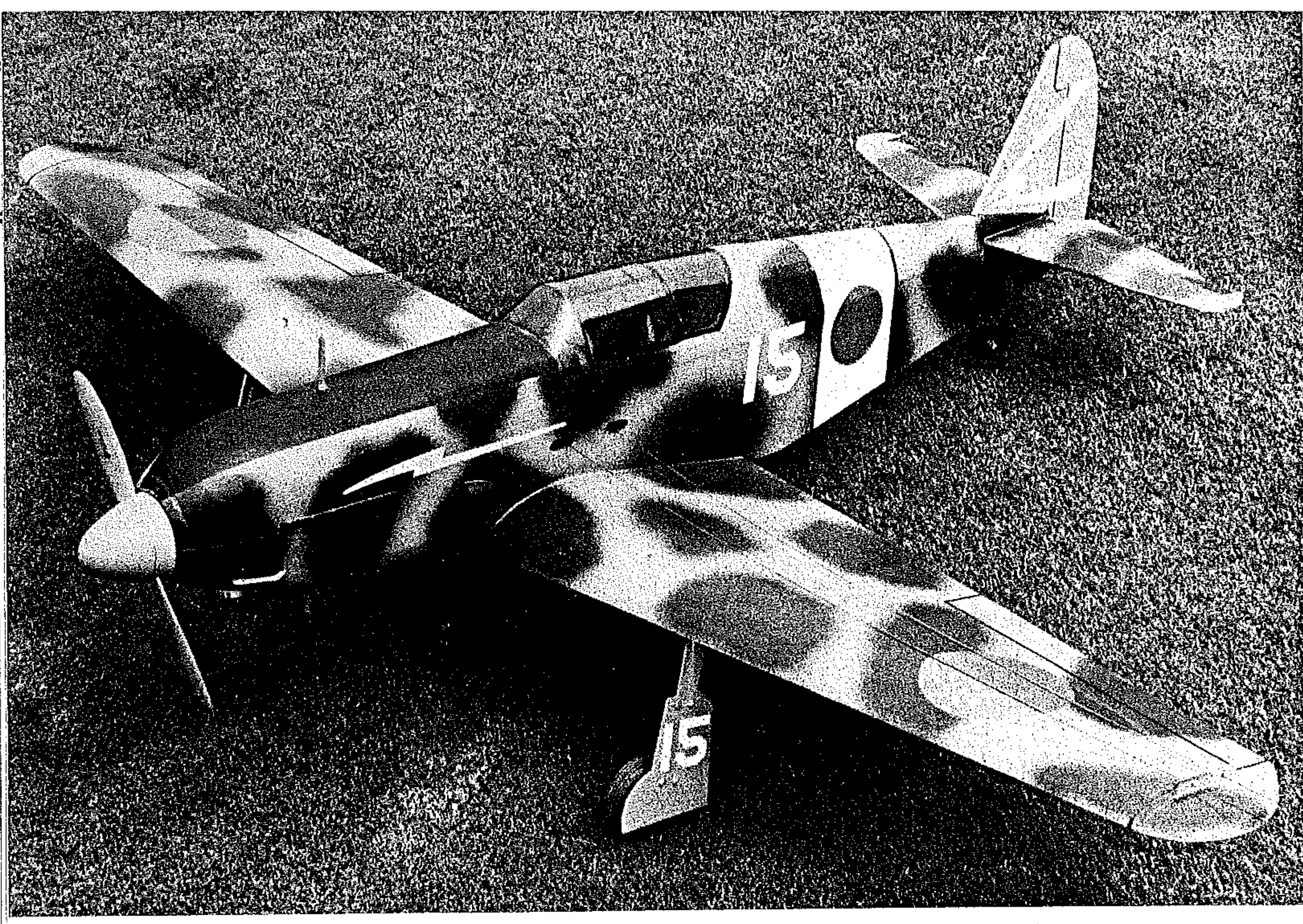


The first of the Japanese fighter aircraft of WW II to earn a reputation as a tough airplane that could withstand real punishment and stay in the air, this semiscale Control Line model (even though made of cardboard) inherits the original's ruggedness. ■Chuck Felton

526

Ki-61 Hien

THE PROTOTYPE AIRCRAFT (its name meaning flying swallow in Japanese) was completed in December 1941. It was powered by an Ha-40 liquid-cooled engine which was a revised and lightened version of the German DB601 engine. The Hien reached a speed of 368 mph and performed very well against a captured P-40 and a Bf 109 sent to Japan by submarine.

The Hien was a radical departure from traditional Japanese Imperial Army Air Service fighter designs. These earlier aircraft were lightly armed, lightly loaded, and were highly maneuverable. By contrast, the Hien stressed speed and climb-and-dive characteristics. It marked the introduction of pilot armor protection and self-sealing fuel tanks in a Japanese fighter. It also possessed substantially heavier fire power and a markedly sturdier airframe.

The Hien was dubbed "Tony" by the Allies. It went into action around New Guinea in April 1943. Despite service problems, including an often unreliable engine, the Hien forced the Allied pilots to modify the tactics they had evolved to combat the lighter and more nimble Japanese fighters. The Hien was a thoroughly

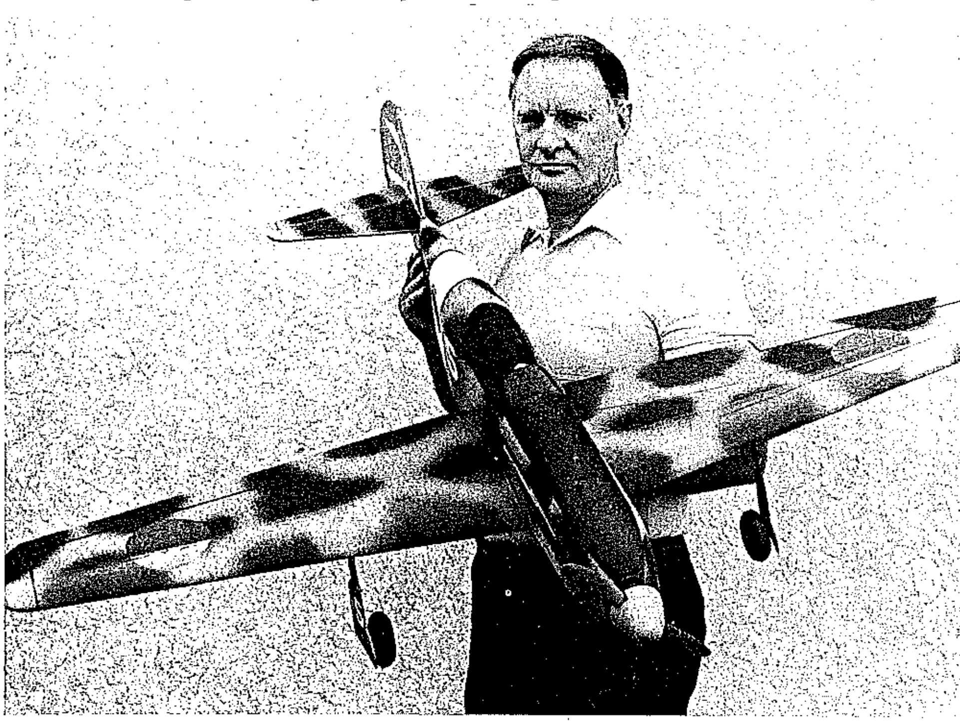
competent design from virtually every aspect. More that any other type, it was responsible for disproving the widely held belief that Japanese aircraft were "lightweights" incapable of taking punishment and surviving.

The model is constructed primarily of ⅛-in. corrugated cardboard. This 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 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 ⅛-in. cardboard will do. Sources of this material include box manufacturers, local shopping centers, or anywhere else 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.

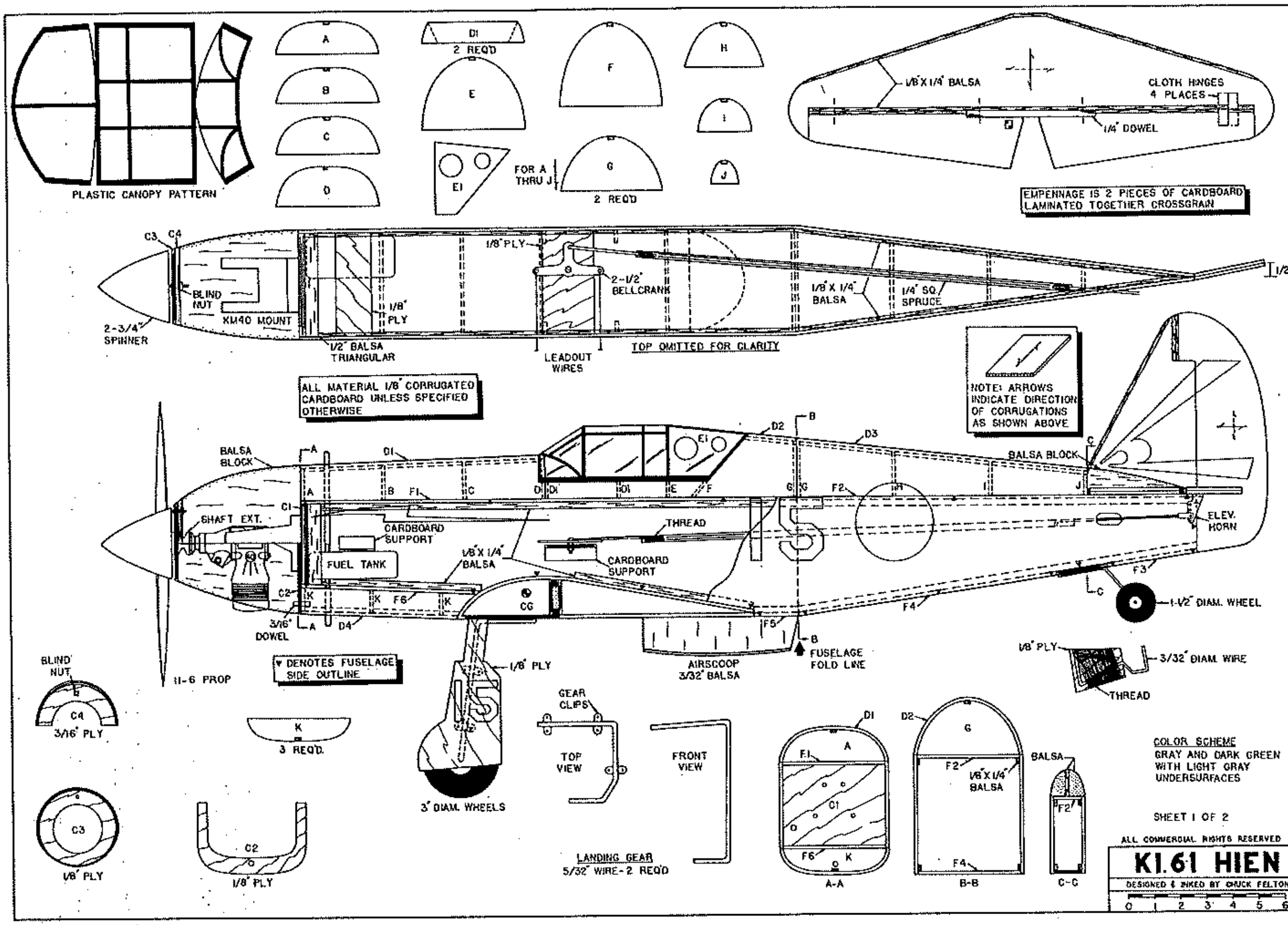
The model is built to a scale of 1½ inches to the foot, which gives a wingspan of 60 in. and a length of 45 in. The bottom of the airfoil is flat with a curved upper surface due to the scoring and folding technique employed. Engines of .30 to .40 cu. in. can be used.

Working with cardboard. Before we be-



Top: With a careful finish and the author's tips on working with cardboard, many will find it hard to tell that this is anything other than a balsa model. Above: Shown here with our author, you can get an idea of the actual size of this fine-flying, quick-to-build model.

Full-Size Plans Available . . . See Page 170



gin, take a look at these special tips.

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

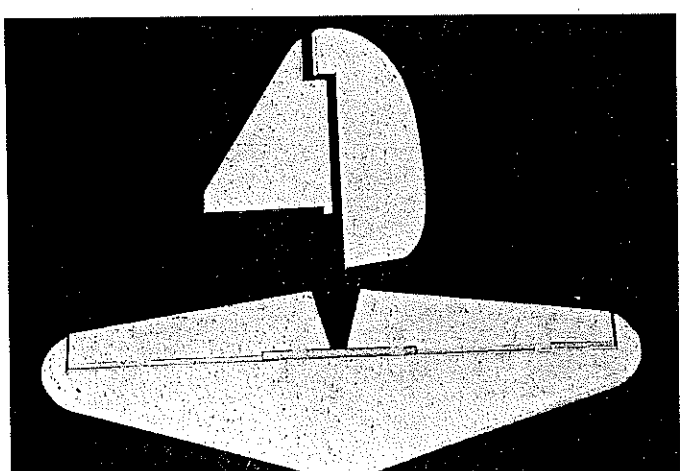
The scoring of the fold lines is done with a screening tool available at any hardware store. It consists of a handle with a 1½-in.-radius wheel at one end which is run along a straightedge on the fold line.

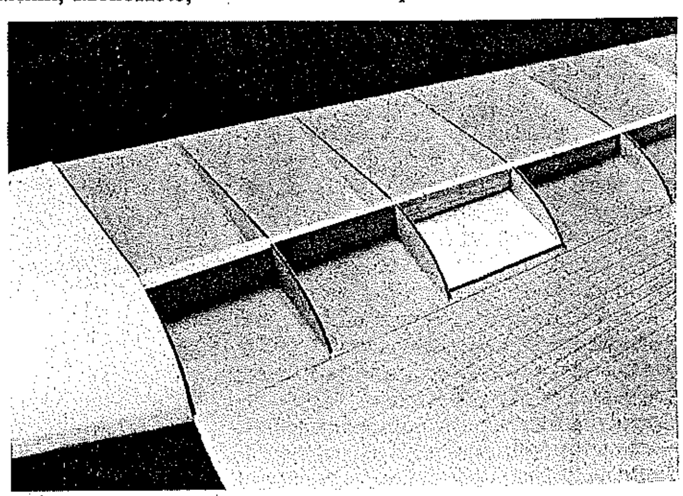
Waterproofing of cardboard is quite simple and can be done to the raw material before you cut out the parts of the model. Simply mix 25% clear polyurethane with 75% paint thinner. The latter can be the cheapest hardware store variety, which is thoroughly mixed with the clear polyurethane. Brush the mixture liberally onto the cardboard sheet, and allow it 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. It cuts sharply and cleanly.

Cardboard is a solid surface with no open areas to cover and is non-porous. The easiest finishing method is to give it three coats of color dope and two coats of clear dope. However, a wide variety of finishing materials may be used on the cardboard. Coverings such as Solarfilm, MonoKote, and vinyl paper are all OK. With any of these, it is recommended that the surface not be doped, which will result in a better bond.

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

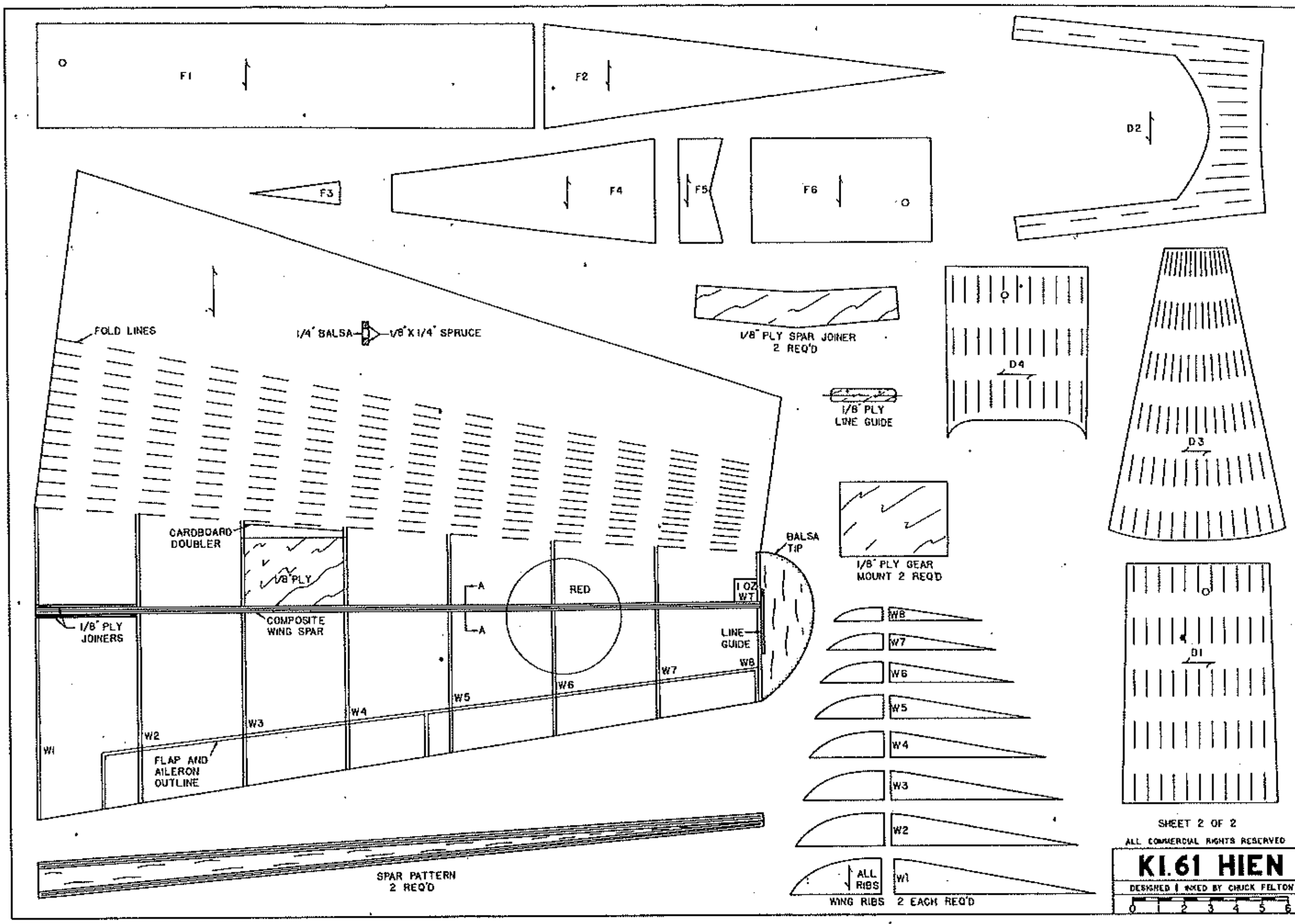
Construction. Cut out all cardboard and wood parts using the template outlines. Be sure to note the direction of the corrugations. Score and fold cardboard parts as indicated on the plans.





Left: The leading edges of the tail surfaces are capped with balsa. Elevator joiner is hardwood dowel, and the author used cloth hinges on the prototype. Right: Wing has a single balsa and hardwood spar, cardboard ribs. The leading edge folds to obtain the curved upper surface.

Full-Size Plans Available . . . See Page 170



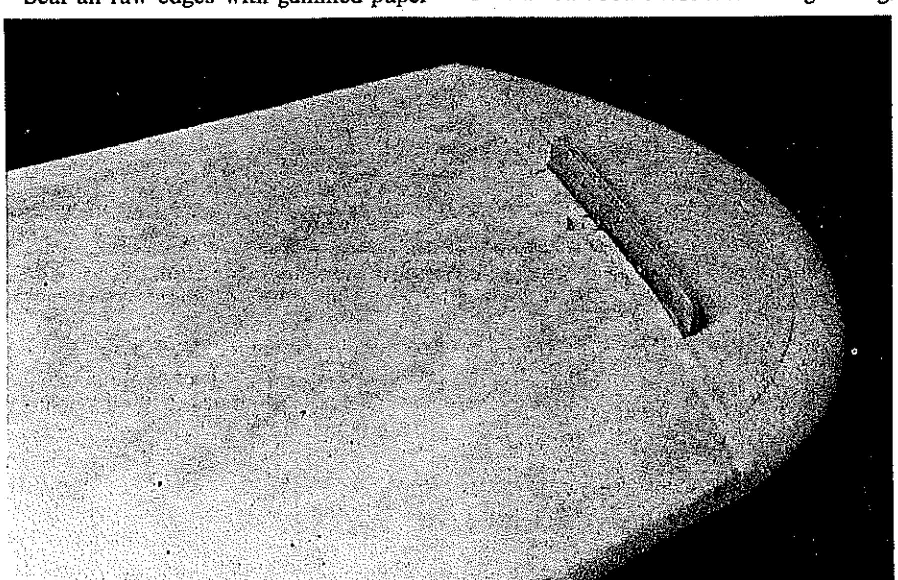
Tail surfaces. The stabilizer, fin, rudder, and elevators are each made from two pieces of 1/8-in. cardboard laminated together cross-grained to give 1/4-in. surfaces. Add a 1/8 x 1/4-in. balsa strip to the fin leading edge. Add 1/8 x 1/4-in. balsa strips to the stabilizer leading and trailing edges. Glue the elevators to the 1/4-in. dowel. Add 1/8 x 1/4-in. balsa strips to the remainder of the elevator leading edge. Round off all the balsa edges.

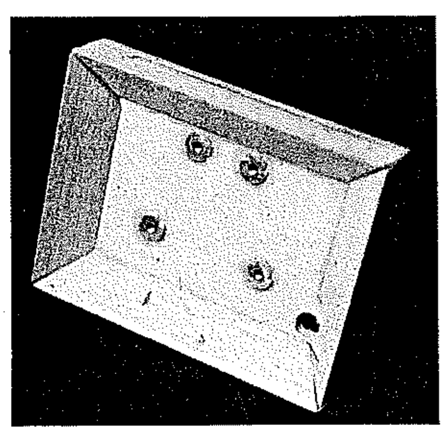
Seal all raw edges with gummed paper tape. Hinge the elevators to the stabilizer with cloth hinges at four places.

Wing. Make the wing spar by capping each 1/4-in. balsa spar half with a 1/4 x 1/4-in. spruce strip, top and bottom. Join the spar halves together with 1/8-in. ply joiners, front and rear. The ply joiners give the correct wing dihedral. Glue the 1/8-in. ply gear mount into each wing panel. Glue the right side of the wing spar onto the right-hand wing panel. Glue all cardboard ribs into the right wing. Add a cardboard doubler over the ply gear mount between Ribs W3 and W4. Glue a 1-oz. weight to the right wing tip.

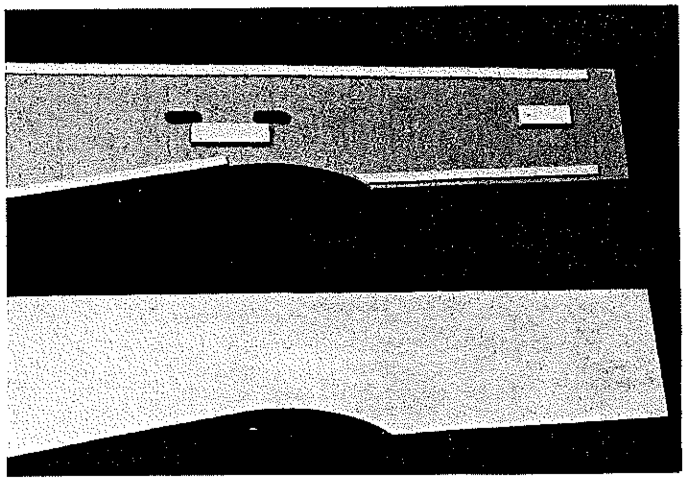
Glue the left wing panel to the left spar and to the right wing along the bottom centerline. Add the ribs and gear doubler to the left wing. Apply glue to the top of the spar, the top of the ribs, and the trailing edge of the right wing. Fold the top wing surface down, and pin it securely in place until dry. Repeat this process with the left wing.

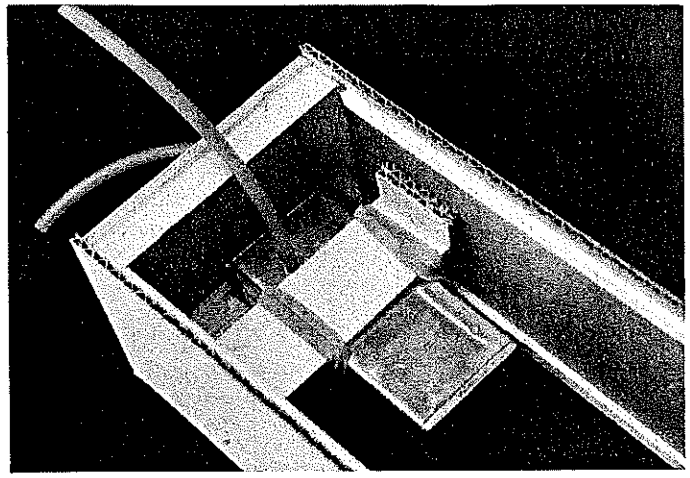
Add the balsa tips to the wing. Make a line guide from 1/8-in. ply. Cut a slot in the left wing balsa tip and glue the line guide in place. Cover the trailing edge and all seams of the wing with gummed paper tape.



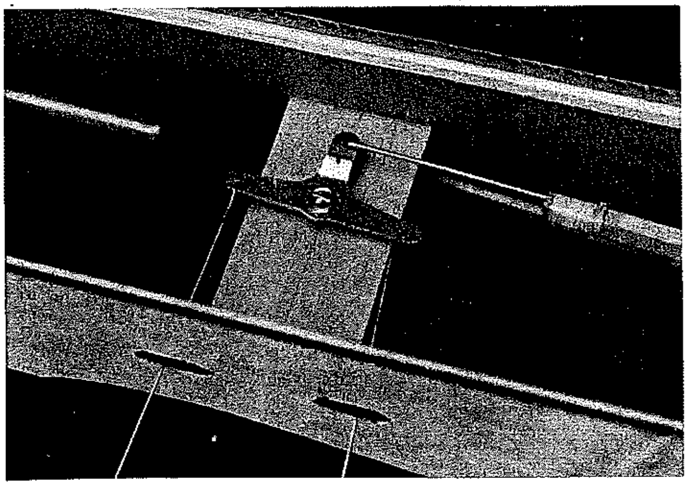


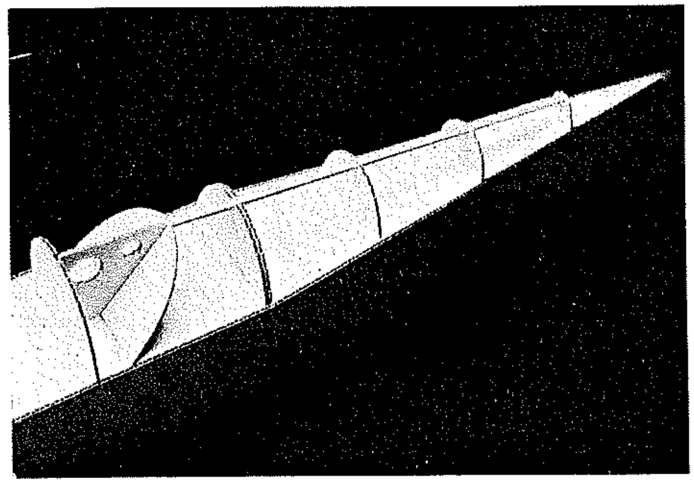
Left: The plywood line guide is glued into a slot that has been cut into the balsa wing tip. Use the white-surfaced type of cardboard as shown here, if possible, for a smoother finish. Right: The plywood firewall uses the traditional triangular balsa bracing and blind nut installations.



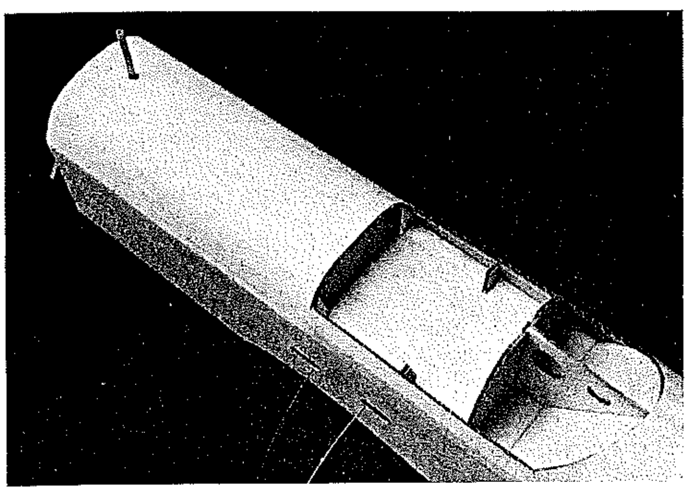


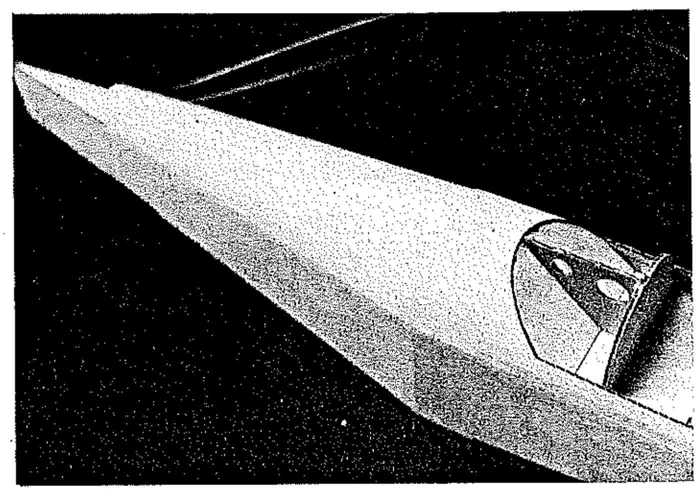
Left: Fuselage sides are lined with balsa strips. The double-layer cardboard supports shown are for mounting the bellcrank and fuel tank supports. Right: Fuselage sides are joined at the firewall, and the fuel tank can be rubberbanded in place. Epoxy should be used in this area.





Left: Bellcrank setup uses hardwood pushrod for the elevator. Right: Fuselge top uses cardboard formers and a single balsa stringer.



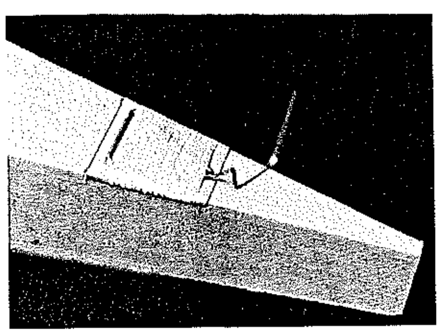


Left: Formers are then covered with the top deck piece which has been scored and folded according to the plans to provide the curved shape of the full-size original. Right: Interior cardboard pieces help give some detail in the cockpit area while providing additional strength.

Fuselage. The sides are outlined with a triangular symbol on the drawing. Line the upper and lower edges of each fuselage side with ⅛ x ¼-in. balsa strips, as shown in the fuselage side view. The strips are recessed ⅛ 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 ¼-in. ply. Locate the mounting holes for a KM-40 engine 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 3/16-in. dowels. Glue the dowels into C1. Line all four back edges of C1 with ½-in.

Continued on page 164



The tail wheel wire is attached to the ⅛-in. plywood platform by wrapping both pieces with nylon thread and then applying glue.

change proposal.

Please send photos, building tips, contest reports, or any items on CL Scale to Bill Boss, 77096 269th St., New Hyde Park, NY 11040.

CL Carrier/Perry
Continued from page 69

hardwood block or length of dowel in the fuselage sheeting. The pivot bearing and hook are inserted through this reinforcement and retained with a wheel collar.

Although the tail hook need not be retracted for the high-speed portion of the flight, to do so reduces drag and avoids the possibility that the tail hook will catch on an uneven joint of the deck on takeoff. The most common release uses Down elevator movement of the pushrod to release the tail hook. The latch pin (usually 1/32-in. music wire) is most often attached to the pushrod and passes through a loop attached to the tail hook. Down elevator movement pulls the pin from the retaining loop and allows the hook to fall.

An alternative favored by some is to use low throttle movement to release the tail hook. Such an arrangement requires an additional wire to the tail and does not allow the engine to be idled before takeoff if one should desire to do that.

The tail hook release mechanism on S.H. Ringo's Wildcat puts no tension on the pushrod with the hook retracted and is adjustable for point of release. It also can be built so that the force required to release the tail hook is stronger than the force exerted on the latch by the weight of the elevator. That way, the hook is less likely to be released accidentally after the engine is started. Another feature is that the hook, if it is released accidentally, can be latched up again simply by raising it to the retracted position. It also can latch itself up on landing under the right conditions.

The two methods of holding a tail hook down are a rubberband (or tension spring) as in the Kingfisher photos and a torsion spring as on the Wildcat. The tension system can be built so that the hooks for the rubberbands nearly line up with the pivot point when the hook is retracted. This reduces the force on the latch mechanism and increases the spring's lever arm as the tail hook extends. This is the method I prefer.

Whatever method is used, the force on the tail hook should be strong enough to prevent the hook from bouncing excessively on landing, yet not so strong as to prevent the tail from settling to the deck when the model is placed gently on its landing gear with the hook extended.

The tail hook should extend no more than 60° from the horizontal (45° or even 30° is probably better). More than 60° extension can allow the tail hook to hold the tail in the air unless the spring tension is reduced to the point that the hook will bounce excessively. The hook portion should be shaped so that the tail hook will catch and hold an arresting line in both the extended position and with the model resting on its landing gear.

A positive down-stop should be provided to control the extended position of the tail hook. A screw, dowel, or block of wood will serve adequately. The Kingfisher uses a piece of steel cable (control line) between the tail skid and the small loop at the end of the hook to limit travel. The Wildcat relies on the torsion spring to control the extended position of the hook.

Richard L. Perry, c/o Model Aviation, 1810 Samuel Morse Dr., Reston, VA 22090.

CL Ki-61/Felton
Continued from page 74

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. The fuel tank may be attached to the support with rubberbands. 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 and F2 in place to cover the top fuselage. Be sure to bring fuel tubing fill and overflow lines out during all the covering operations. Cover the bottom fuselage with F3 through F6.

Add Bulkheads A through D to the top fuselage. Cover the bulkheads with D1, which has been scored and folded. Add Bulkheads D1, E, E1, F, and G to the top fuselage; cover with D2. Add remaining Bulkheads H, I, and J to the top fuselage; cover with D3. Add the three K bulkheads to the forward bottom fuselage; cover with D4.

The cowl is made from a hollowed-out balsa block. The top half consists of a hollow block with 3/16 ply C4 glued to the front. Drill a hole in C4, and install a blind nut on the back side before gluing it 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 Firewall C1. When aligned, glue C2 to the back face of the hollow block.

The hole 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 cowl 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. Glue the fin to the fuselage, and add balsa blocks to each side of the fin. Sand the blocks to match the fuselage contour. Glue the rudder to the fin with the trailing edge offset 1/2 in. to the outside of the flying circle.

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

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 overall model is medium gray with dark green camouflage on the top. The fin and spinner are Curtiss blue. The lettering and trim are made from MonoKote. The roundels are red, the numbers white. Make the canopy from thin plastic; epoxy-glue to the fuselage. Outline the canopy with thin strips of MonoKote. The aileron and flap outlines are black MonoKote.

Final assembly. Glue the wing to the fuselage. Pass the lead-out wires through the wing tip line guide, and tie them. Attach the nylon control horn to the elevator, and hook up the pushrod. Attach 3-in. wheels to the main gear and a 1½-in. wheel to the tail gear. Attach an 11-6 prop and a 2¾-in. spinner to the engine.

Your airplane is now complete. Be sure to balance the model at the point shown on the plans.

RC Hi-Tech 2002/Hunt

Continued from page 97

The next flight proceeded uneventfully until I dived the aircraft to maximum speed for a high-speed flyby for the camera. At just about the point when the aircraft pitched downward, I heard a loud buzzing sound above the engine/pipe noise. After landing, I inspected the aircraft and found nothing unusual—no nicked blades, nothing obviously loose on the fan unit itself. Since the noise had started when the aircraft was pitched nose down, I reasoned that the fan blades might have stalled. The theory seemed to have merit, the argument being that the fan inlet (below the fuselage) was being shielded by the canard and wing, obstructing the airflow to the fan and causing the blades to stall at high rpm. Another observation strengthened this theory: as soon as the noise occurred, the aircraft slowed like it had hit a brick wall. With the nose well down, one would expect a rapid descent, but if the blades had stalled, thrust and forward speed would be significantly reduced.

Returning home, expecting to cut a cheater hole (Eee Gads!) in the top of the fuselage, I found the real problem. Inspecting the MonoKote aileron hinge, I found that it was either torn or completely separated from the wing at both left and right aileron tips. Assuming that only a severe aileron flutter could cause this, I proceeded to stiffen the entire aileron control system. This included, as previously mentioned, the replacement of the 3⁄32 wire torque rod with ⅛-in. wire and replacement of the Nyrods with cable. Subsequent flights showed that this modification alleviated the flutter problem.

Now that all these problems have been remedied, how does it fly? Fast, smooth, and slow (with power). Takeoffs and go-rounds rival most overpowered sport ships. Unfortunately, with the wing loading approaching 30 oz./sq. ft., this aircraft must be handled gingerly during dead-stick landings. It will not stall a wing tip and spin in like a heavy Scale model, but you will notice a loss of pitch authority. I have found, during the few dead-stick landings that I have had to perform, that the nose is not hard to keep up if it is already slightly up. It may seem strange and against conventional flying practices, but you must keep the nose level or slightly high during approach in order to perform a flared, dead-stick landing with this aircraft.

The only other condition you should be aware of is that the engine can overheat if left at any throttle position while sitting motionless on the ground. Since the cylinder head is entirely out of the wake of the fan, forward motion is your only friend. (If you have flown a pusher-type aircraft, you have very likely experienced this problem yourself.)

Construction/modifications Construction of the HT-2002 is almost identical to that of the HT-2001, so I will describe only the changes. I will also spend some time describing the construction of the RK-740 fan unit peculiar to the engine used (O.S. Max .46 VR DF) and its installation in HT-2002.

The new forebody is constructed with ⅛-in. and ¼-in. sheet as well as solid block balsa. Cut out two inboard and two outboard ⅛-in. sheet balsa fuselage sides and laminate with gap-filling cyanoacrylate (CyA). The inboard sheet is full length to F5; the outboard sheet is foreshortened as