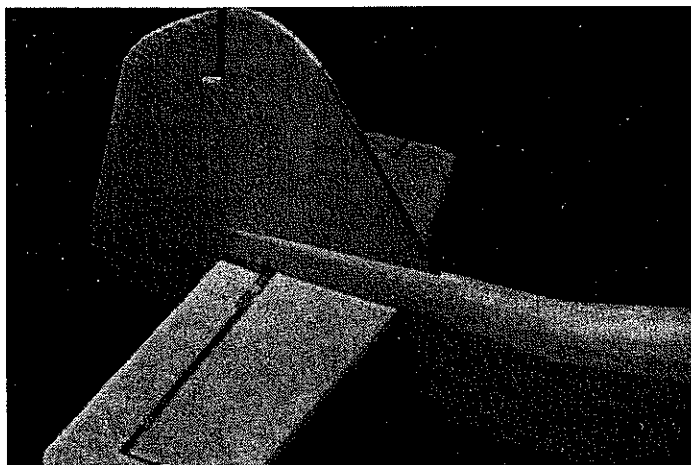
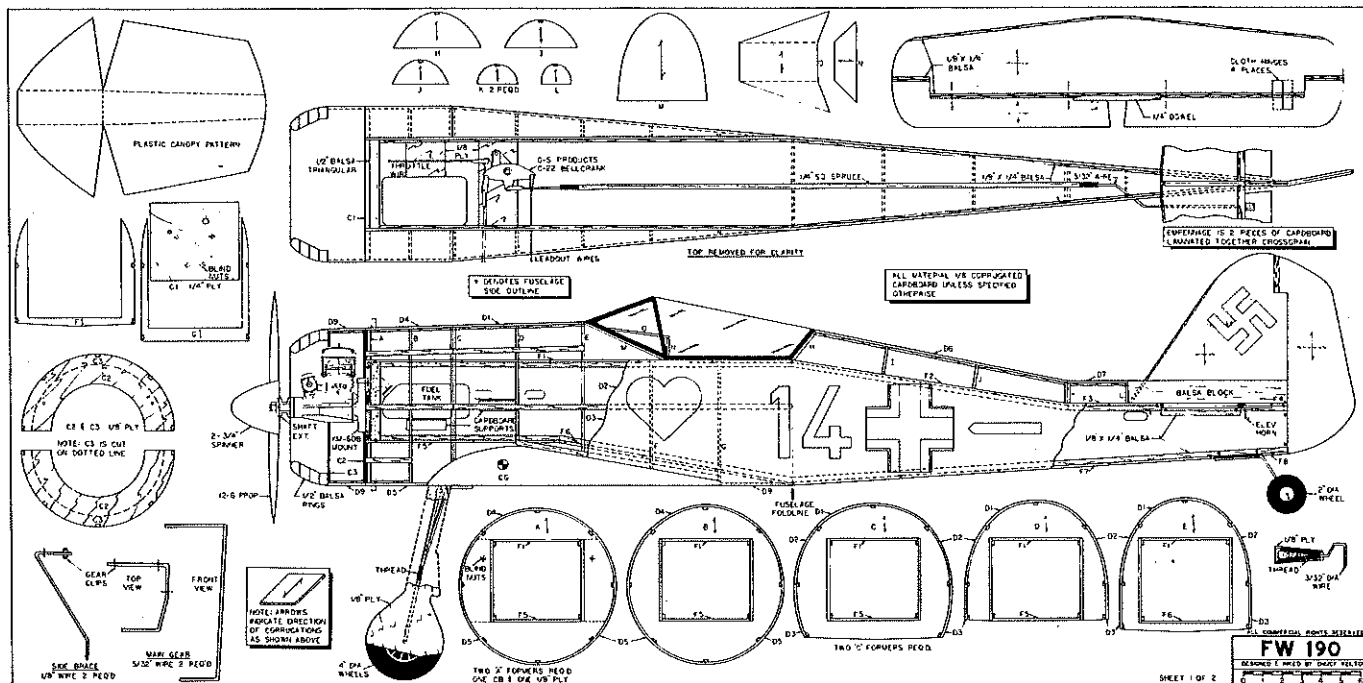
All the parts for one wing half. The cardboard skin for each wing panel is one piece that is folded over at the leading edge.



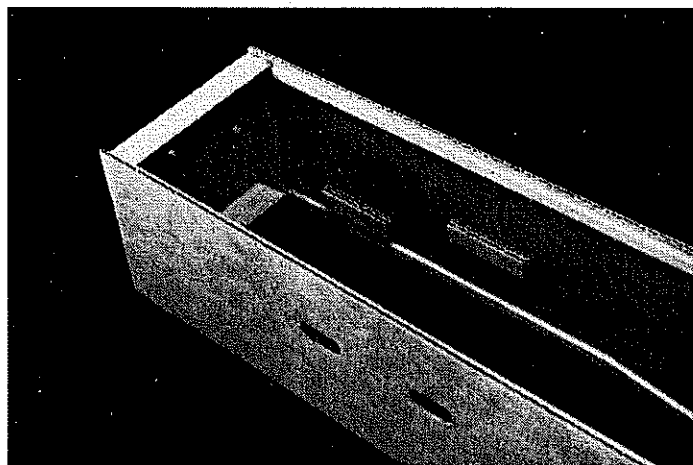
Here, the ribs, spar, and gear mount have been glued to the left wing bottom panel. The right wing already has been completed.



Wing tips are made of balsa. Gummed paper tape is used to seal seams and the trailing edge. Stationery stores carry such tape.



Tall surfaces are laminated cardboard, giving 1/4-in. thickness. Elevators joined with 1/4-in. dowel. Balsa fairing between fin/stabilizer.



Fuselage sides with the firewall in place, plus balsa edge strips and cardboard supports for the bellcrank and fuel tank mounting plates.



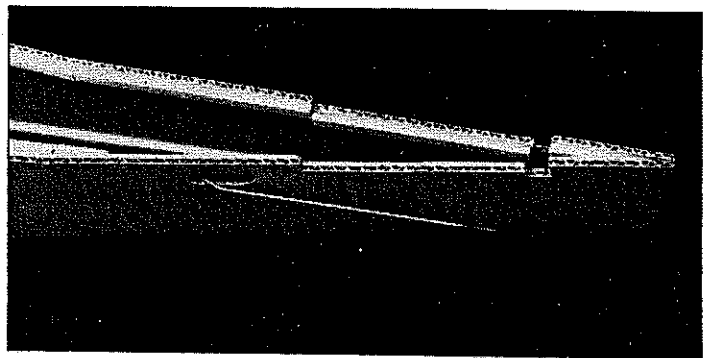
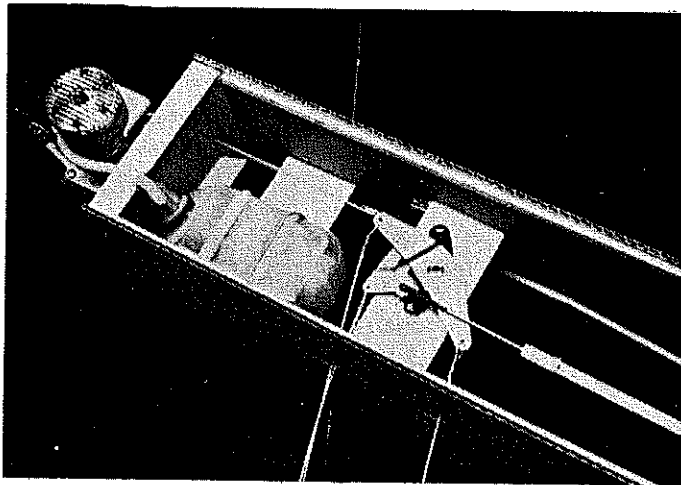
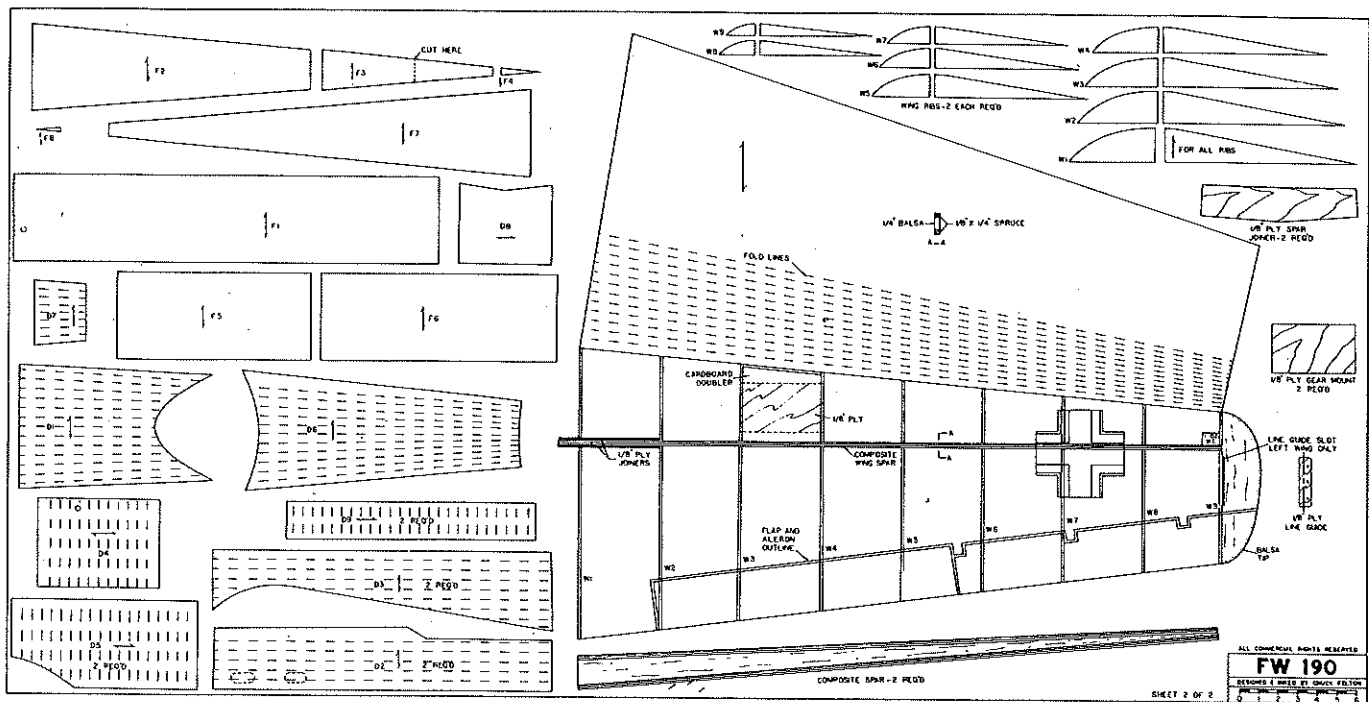
Chuck Felton shows off his creation. Cardboard sources: box manufacturers or any local shopping center's stack of discarded boxes. That with a white-finished paper on one side is the best.

dope followed by several coats of color. Covering such as Solarfilm and MonoKote can be used. With any of these, it is recommended that the surface not be doped, which will result in a better bond.

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

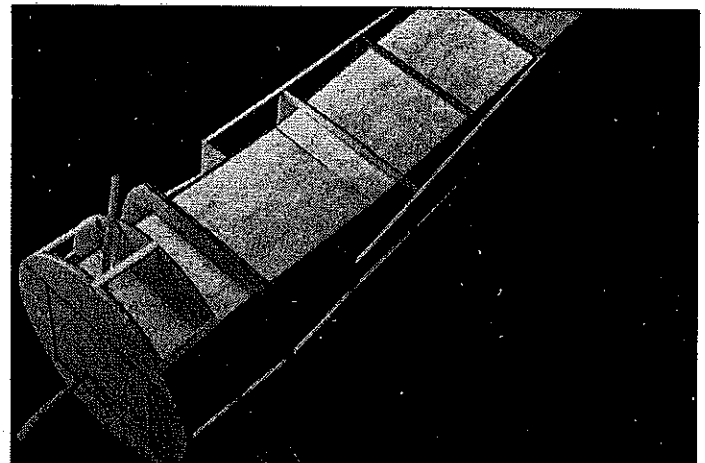
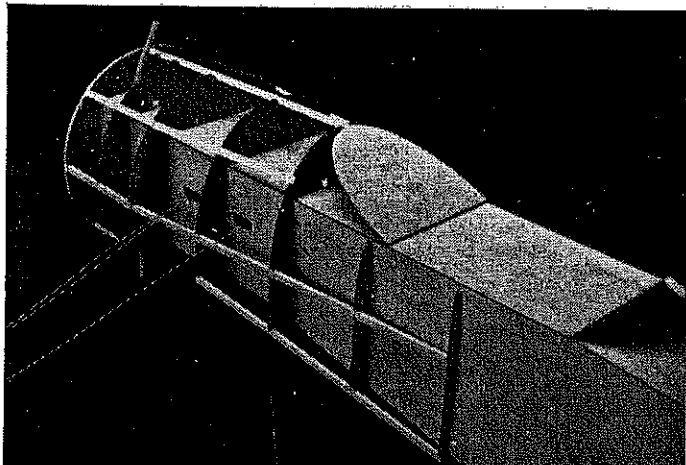
Construction. Cut out all cardboard and wood parts using the template outlines. Be sure to note the direction of the corrugations. Score and fold cardboard parts as indicated on the plans.

Empennage. The stabilizer, fin, rudder, and elevators are each made from two pieces of 1/8-in. cardboard laminated together cross-grain to give 1/4-in. thick surfaces. A simple way to do this is to line the edges and center of one piece to be laminated with strips of thin double-sticky-back tape; just press the two pieces together. This method eliminates warping which can occur when using glue. Add a 1/8 x 1/4 balsa strip to the fin leading edge, and round it off. Similarly add 1/8 x 1/4 balsa strips to the stabilizer leading and trailing edges, and round them off. Glue the



This is the fuselage rear end, with the sides joined and $\frac{1}{8} \times \frac{1}{4}$ balsa edge strips in place. Note $\frac{1}{8}$ -in. recess of strips from the edge.

Fuel tank, engine, and bellcrank have been installed—as have the control lead-outs and pushrods for elevator and throttle control.



The box section of the fuselage has been completed in this view, and formers have been slid over the box, glued, and stringers added.

Bottom view of the fuselage front showing formers and stringers applied over the box. Author recommends water-based or white glues.

elevators to the $\frac{1}{4}$ -in. dowel. 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 $\frac{1}{4}$ -in. balsa spar half with a $\frac{1}{8} \times \frac{1}{4}$ spruce strip—top and bottom. Join the spar halves together with $\frac{1}{8}$ ply joiners, front and rear. The ply joiners give

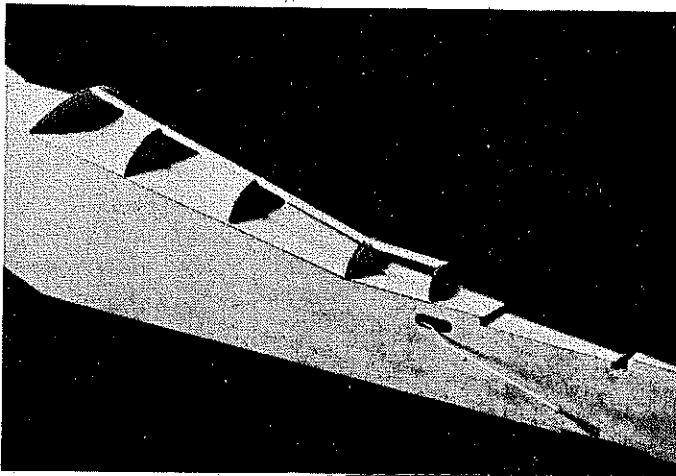
the correct wing dihedral.

Glue the $\frac{1}{8}$ ply gear mount into each wing panel. Glue the right side of the wing spar onto the right wing panel. Glue all cardboard ribs into the right wing. Add cardboard doubler over the ply gear mount between ribs W3 and W4. Glue a one-oz. weight into the right wing tip. Glue the left wing panel to the spar and to the right wing

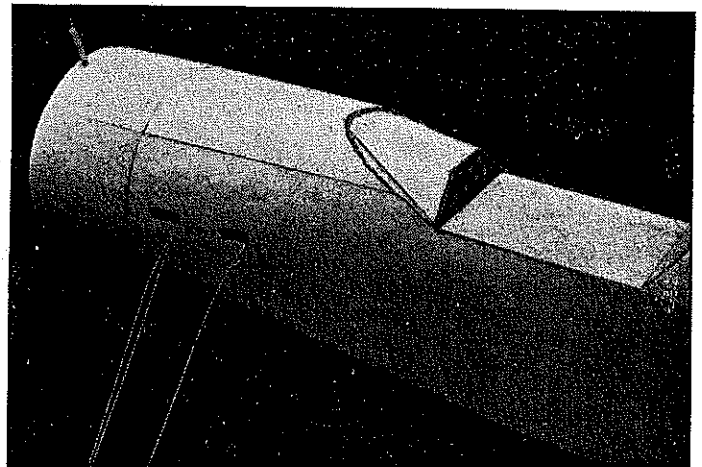
along the bottom center line. Add ribs and gear doubler to left wing.

Apply glue to the top of the spar, top of the ribs, and the trailing edge of the right wing. Fold the top wing surface down, and pin it securely in place until dry. Repeat this process with the left wing.

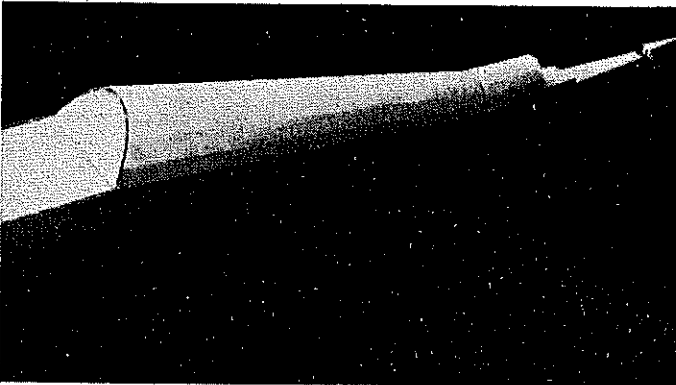
Add balsa wing tips. Make a line guide from $\frac{1}{8}$



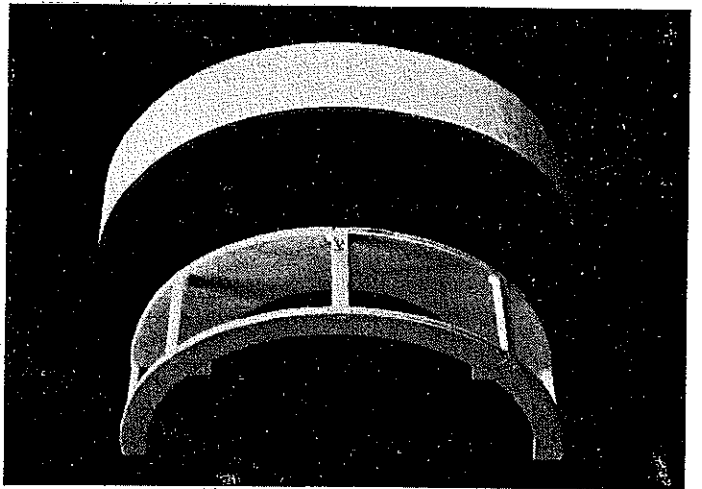
The turtledeck and fuselage rear end. Note platform for stabilizer and cutout for elevator joiner dowel.



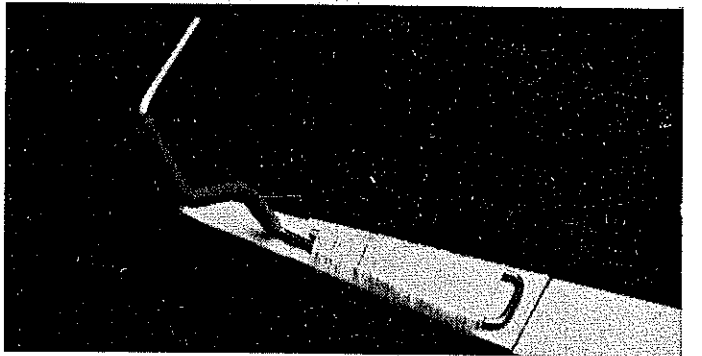
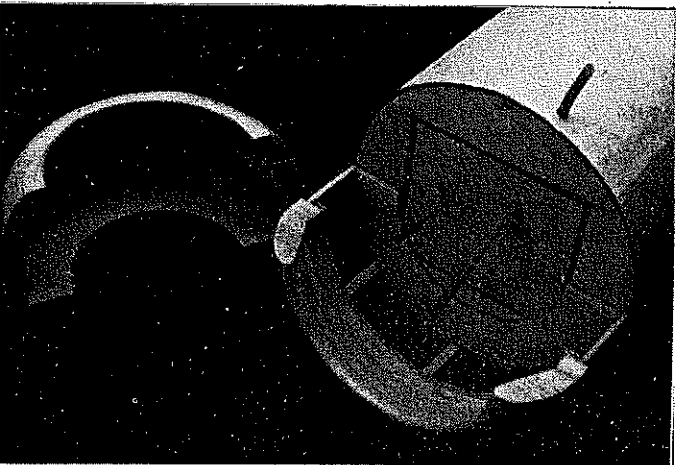
It's really taking shape now—cowl, outer sheathing, and instrument panel in place. Fill cardboard edges around cockpit with glue.



Turtledeck covering in place. It's necessary to score D6 just as shown on the plans in order to obtain this shape over the fuselage taper.



Builtup cowl frame with cardboard covering. Formers are 1/8-in. ply.



Attach the tail wheel to the ply support by wrapping with thread.

The completed cowl with balsa front rings sanded to shape. Bolts are used for attaching the top cowl half to the firewall.

ply. Cut a slot in the left wing tip, and glue the line guide in place. Cover the trailing edge and all seams of the wing with gummed paper tape.

Fuselage. The 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 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 below the fuel tank and bellcrank.

Make the firewall (C1) from 1/4 ply. Locate the mounting holes for a KM-60B engine mount on the face of C1. Drill the mounting holes, and install blind nuts on the back of C1. Drill holes in

C1 for the fuel tubing and throttle control wire. Line all four back edges of C1 with 1/2-in. triangular balsa for bracing.

Glue C1 to right side of the fuselage. When dry, glue left side of the fuselage to C1. Attach fuel tank to the 1/8 ply support. The fuel tank may be attached to the ply support with rubberbands. Make pushrod from 3/32-in. wire and 1/4-in. sq. spruce, and attach it to the bellcrank along with the lead-out wires. The tank and bellcrank assemblies are installed 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, F3 and F4 in place to cover the top of the fuselage. Be sure to bring fuel tubing fill and overflow lines out during the covering oper-

ations. Cover bottom of the fuselage with F5, F6, F7, and F8.

Add Formers A, B, C, D, E, F, and G to the forward fuselage. Small cutouts will be required in Formers B through E to allow them to slide past the fuel tubing. Note that two C formers are required, both cardboard. Two A formers are required, one of cardboard and one of 1/8 ply made in four sections as shown by the dotted lines on the plans. Add 1/8 x 1/4 balsa stringers from Formers A through G. Add Formers H through L to top of the aft fuselage, and add 1/8 x 1/4 balsa stringers. Make instrument panel by adding M, N, and O to the forward cockpit area.

At this point, hold the upper half of cowl piece C2 in position against front of ply Former A, and drill two holes through C2 and A as shown on the

C2 pattern. Install blind nuts to the rear side of Former A to be used for cowl attachment. The fuselage is now ready for covering. Glue D1 to the top of Formers C, D, E, and M. Add left and right side pieces of D2 to Formers C through G back to the fuselage fold line. Note that the left side of D2 has holes for lead-out wires. Bevel D2 at the fold line so that it fits into the fuselage lines.

Add left and right side pieces D3 to Formers C through G back to the fuselage fold line and bevel at the fuselage fold line. Add D4 to the top of A, B and C. Add left and right side pieces D5 to sides of Formers A, B and C. Add D8 to bottom of the fuselage. Add D6 and D7 to the top aft fuselage. The fuselage sectional views on Sheet 1 of the plans show the location of covering pieces D1 through D5. Cover all fuselage seams with gummed paper tape.

Cowl. The two cowl pieces are each built-up by connecting C2 and C3 with pieces of 1/4 x 1/4 balsa strips. Each half is then covered with D9. Rings of 1/2-in. balsa are then added to C3 and sanded to shape. The lower portion of the cowl is glued to Former A, while the upper half is attached by the bolts in C2 which fasten to the blind nuts in the back of Former A.

Cut holes in the cowl for exhaust and needle valve. Coat inside of cowl and front of Former A with epoxy. Drill mounting holes in the KM-60B mount. A shaft extension is used to give adequate propeller clearances.

Sub-assembly. Cut a small notch in the aft fuselage under the elevator dowel to ensure smooth elevator movement. Glue stabilizer to the fuselage and fin to the top of stabilizer. Add a balsa block to each side of the fin, and sand to match fuselage contour. Glue rudder to the fin with the trailing edge offset approximately 1/4-in. to the outside of the flying circle.

Make the tail wheel from 3/32-in. wire. Bend as shown, place on 1/4 ply support, wrap with nylon thread, and smear with glue. When dry, glue in place in the bottom fuselage cutout.

Make the main landing gear from 5/32-in. wire and the side braces from 1/8-in. wire. Attach the main gear and side braces to the 1/4 ply supports in the bottom wing with nylon gear clips. Attach braces to the main gear by wrapping with thread, then smear with glue. Attach the ply gear fairings to the main gear with nylon gear clips.

Finishing. Paint and trim the model before gluing the wing to the fuselage. Give the entire model one coat of clear dope. Sand lightly with fine sandpaper when dry. Bottom of the model is aero blue. Upper side is light and dark green with a yellow fuselage band and rudder base. All trim is MonoKote. Markings are black outlines with white, except the heart emblem which is bright green outlined with white. Aileron and flap outlines are black. Make the canopy from thin plastic, epoxy to fuselage, and outline with strips of black MonoKote. The addition of guns, bombs, etc., is left to your own imagination.

Final Assembly. Glue wing to the fuselage. Pass lead-out wires through the wing tip line guide and tie off. Attach nylon control horn to the elevator, and hook up the pushrod. Attach 4-in. wheels to the main gear and a 2-in. wheel to the tail gear. Attach 12-6 prop and 2 1/4-in. spinner to the engine. Your ship is now complete. Be sure to balance the model at the point shown on the plans.

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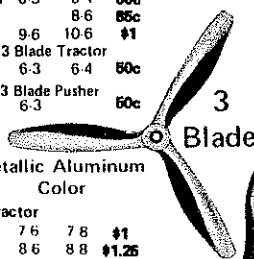
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5-3	6-3	6-4	50c

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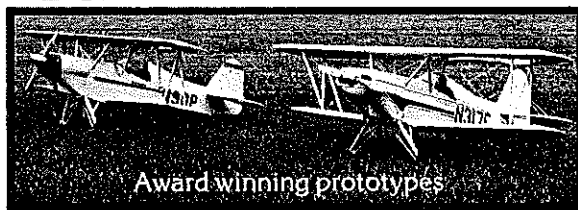
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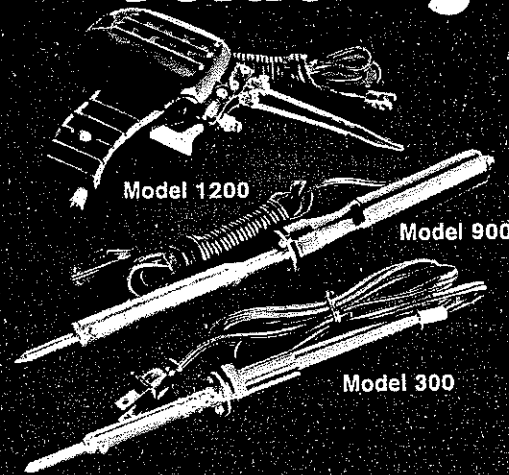
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