

HAWKER HURRICANE

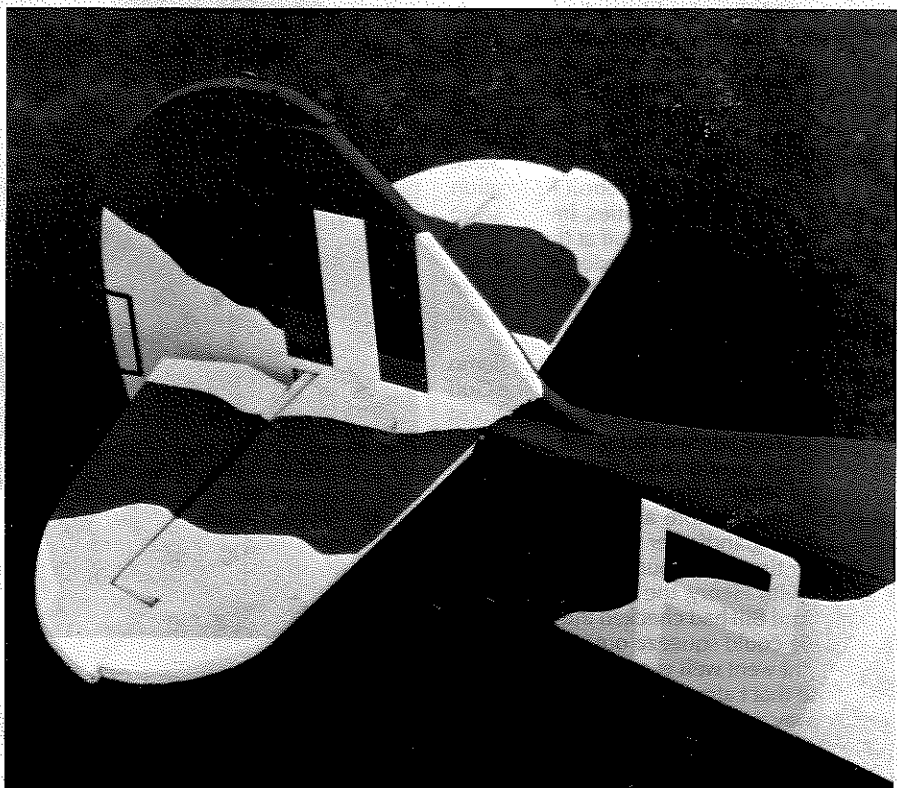
By **CHUCK FELTON**. . . Take a close look at this control line model. It may be hard for you to believe, but it is made from plain old cardboard! The author explains his techniques for producing a fine model.

• The Hurricane was the first eight-gun monoplane fighter in service with the RAF and the first to exceed 300 mph. The design was not as advanced as that of the Spitfire or the German Bf 109, as it utilized metal frame-and-fabric construction. Never receiving the glamour treatment lavished on the Spitfire, the Hurricane nevertheless provided the bulk of the defenses during the dark days of 1940, when the fighter squadrons were up against the might of the vastly superior Luftwaffe. In fact, until well into 1941, the Hurricane was by far the most numerous of the RAF's combat aircraft, and it bore the brunt of all the early combats with the Luftwaffe over France and England. In the hectic days of 1940, the Hurricane was found to be an ideal bomber destroyer, with steady sighting and devastating cone of fire. The sheer aggressiveness of the British squadrons tended to nullify any performance shortcomings of the aircraft in combat, and it should be remembered that a single-seat fighter armed with eight guns was still a big innovation by 1940 standards. The psychological effect of streams of fire aimed at the rather poorly protected bombers so unnerved many German crews that they broke formation, making them easy targets for the defenders. By the end of the daylight phase of the Battle of Britain, Hurricanes had accounted for 57 percent of all German aircraft shot down in combat.

The Hurricanes were also widely used overseas, where their simplicity greatly facilitated maintenance at the somewhat

primitive airfields being used. In all, 14,231 Hurricanes were built, with hundreds be-

ing exported to foreign countries both before and after the war.



Thicker-than-usual leading and trailing edges of tail are only clues to this model's building material. Paint job's a beaut.

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BUILDING THE MODEL

The model is constructed primarily of 1/8-inch corrugated cardboard. This greatly reduces both building time and cost. The design makes use of cardboard's unique feature in that it can be folded. The wing is built of two large pieces of cardboard with cardboard ribs and a single 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 can take plenty of punishment at the flying field.

Cardboard varies in weight, but any 1/8-inch corrugated cardboard will do. Sources of 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 is explained in the construction hints.

The model is built to a scale of 1-1/2 inches to the foot, resulting in a wingspan of 60 inches and a length of 47 inches. The bottom of the airfoil is flat with a curved upper surface, due to the scoring and folding technique employed. Engine 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 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 gluing surfaces together.

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-inch radius wheel at one end, which is run along a straightedge on the fold line.

Waterproofing: 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-percent clear polyurethane with 75-percent 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, you will find that it is as crisp as wood and cuts sharply and cleanly.

Finishing: Cardboard gives a solid surface with no open areas to cover and is non-porous. The easiest finishing method is to give two coats of clear dope, sanding lightly between coats with #400 sandpaper, followed by three coats of colored dope. However, a wide variety of finishing materials may be used on the cardboard. Coverings, such as Solarfilm, MonoKote, and vinyl paper can be used. With any of these, it is recommended that the surface not be

doped, which will result on a better bond.

Paper Tape: All seams, joints, and exposed edges of the model are covered with strips of gummed paper tape. Obtain a one-inch wide roll from a 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 in the plans.

Empennage: The fin, rudder, stabilizer, and elevator are each made from two pieces of 1/8-inch cardboard laminated together crossgrain to give 1/4-inch thick surfaces. Add a 1/8- x 1/4-inch balsa strip to the fin leading edge and round off. Add 1/8- x 1/4-inch balsa strips to the stabilizer leading and trailing edges and round off. Glue the elevators to the 1/4-inch dowel. Add 1/8- x 1/4-inch 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 wing spar by capping each 1/4-inch balsa spar half with a 1/4- x 1/4-inch spruce strip top and bottom. Join the spar halves together with 1/8-inch ply joiners front and rear at the centerline. Glue the 1/8-inch ply gear mount into each wing panel. Glue the right side of the wing spar onto the right-hand wing panel from the centerline to rib W4. When dry, glue the outboard portion of the spar to the bottom wing from W4 through W9. Glue all cardboard ribs into the right wing. Add cardboard doublers over the ply gear mount between ribs W2-W3 and W3-W4. Glue a one-ounce 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, the top of the ribs and 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-inch ply. Cut a slot in the left wing balsa tip and glue the line guide in place. Cover the trailing edge and all seams with gummed paper tape.

Fuselage: 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-inch balsa strips, as shown in 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-inch ply. Locate the mounting holes for a KM-40 motor mount on the face of C1. Drill the mounting holes and install blind mounting nuts on the back side of C1. Drill a hole in C1 for a fuel tubing exit and two holes for the 3/16-inch dowels. Glue the dowels into C1. Line all four back edges of C1 with 1/2-inch 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-inch ply support. The fuel tank may be attached to the support with rubber bands. Make a pushrod from 3/32-inch wire and 1/4-square spruce and attach it to the bellcrank along with the leadout 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 fuselage. Be sure to bring fuel tubing fill and overflow lines out during all covering operations. Cover the bottom fuselage with F4, F5, and F6.

Add bulkheads A through H to the top fuselage, adding 1/8- x 1/4-inch stringers. Cover bulkheads A through C with D1, which has been scored and folded. Cover bulkheads C through E with D2. Cover bulkheads E through H with D3. Cover upper portion of bulkheads E through G with D4. Add the three J bulkheads, with stringer, to the forward bottom fuselage and cover with D5. Add balsa exhaust stacks to both sides of fuselage.

The cowl is made from a hollowed-out balsa block. The top half consists of a hollow block with 3/16-inch ply C4 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-inch 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 mounting holes in the KM-40 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-inch triangular balsa to bottom of horizontal at fuselage intersection for bracing. Glue the fin to the fuselage. Add scrap balsa bracing between fin and stabilizer intersection. Add the rudder to the fin with the trailing edge offset 1/2 inch to the outside of the flying circle.

Make the tailwheel gear from 3/32-inch diameter wire. Bend as shown, place on the 1/8-inch ply support, wrap with nylon thread, and smear with glue. When dry, glue in place in the bottom fuselage cutout. Add scrap balsa wheel fairings.

Make the main gear from 5/32-inch diameter wire as shown. Make gear fairings from 1/8-inch ply and attach to the gear with nylon gear clips. Attach the gear assemblies to the 1/8-inch ply supports in the bottom wing with nylon gear clips. Make the airscoop from a hollowed out balsa block and glue to the bottom of the wing.

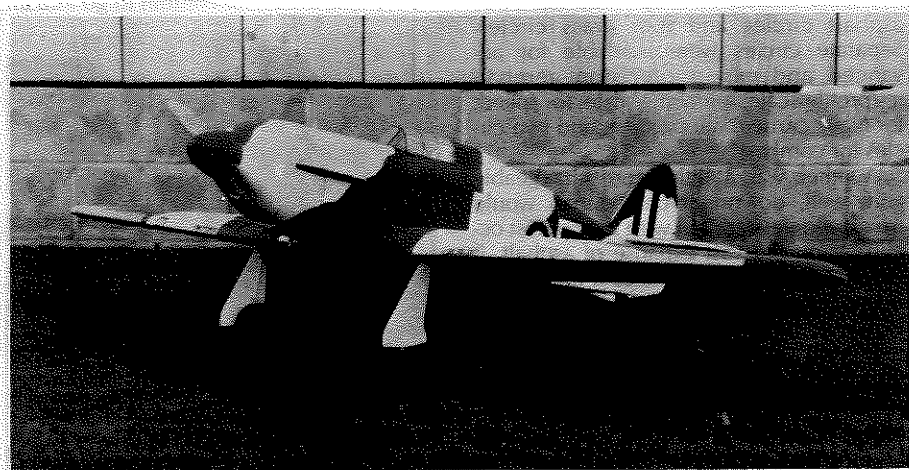
FINISHING

Now is the time to paint and trim the model before final assembly. The color scheme is dark green and gray on top and gray underneath. The lettering and roundals are made from MonoKote. Make

the canopy from thin plastic and epoxy to the fuselage. Outline the canopy with strips of black MonoKote. The aileron and flap outlines are also made of black MonoKote.

FINAL ASSEMBLY

Glue the wing to the fuselage. Pass the leadout wires through the wingtip line guide and tie off. Attach the nylon control horn to the elevator and hookup the pushrod. Attach three-inch diameter wheels to the main gear and a 1-1/2-inch diameter wheel to the tail gear. Attach a 10-6 prop and a 2-3/4-inch spinner to the engine. Your ship is now complete. Be sure to balance the model at the point shown on the plans. •



Scale-like appearance of the Hurricane is enhanced by the paint job, but honestly, would you guess it was made out of plain old cardboard?

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