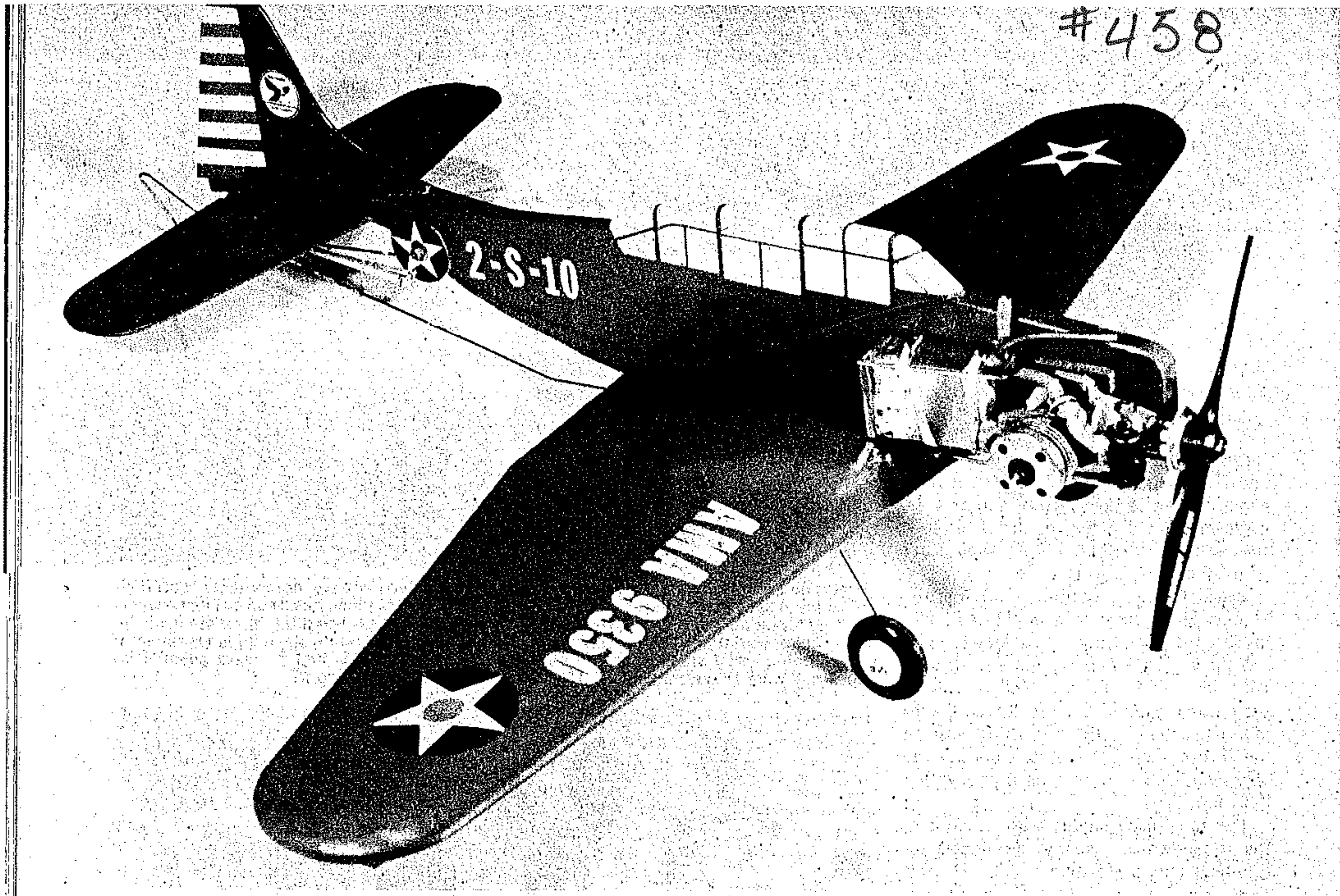
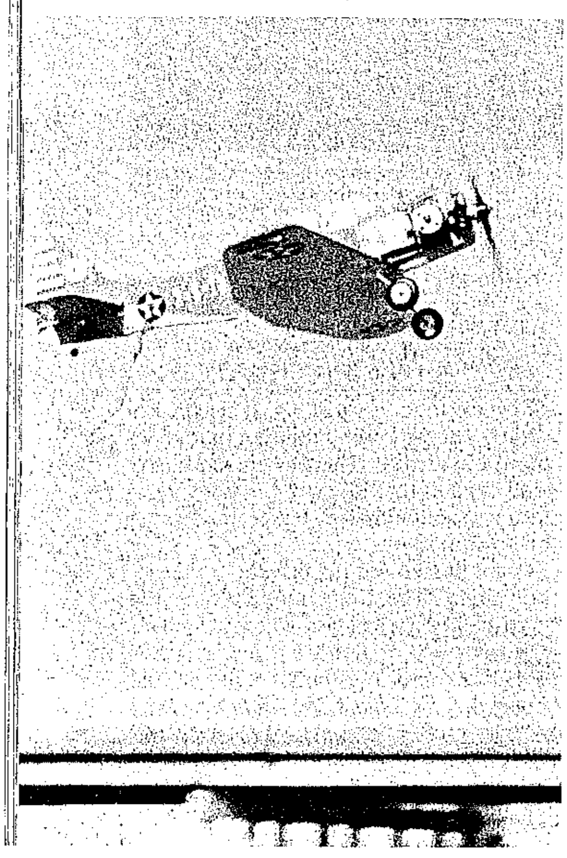
#458




# Profile Dauntless SBD-3



THE IDEA FOR .15-sized Profile Carrier came when one of our club members called me during an early month of 1982. He was concerned that the so-called beginner's Carrier event, Profile Carrier, had grown too complicated. Hot engines, line sliders, ailerons, flaps, and rudders often graced them. The mechanisms could make Rube Goldberg envious!

When Dave, that concerned club member, suggested a new beginning Carrier event with .15 engine, I jumped at the chance to design a model for it. For simplicity we decided that the only movable components during flight would be the throttle, elevators, and tail hook. My first model was an HB .15-powered Wildcat. It was flown on 52½-ft. lines and achieved a top speed of 60 mph. Most members of our model club (The Rocky Mountain Aeromodelers) have flown this airplane.

**Top: The completed model, ready for flight. It weighs in at 24 oz. Left: The .15 Dauntless in low-speed flight with the tail hook down. It takes only a small amount of up-elevator to hold the model at the reduced speed. It's a very stable flier, lifting off the deck quickly for smooth high-speed flight before going into the low-speed phase.**

The unanimous comment: "Hey, this is fun!"

You could hardly feel the .15 Carrier airplane on the end of the lines (less than 7 lb. pull at 60 mph), and it took very little effort to fly it. Talk about economy, you could make three flights for the same amount of fuel used for one flight of a .35-powered Carrier airplane. Also, the model was built for about half the cost.

With the .15 Wildcat experience, our club established the following rules for .15 Profile Navy Carrier:

1) Use existing Profile Navy Carrier rules except as specified in the following rules.

2) Engine—.1525 cu. in. maximum.

3) Line length—52 ft., 0 in. to 52 ft., 6 in.

4) Minimum line diameter—.012 in. stranded or .010 in. solid.

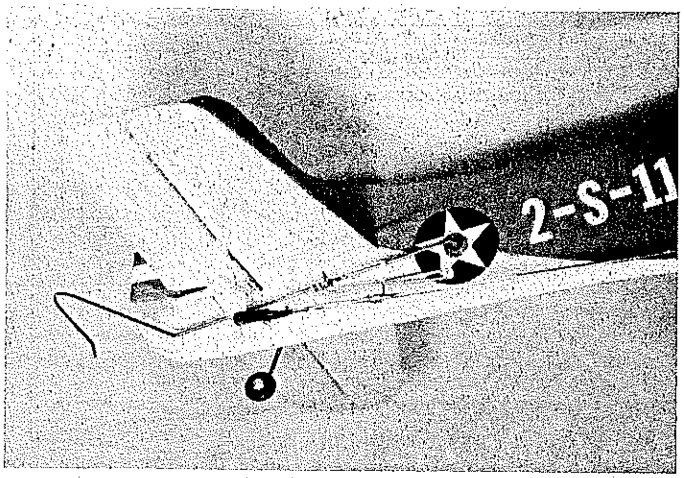
5) Scale bonus points—none.

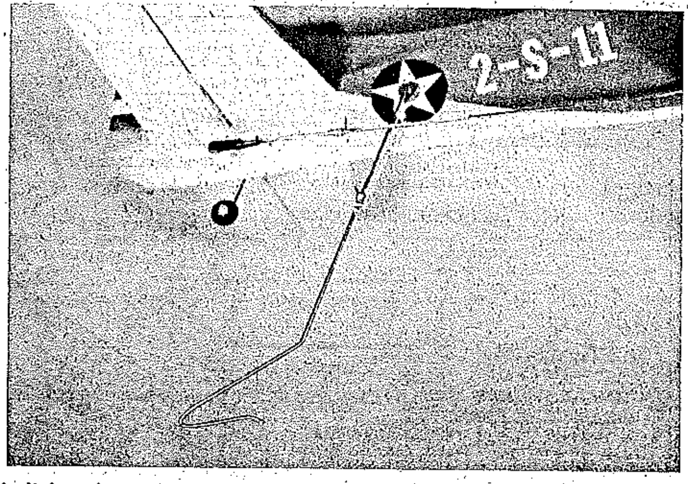
6) Minimum wing area—none.

7) Maximum high speed for scoring—70 mph.

8) Permissible movable components—throttle, hook, and elevator.

9) Time model for eight laps (in lieu of






The landing hook in the up position at left, down position at right. It is released from the up position by a quick down-elevator control movement. All the details you see in the pictures are further clarified by the author's excellent exploded-view drawings.

seven).

With these rules, I decided that my next model should: 1) Have a wing area of 160 sq. in.; 2) Have a low wing (the throttle control is difficult to route around the fuel tank of a mid-wing design); 3) Be a replica of an actual Navy carrier airplane.

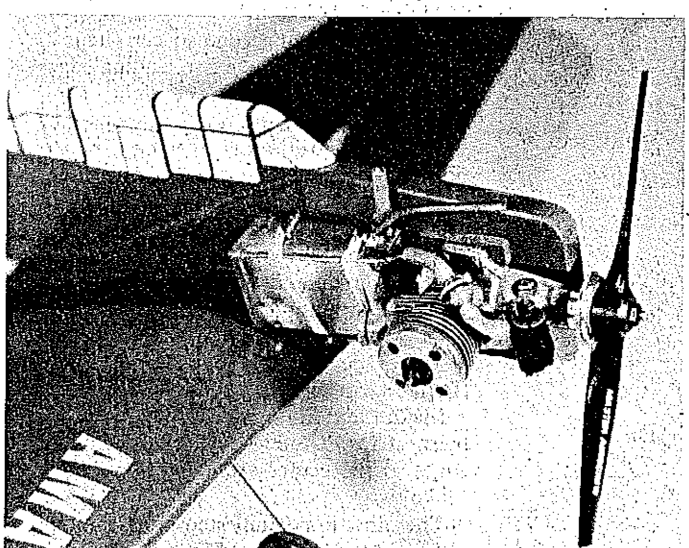
After searching through information about all of the World War II carrier aircraft, I selected one of my favorite airplanes, the Douglas SBD-3 Dauntless. With a span of 22¾ in., the model would have a wing area of 161 sq. in. And it has a low wing!

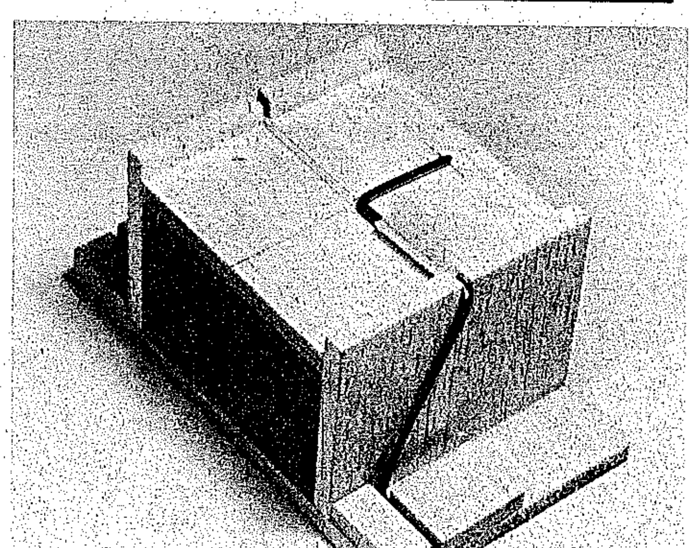
The Douglas Dauntless was our Navy's principal carrier-based dive bomber during most of World War II. From the attack on Pearl Harbor until V-J day, this airplane was responsible for sinking 18 warships, six carriers, and over 300,000 tons of enemy shipping. Also, Dauntless gunners shot down 138 Japanese planes with fewer than 80 Dauntlesses shot down by Japanese aircraft. At war's end, it was the only U.S. carrier aircraft, which had been operational at Pearl Harbor, still in service. Altogether, 5,321 Dauntlesses were built by Douglas.

**Construction.** This model basically involves conventional construction techniques. Only the method of mounting the landing gear and the control bellcranks incorporate somewhat novel practices. I recommend that the components of the model be built in the following order: landing gear, wing, fuselage, and empennage.

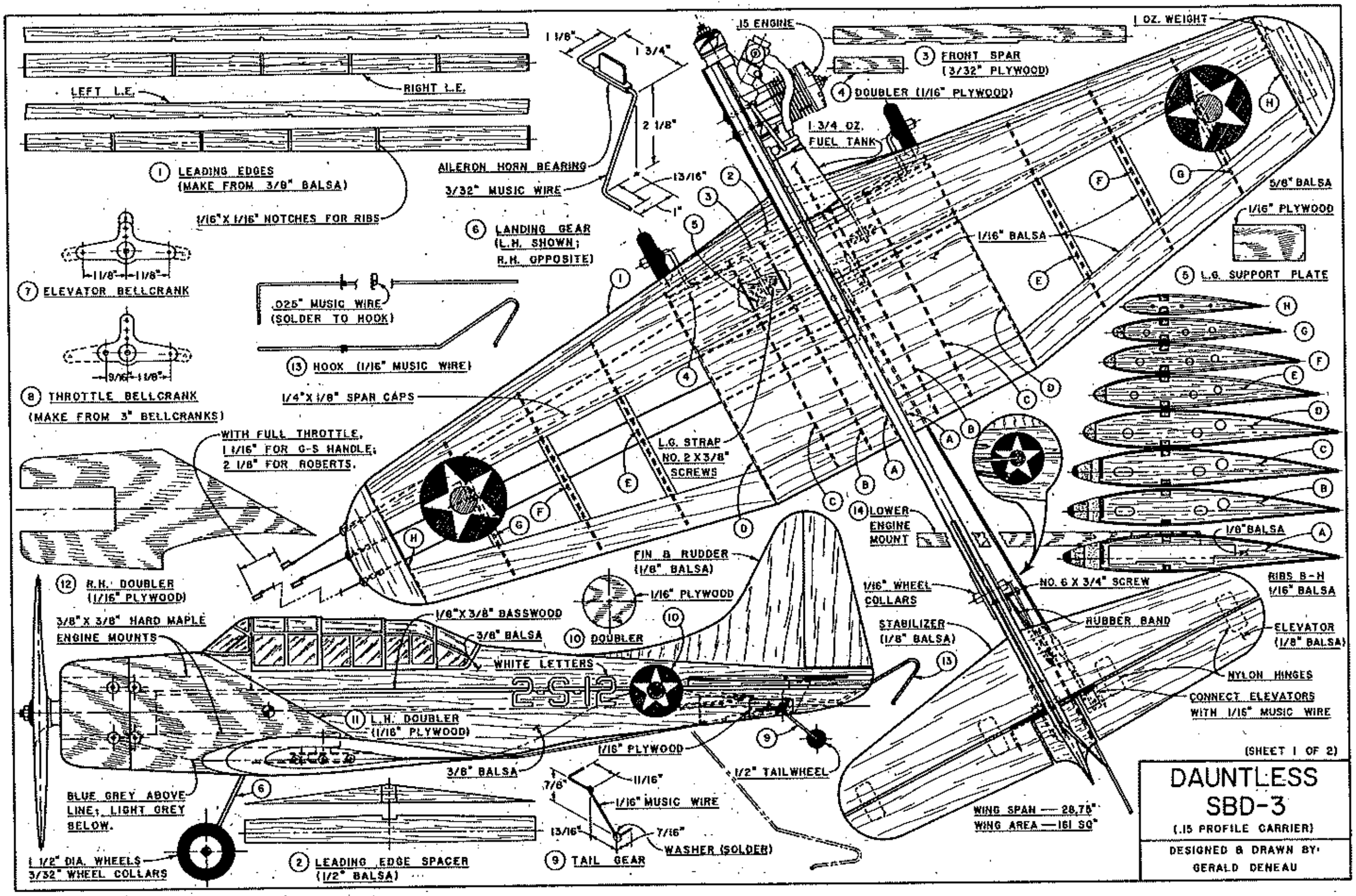
An easy way to transfer the various pieces (such as ribs, doublers, spars, etc.) from the plans to patterns on wood starts with making Xerox copies of the components. Cut out the Xeroxed patterns, and glue them to the applicable balsa or plywood pieces with rubber cement. After the components have been cut out, you can peel off the paper templates. The best part is that you haven't cut up your plans.

**The concept of a .15-powered Control Line Profile Carrier club competition has been successful for the Rocky Mountain Aeromodelers due, in large part, to the simplicity of the systems that are allowed. The models have an appealing appearance as well, we see from this example. ■ Gerry Deneau**





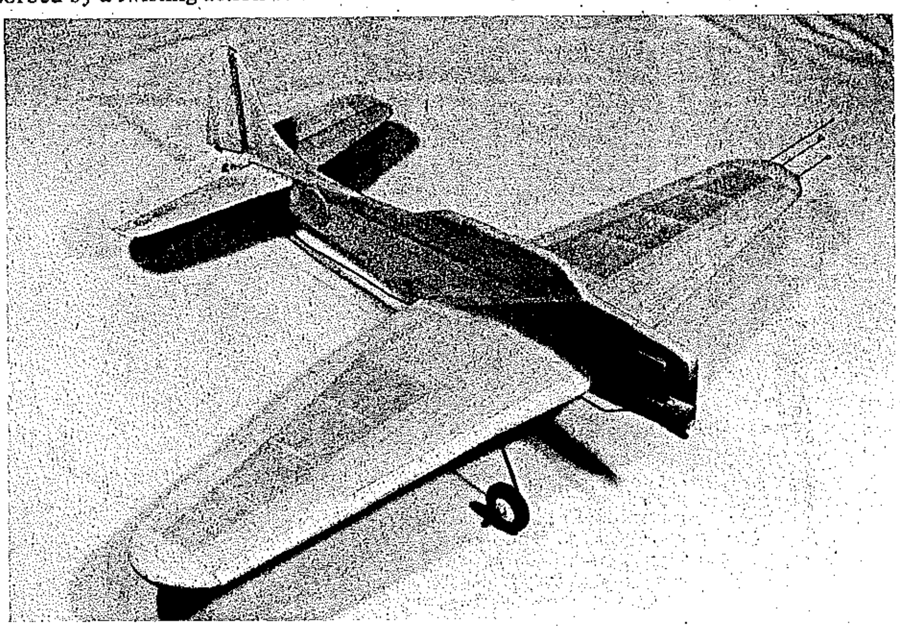
Left: We direct your attention to the engine and fuel tank installation in this view. You'll want a strong .15 engine with a carburetor. Right: A jig eases the building of the landing gear, the left gear leg shown in place (the right gear leg uses the opposite side of the jig).




**Landing gear.** You might think it odd to build the landing gear first. The reason is that the main landing gear must be installed during wing construction. Refer to Sheet 1 of the plans and the detail of Item 6 for the dimensions of the main landing gear made of 3/32-in. music wire. Be sure to slide the aileron horn bearing onto the wire before making the final bend for the 1⅛-in. leg. The horn bearing permits the landing gear to incorporate an efficient torsion bar action; flexing loads are absorbed by a twisting action of the horizontal part of the gear.

Make the left main gear first. Then, construct the right gear as a mirror opposite. For accurate landing gear bends, use a jig.

Refer to Sheet 1 of the plans and the detail of Item 9 for the dimensions of the tail gear. Use 1/16-in. music wire. The loop for the bolt can be made by bending the wire around a nail held in a vise. (The nail should be the same diameter as a 2-56 bolt.) Solder an inboard washer to the wire, install a ½-in. wheel, and solder on a retaining washer.



The Profile Dauntless structure has been completed and covered, and it's now ready for painting and decorating. Balsa and ply construction is typical of profile CL models.

**The wing** is the most complicated part of the model. However, the following sequence will simplify its construction.

Make two each of Ribs A through H. The holes for the bellcrank lead-out wires are needed only in one set of ribs. Make the ribs from ⅛ sheet balsa and Ribs B through H from 1/16 balsa.

Make the landing gear spar (Item 3) from 3/32 plywood, two doublers (Item 4) from 1/16 plywood, and two spacers (Item 15) from 1/32 balsa.

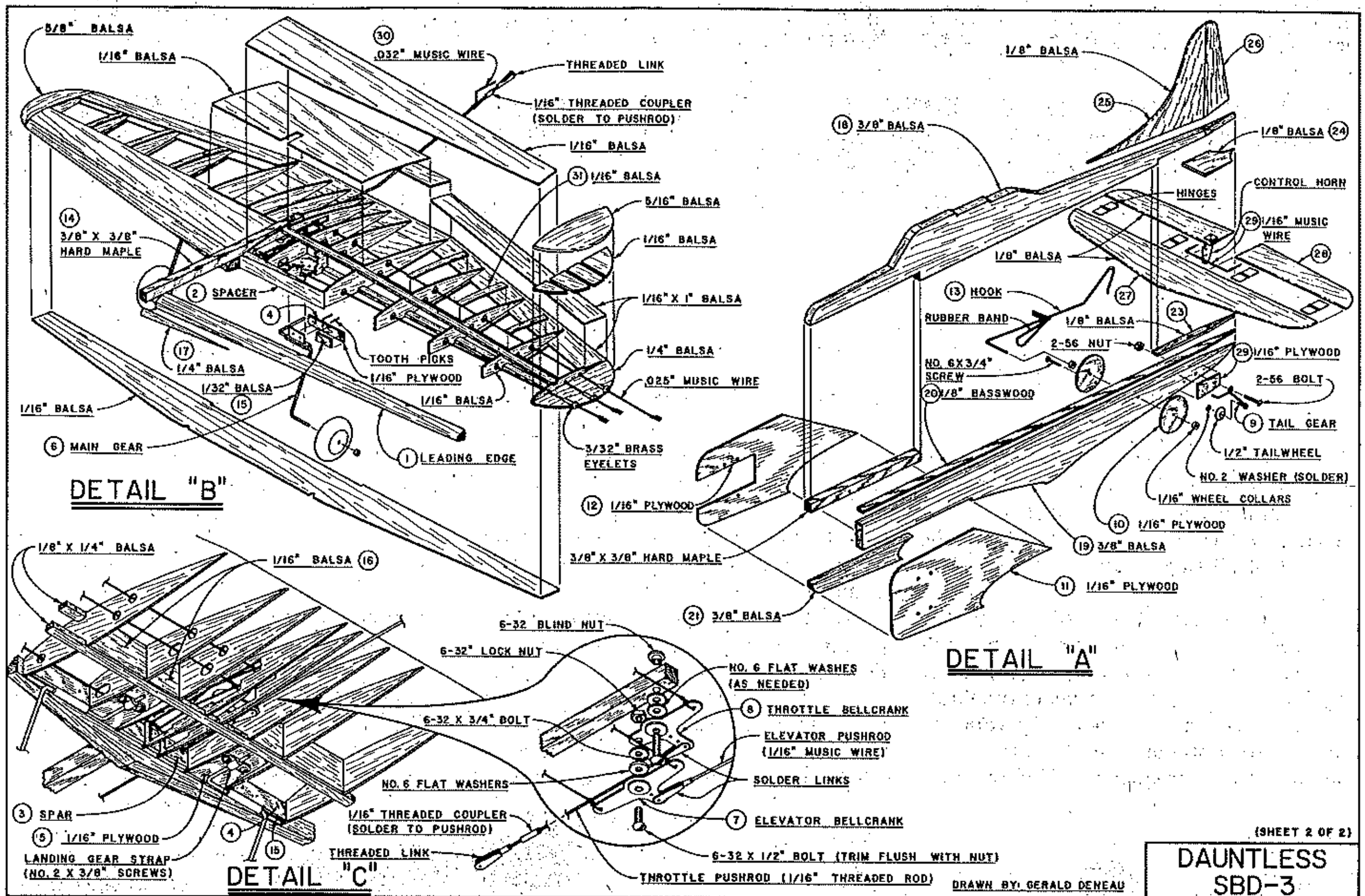
Make the leading edge spacer (Item 2) from ½-in. balsa. Make two leading edges (Item 1), one left and one right, from ⅜-in. balsa. The 1/16-in. notches are used to simplify the positioning of wing ribs. Do not shape the leading edges at this time. Retain the rectangular cross section until the final stages of wing assembly.

Make the lower engine mount (Item 14) from hard maple. Drill a ⅛-in. hole for the bellcrank mounting bolt. Countersink and install a 6-32 blind nut.

Make the landing gear support plate (Item 5) from 1/16 plywood.

Make the trailing edges from 1/16 x 1-in. balsa strips. Glue the outboard trailing edges to the center section trailing edge. Make two.

The most important step in assembling a straight wing is to hold each rib so that it is in alignment. I strongly suggest the use of an A-justo-jig, Great Planes wing jig, or similar device. A handmade jig also does this job very well. Be sure that the




chord line of each rib is the same distance above the working surface.

Glue the lower engine mount (Item 22) to the root ribs (Item A). Locate all ribs in their proper positions, and glue them to the trailing edges. Position the front spar (Item 3), and glue it to the center section ribs (Items A through D).

Glue the leading edge spacer (Item 2) to the front spar. Position the left leading edge (Item 1) on the wing with the ribs inserted into the slots. Glue in place. Repeat for the right leading edge.

Position and glue the upper spar caps in place. Turn the wing upside down, and glue the lower spar cap to the ribs. Glue the leading edge segments (Item 17) to the leading edges at the wing center section.

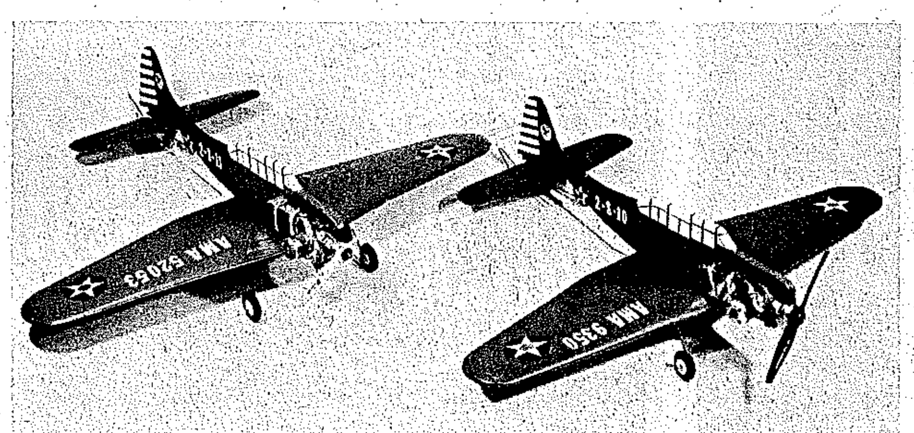
Glue the landing gear support plates (Item 5) to the front spar, ribs (Items B and C), and lower spar cap. These plates fit into the notches in the bottom edge of the front spar and lay on top of the lower spar cap.

Before proceeding with the leading edge sheeting, install the landing gear, bellcranks, and wing control system. Temporarily position the left gear so that the bearing horn shoulder presses against the lower edge of the spar with the inboard end of the horn touching the inboard rib (Item C). (Refer to Detail C.) Check that the spacer (Item 15) fits between the horn and rib (Item D). Remove the landing gear, and glue the spacer into place. Repeat for the right gear spacer.

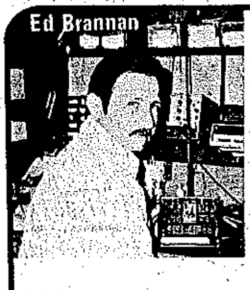
Reposition the left gear so that the horn is against the spar and the inboard landing gear leg is laying on the support plate (Item 5). Then, place the doubler (Item 4) on the aft side of the horn and spacer. Drill two 1/16-in. holes through the doubler, horn, spar, and part way into the leading edge. Temporarily insert toothpicks into the holes from the back side. Enlarge the holes as needed to permit the toothpicks to penetrate into the leading edge.

Withdraw the toothpicks, doubler, and landing gear. Apply epoxy glue to both sides of the horn and front side of doubler. Reposition the landing gear horn on the spar, place the doubler against the horn and spacer, and insert the tooth-

*Continued on page 170*



**Left: When this article was written, members of the Rocky Mountain Aeromodelers had built five of the Profile Dauntlesses—two shown here. Right: The author, Gerry Deneau, with his first .15 Carrier model, a Gruman Wildcat (L), and his second, the Dauntless featured here.**




Hobby Radio Incorporated

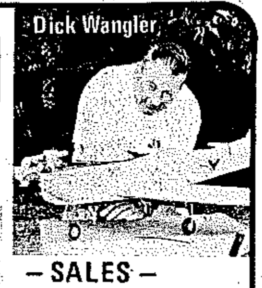
322 So. Gallatin Rd—Madison, TN 37115
(615) 868-6811
Mon thru Sat — 9:00 a.m. to 5:00 p.m.

CHANGE TO RECHARGEABLES

Replace that expensive throwaway dry cell transmitter battery with a rechargeable nickel cadmium battery. Ready to use. Replaces the Eveready 276 nine volt dry cell battery.

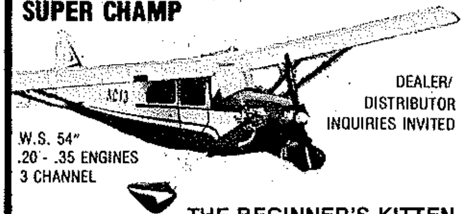
Transmitter Ni-Cad Battery ........ $30.00
Transmitter Ni-Cad Charger ........ $ 8.95
Battery/Charger Combo ............. $35.00

REPAIR SERVICE FOR:
HOBBY LOBBY
EK LOGICTROL
FUTABA — KRAFT
HOBBY SHACK
ROYAL — PRO LINE




— SALES —
RADIO SYSTEMS
FUTABA and ROYAL
ACCESSORIES FOR
MOST RADIOS

A DUAL PERSONALITY TRAINER!
GEMINI'S BEAUTIFUL
SUPER CHAMP




DEALER/ DISTRIBUTOR INQUIRIES INVITED

THE BEGINNER'S KITTEN AND AN EXPERT'S TIGER

Revolutionary snap-on wing eliminates bolts or rubber bands. Complete kit $54.95, dealer or direct.

GEMINI MODELS, INC
P.O. Box 1168, Passaic, NJ 07055


## CL Combat/Johnson

*Continued from page 168*

ple of turns rich-lean, rather than the usual one-eighth turn.

**During the Saturday night repairing** of the one model I used (it made six matches), I had a chance to use the epoxy injector Chuck Rudner and Myles Lawrence made. It's just a regular syringe with some brass tubing stuck in it and the tip is sharpened so it will slice into soft wood and foam. It's easy to mix the epoxy in equal amounts, because you have the ounce and cc graduations on the side. We also found that the microwave is superior to the old hot-water trick when it comes to warming epoxy so it'll set faster. I put the whole thing in Howard Rush's oven, and it worked fine.

Cleanup was pretty easy, because the epoxy we used didn't stick to the plastic syringe or the rubber plunger. Make sure the brass tube is clear of epoxy before it sets! I can see a revolution in model repair during matches. Envision a pit crew with premixed portions of epoxy kept in a cooler. The model hits the ground, and a 10cc portion is rushed to the microwave which is being run by a generator. Not much time left in the match, so the mechanic sets the control to Roast, and 10 seconds later the epoxy is ready to go, and 25 seconds later the "5-minute" epoxy has dried as the engine is being started.

Well, the above may not work too well, but I do have a Howard Rush story for everyone. Howard will be representing the U.S.A. on the Combat team this year, and besides some exotic FAI stuff, he has some equally-exotic Fast Combat material. His choice of propeller was the Y&O cast in carbon fibre. Mind you, this is no thinned down Y&O, but the real McCoy which you measure with a ruler rather than calipers. Just to confound everyone, his models are very fast using this rather-Fifties-appearing prop.

Howard crashed in one of his matches, and Rich Lopez and I couldn't get the prop off. We couldn't get it off during the match, after the match, or for the rest of the day! We theorized that the heat in the crank must have glued it and the prop together. Lopez suggested using a chisel—or maybe just sticking the whole thing in the microwave and seeing what would happen. Just after midnight, Rich succeeded in getting the remains of the prop off using a gear puller.

The same thing can happen with some of the plastic-type props when they break off cleanly with the thrust washer. Nothing short of a miracle would have saved us, but a good water-pump pliers might help you. Something we *did* think about after the match was lost was leaving the hub in place and just putting on another prop, since the engine had a Brasher crank and there would have been enough room for a second prop if the washer was left off.

**I received some literature** from USE for their .15 model engine (see the photo). It looks very interesting, and another good .15 couldn't hurt. They claim .85 horsepower and a very light weight of 114 grams (four ounces). The cylinder barrel has intergral cooling fins, much like the old K&D greenheads. The exhaust exits on the right side about midway between a sideport engine and rearport. The crank is 10mm diameter, which is plenty robust. The note I received from them said there would be some engines at the World Championships. Their address is: USE, Floridadreef 17, 3565 AM Utrecht, Netherlands. There should be much more on this engine after the World Championships.

*Charlie Johnson, 3716 Ingraham St., San Diego, CA 92109.*

## Profile Dauntless/Deneau

*Continued from page 75*

picks. Clamp or hold the assembly together until the epoxy sets up. Secure the landing gear leg to the support plate with the landing gear strap and No. 2 x ⅜-in. screws.

Follow these same steps for the right landing gear.

Attach the lead-out wires to the bellcranks (see Detail C), and assemble the elevator bellcrank (Item 7) to the throttle bellcrank (Item B) with bolt, washers, and locknut. Trim the bolt flush with the nut. Thread the lead-out wires through the left wing, and secure the bellcrank assembly to the lower engine mount with a bolt and washers; cut off the bolt flush with the top of the blind nut.

Cut off a piece of 1/16-in. music wire to a length of 8 in. for the throttle linkage. Solder a clevis link to one end.

Drill a ⅛-in. hole through the leading edge, leading edge spacer, and spar so that the hole lines up with the outer hole of the throttle bellcrank. From inside the wing, thread the unsoldered end through the leading edge hole. Engage the solder link with the outboard hole of the throttle bellcrank (Item 8).

Cut off a piece of 1/16-in. wire to a length of 12 in., and solder a clevis link to one end. This wire will be used for the elevator pushrod. Drill a ⅛-in. hole through the trailing edge of the wing, ½ in. to the right of the wing centerline. Widen the hole to make a ⅛ x ⅜-in. slot. From inside the wing, slide the unsoldered end through the trailing edge, and engage the solder link with the elevator bellcrank.

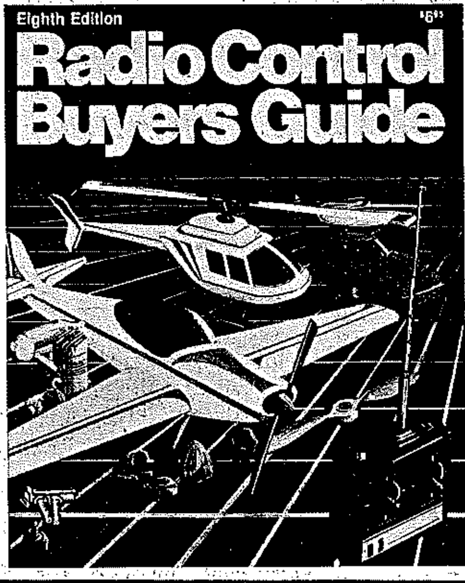
Glue the upper and lower leading edge sheets to rib leading edges and spar caps. Glue balsa sheet segments between Ribs B and C and between Ribs C and D. Glue to the spar caps and ribs. (See Detail C, Item 16.) Glue 1/16 sheeting to the upper and lower surfaces of the center section ribs. Cut rib cap strips (Detail B, Item 31), and glue them to the upper and lower edges of the ribs (Items E, F, and G).

Sand the leading edges to shape. They should blend smoothly into the leading edge sheeting.

Make the right wing tip from a ⅜-in. balsa block. Roughly shape it, and glue it in place. With a sanding block, do the final shaping to blend the tip smoothly into the wing.

The left wing tip is made like a sandwich. The lower part is made from ¼-in. balsa, the center pieces from 1/16 balsa, and the top piece from 3/16 balsa (Detail B). Glue the pieces together, and drill holes for the eyelets. Thread the lead-out wires through the holes, then glue the tip to the wing. Sand to shape. Position the eyelets, and glue them in place. Do not tie the ends

# The RC Reference You'll Read Year-Round.




This one won't gather dust on your R/C bookshelf —you'll keep it too busy, on your workbench, or in your lap. Because the new **Radio Control Buyers Guide, 8th Edition,** was designed to be used year round, for planning projects, locating hard-to-find products, getting ahead in your hobby.

**The Guide** is the master reference work on R/C product information. The 8th edition features over 2,500 RC Aircraft, Cars, Boats, and related products, including hundreds of new products recently released at Toledo and other major R/C shows.

The highly descriptive information is illustrated with thousands of photographs. And the new double-listing format is easier-than-ever to use.

Newcomers will find **The Guide** a mind-jogging excursion into the seemingly endless possibilities of the R/C world —and the wildest machines of its devotees. And all of the Models shown are commercially available.

Get the new **Radio Control Buyers Guide, 8th Edition.** It's the R/C reference book you'll read.

**See Your Hobby Dealer!**

If not at your dealer, send $6.95 plus $2.00 postage and handling to:

BOYNTON & ASSOCIATES, INC.
CLIFTON HOUSE, CLIFTON, VA 22024

**Radio Control Buyers Guide**


of the wires at this time; this will be done after the engine is installed.

Final-sand the wing to remove all rough edges.

**The fuselage** is constructed like most profile models. The only deviation from normal practice is the installation of a basswood reinforcement strip between the upper and lower fuselage pieces. Refer to Detail A.

First, cut out the upper and lower fuselage pieces from 3/8-in. balsa. Then, cut the basswood strip (Item 20) and upper engine mount (Item 22) to the correct lengths. Glue the basswood strip to the lower fuselage (Item 19). Glue the upper engine mount to the upper fuselage (Item 18). Be sure that the lower surface of the engine mount is flush with the bottom surface of the upper fuselage.

Cut the balsa spacer (Item 23), and glue it in place. Position the upper fuselage on the lower fuselage. Check that a 1/8-in. slot exists between the upper fuselage and the spacer; there must be enough space for the stabilizer to be inserted.

Cut two round doublers (Item 10) from 1/16 plywood. Drill a 1/16-in. hole through the center of each doubler and through the lower fuselage. Glue on the doublers, using a 1/16-in. wire to hold pieces in alignment; remove the wire before the glue sets.

Make the tail gear doublers (Item 29) from 1/16 plywood, and glue them to each side of the lower fuselage. When the glue has dried, drill a 1/16-in. hole for the front leg of the tail gear and a 1/8-in. hole for the tail gear mounting bolt.

Redrill the 1/16-in. hole through the center of the round doublers. Also, from the outboard side of the fuselage, drill a 1/16-in. hole 3/8-in. deep into the doubler and fuselage. This last hole is located in the lower aft part of the outboard doubler and will be used to locate the #6 x 3/4-in. screw.

Sand the fuselage to its final shape.

**Tail surfaces.** Make the stabilizer (Item 27), elevators (Item 28), fin (Item 25) and rudder (Item 26) from 1/4-in. balsa. Sand all of the parts to shape. Glue the rudder to the fin with the rudder trailing edge offset 1/2 in. Connect the left and right elevators with music wire (Item 29). Secure the wire to the elevators with epoxy.

Cut slots in the elevators and stabilizer for the hinges. Insert the hinges in the stabilizer, and glue in place. After the glue dries, slide the elevators onto the hinges, and glue in place. Be careful not to get glue into the hinge pivot areas. Install the control horn on the right elevator.

**Assembly.** Slide the stabilizer and elevator assembly into the fuselage slot, and secure with glue. Next, glue the tail cone spacer (Item 24) to the fuselage, leaving equal space between the elevators and spacer. Glue the fin and rudder assembly to the top of the fuselage. Glue the wing to the fuselage.

Glue the fuselage chin (Item 21) to the lower engine mount and wing leading edge. Sand any rough edges from the joints, and then glue the plywood reinforcements (Items 11 and 12) to the fuselage with epoxy.

Position the engine, and locate the mounting holes. Drill 1/8-in. holes for mounting, counter sinking larger holes on the inboard side for blind nuts. Position the fuel tank, and drill 3/32-in. mounting holes for it. Install the fuel tank retaining wires.

Bend the elevator pushrod so that it aligns with the appropriate hole in the elevator horn. Screw a threaded coupler into the threaded link, and connect the link to the elevator horn. Cut the elevator pushrod to fit into the threaded coupler. Solder the pushrod to the coupler.

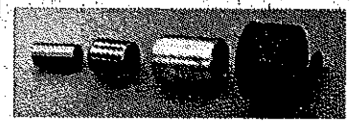
Install the engine. Screw a threaded coupler onto a threaded link (refer to Detail C). Connect the link to the engine throttle arm. With the arm at half-throttle position and the throttle bellcrank in neutral position, bend the throttle pushrod to align with the coupler. Cut the pushrod, and solder it to the coupler.

Slide brass eyelets over the lead-out wires and glue them to the wing tip with epoxy. Move the throttle arm to full-throttle position. Holding the arm in this position, tie the ends of the lead-out wires as shown on Sheet 1 of the plans.

**Hook installation.** Fabricate the hook

## NEW MK 2 H & K SUPER STARTERS

Look before you leap! The original is still the best. Has a new, larger clutch which is fully supported in **all** applications, 90 day warranty, and new lower prices!



MODEL 1—Q-35, Q-50, ZENOAH, ROPER **$24.95**

MODEL 2—Super Hustler, MAG II **$32.95**

MODEL 3—Tartan Twin and Super Twin (Glow) **$39.95**

Manufactured and Distributed by P. K. Products
P. O. Box 6226 • Hayward, CA 94540 • (415) 581-4277

Add $1.50 for postage and handling. Dealers inquiries invited.

## Pro·Tech·Tor


**Transmitter Protection Case**

PRICE: $35 Includes Shipping & Handling in U.S. CA res. add 6%. Send check or m.o. to:

BERGERON ENTERPRISES
443 ROBERTA FULLERTON, CA 92632


(Item 13) as shown on Sheet 1 of the plans. Install the hook to the fuselage as shown in Detail A. Install a #6 x ¾-in. screw into the ⅛-in. hole drilled earlier—screw in until it protrudes ⅜-in. This screw will be used as a stop for the hook when it is in the down position.

Wrap and solder a length of ⅓₂-in. music wire to the elevator pushrod. Then, bend it to hold the tail hook in the up position. Trim the end of this wire so that the hook will drop when the elevator is in the full-down position (see Detail B, Item 20). Loop a rubberband around the hook, and engage it with the screw extending from the round doubler. Engage the hook with the elevator pushrod, and recheck that it will drop with full-down elevator.

**Finishing.** Remove the engine, hook, and tail gear. Cover the wings with silkspan or an equivalent material. Paint the upper part of the fuselage blue-gray and the lower part light gray. The plan shows the approximate line that separates the colors. The upper part of the wing is blue-gray, and the bottom is light gray. The canopy windows are white. Apply white fuselage lettering and star insignias, the latter with red, white, and blue colors.

Apply 1 oz. of "stick-on" lead weight to the underside of the right wing tip. Install the engine, fuel tank, hook, and tail gear. Check that model balances within ± ¼ in. of the center of gravity (CG) location shown on Sheet 1 of the plans. Apply nose or tail weight if needed to achieve the desired balance point.

**Flying.** The little Dauntless is very stable in flight. It lifts off the deck very quickly, and then it settles down for a smooth high-speed flight. Speeds from 60 to 70 mph are easily attained. I have flown my Dauntless at 70 mph to take first place at one of our club contests.

Slowing down the Dauntless for low-speed flight is quite uneventful. The little ship requires only a small amount of up-elevator to hold it at the reduced speed. With practice, you can really get the nose up with the correct throttle control being applied.

Landing is the best part. Just pick your spot, chop the throttle, and let her settle in. It's easy to make three-point landings with this model.

I hope that you enjoy flying the .15 Dauntless as much as I have. Happy landings!

## Scanner/Marez

*Continued from page 79*

quickly as possible. The crystals are not damaged by soldering or de-soldering, but like most electronic components, they don't really like long sustained applications of high temperatures. Fortunately, the pins on the installed crystals are not cut off, and you can re-use them in sockets after cleaning all the solder off. Assuming that you are interested only in one or a couple of new frequencies, you may opt to solder in the new crystals at this point. However, if your interest includes sockets, we should first talk about them, and crystals, a little bit more.

First, the former. There are two types of sockets available. One has the same pin diameter and spacing as the crystals and will drop right into the hole on the printed circuit board. Another has wide, flat pins with wider spacing, and will not. Both are available from Kraft Systems. The board-mounted type, which you need at this point, is Part No. 120-074 ($3.00 each). The other type (use will be described later) is Part No. 120-141K ($1.00 each). Small crystal sockets such as this are something of a rarity; don't bother looking for them at Radio Shack or small electronics supply houses.

Back to the crystals, again my recommendation is get them from Airtronics. If you insist on a different source, you need an HC-25/U type. Do not accept the HC-18/U (which is the same size but has long wires instead of pins) unless you definitely intend to solder them in. The Airtronics crystals come with a nice, neat molded plastic cap; they are identified with the colors and channel numbers, which is a tremendous help, especially if you have decided on plug-in field changes. However, the cap is too wide to allow seven plug-in crystals in the space provided on the PC board. You can install sockets in every other position if four plug-ins are enough to satisfy your requirements. Or you can trim the lip on the sides of the molded cap; this narrows it enough to allow seven side-by-side crystals. However, in this and any previous mention of plug-in crystals, you will still need to remove the top cover whenever a frequency change is required. This is too slow and involved for the constant changes required when the scanner is being used at an active contest. This situation will only get worse when the new frequencies are phased in, so we have developed the ultimate update, which will now be described.

**Full-house update.** Basically, we will install a support-mounted crystal socket board high enough to permit easy crystal identification and changes. A clear plastic window will be provided for checking the installed crystals. The new board, being larger than the space initially used by the original crystal circuitry, will require relocation of the speaker and antenna mount. Don't be put off by all these scary-sounding things. The recommended changes are still mainly mechanical, no involved electronics changes being required.

Start by taking off the top and bottom covers and the rear panel. Unsolder the wires to the speaker and antenna connector, and remove the 12-volt power input jack from the panel. Using your small iron and solder wick, remove all seven crystals from the board; while you are at it, clean the solder completely off their pins. This is best done by applying a bit of paste solder flux, heat, and wiping off the melted solder with a rag. Be careful to not leave any solder bridges on the board during the desoldering operation.

To make the crystal socket board, you'll need a piece of .1-in. spacing electronic prototype perforated board, preferably the epoxy-based type. The cheaper phenolic board is acceptable, though it does not drill and cut as cleanly as the epoxy, and it is not as strong. Cut it to the size of 14 x 32 holes, as shown in the photo. Referring again to the photo, note the locations of the new holes, and drill them as indicated. Note that the 14 crystal