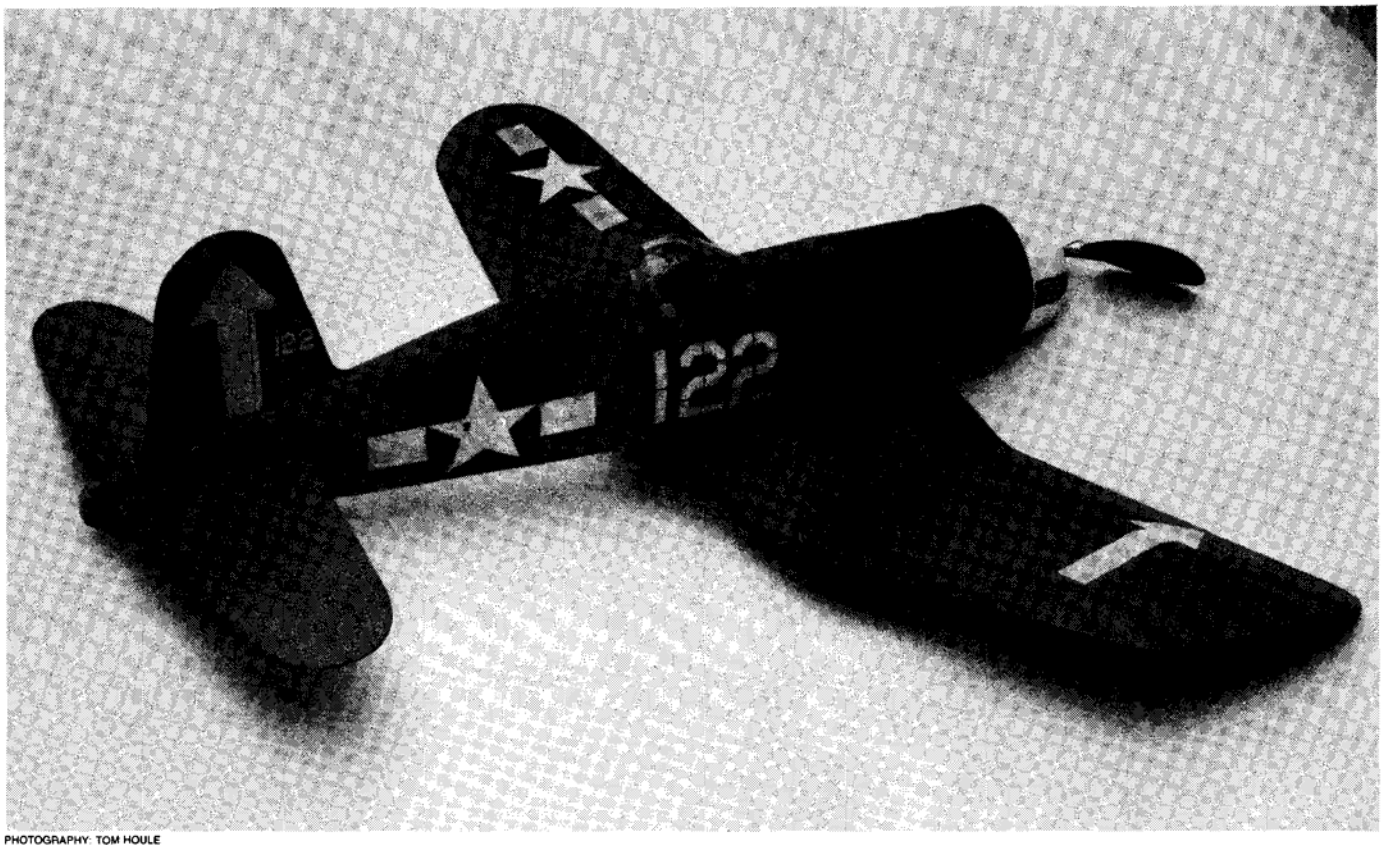
Jumbo Rubber Scale:

F4U-1D Corsair

By Tom Houle

Some interesting construction features highlight the building of this model of the legendary "bent wing bird".



PHOTOGRAPHY: TOM HOULE

Another builder's delight, Tom Houle's F4U-1D *Corsair* recreates one of modeling's favorites in large, rubber scale.

Up front it looked like an easy task. All the Navy wanted was the merger of the experimental XR-2800 Pratt & Whitney powerplant with a new shipboard, single-seat, fighter monoplane. Vought-Sikorsky (later Chance-Vought) had its work cut out. The XR-2800 was air cooled with 18 cylinders placed two deep in a radial configuration, and developed 2,000 horsepower. To properly load the engine and develop the full horsepower, it was necessary to use a Hamilton Standard 13-foot, 4-inch three-blade prop. Now came a problem: to clear the ground and keep the landing gear strut length within reasonable limits, the designer, Rex B. Beisel, opted to "bend" the wings and inadvertently created a legend - "the bent wing bird". Also called the crank-wing configuration, it offered other advantages too: Better over-the-wing visibility, a low drag wing/fuselage junction, and a sort of planing action if the aircraft had to be ditched. And so the Chance Vought XF4U-1 came to be, initially tested on May 29, 1940.

Its potential combat performance became apparent when, four months after its maiden flight, the XF4U-1 became the first American fighter to exceed 400 MPH in level flight. Actual clocked speed was 404 MPH.

The first production F4U-1 *Corsair* flew almost a year later on June 24, 1942. By this time, the original R-2800 engine had gained a two-stage supercharger to offset the inevitable armament and armor induced weight gains. Marine squadron VMF-124 at Camp Kearney, California was the first unit to be fully equipped with the *Corsair.* The Navy, however, was not enthusiastic about its carrier performance; visibility was impaired on landing, the stiff and springy landing gear caused excessive bouncing and new pilots transitioning from the North American SNJ found the F4U-1 to be tricky to handle on the ground and even more so in the air during a wave-off where full power and a left bank could cause the *Corsair* to flip inverted. A blown canopy and raised seat improved visibility. A pneumatic tail wheel softened touch down. It did take almost two more years, however, for the Navy to officially approve the *Corsair* for carrier duty.

Vought terminated production in February, 1945 after building almost 5000 aircraft. However, additional revisions continued to roll off the line until December, 1952 when the last F4U-7 and AU-1 models were delivered. In total 12,571 *Corsairs* were built.

There are many excellent scale references to work from to authentically duplicate any number of F4U configurations. An incredible array of color schemes and armament/radar models are possible, starting with the silver and yellow XF4U and ending with the multi-striping and barn door sized lettering of the Marine AU-1 and foreign F4U-7 of the 1950's. I used the Squadron/Signal Publica-

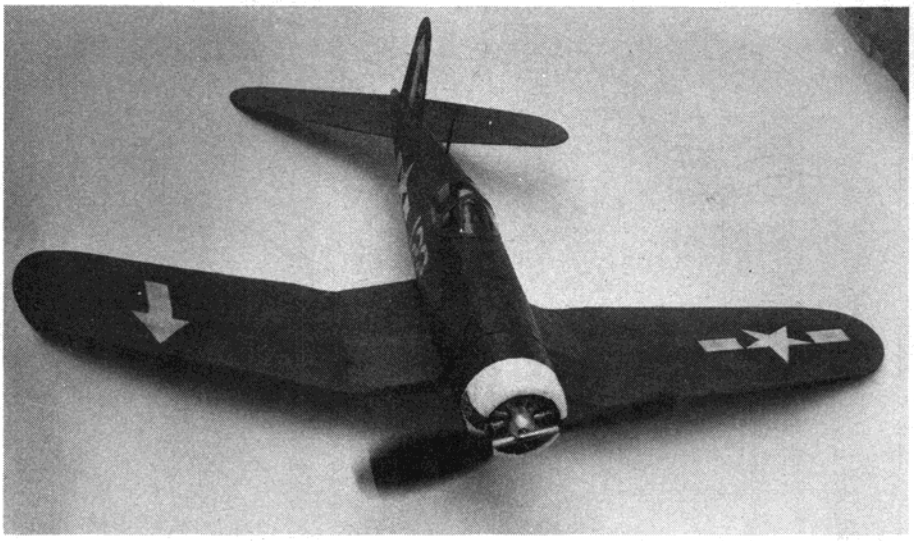
tions Aircraft No. 29 *F4U Corsair In Action* and *Fighters of World War II* by Charles W. Cain,Exeter Books, New York. Profile Publications holds the copyright. Both are excellent and will provide virtually all the information you'll need including an excellent four-view of the F4U-1A in the Squadron/ Signal publication. With only minor canopy and cowl changes you can modify my plan to represent any of the models from the earliest to the latest. The F4U design was so good up front that it actually changed externally very little over its 12 year service life.

My model, as built and marked, replicates an F4U-1D assigned to VF-84 aboard the U.S.S. Bunker Hill in February, 1945. The overall color is glossy Sea Mist blue with insignia blue and white insignias and white squadron markings. The markings were taken directly from a four-color layout in *Fighters of World War II.* All marking and insignia patterns are shown full size on the plans if you wish to duplicate my color scheme.

The scale I selected is 1″=1′. This places the model at a 40.9 inch span with approximately 330 square inches of wing area. The area was attractive, as scale models do not build like Wakefields and weigh in accordingly. All up, my model, less rubber and nose weight, weighs 117 grams (4.12 ounce.) This includes finish paint, markings and prop/ nose plug assembly. I deliberately left off the landing gear as I would not ROG the model and I personally much prefer the sight of such a model flying as it is supposed to; legs up. Plus there is a marked reduction in drag and weight. You could build a heavy dummy set of plug-in struts for static display. Ditto for the scale prop assembly if you are so inclined. I have included the scale outlines for both on the plans. You will have to figure out the ways and means of attaching and removing the four gear doors!

Let's start building. Since some of you younger modelers may want to try your hand at building this bird, I am going into some extra how-I-did-it detail. You old timers just turn to the plans and start cutting. I always start with the tail feathers as I like building them the least. Start out by soaking three strips of 1/32 x 3/32 basswood in hot water for 20 minutes. Make them long enough to wrap around both horizontal stabilizer tips and the top of the vertical stabilizer. While they are soaking, cut the two horizontal stab and the vertical stab tip forms from 3/32 sheet. These will serve as bending forms around which you'll form the actual tips. Using an aliphatic glue like Titebond or SIGbond, laminate and pin the strips (three per tip) to the outside of the forms. Let these strips dry for at least three days and then lay out both stabilizer assemblies using 3/32 squares and 3/32 x 3/16 strips. The 3/32 sheet trim tabs should be hinged with soft copper wire. A touch of epoxy will hold the wire in place. Clean up all glue webs and sand and set these pieces aside. Incidentally, I used Titebond throughout but you could also use a cyanoacrylate type if you prefer. Now on to the wings.

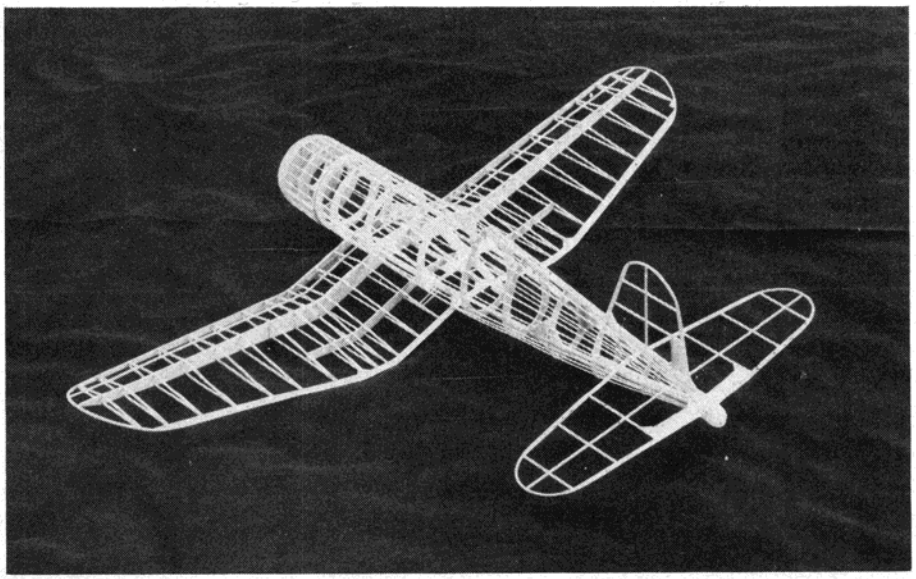
You are probably wondering how to build a bent-wing in one piece. I was too until I actually did it. I must admit I did a lot of head scratching and sketching trying to come up with the least complicated process, not to mention how does one draw a plan view of such a wing? The plans show the wings as viewed from above with the outer panels laid flat but the center section actually humped. The "X" points indicate the transition point from flat panel to elevated section. Only the outer panels have true perspective. *Do not attempt to build the center section using rib locations shown!*



Tom's inspiration was a *Corsair* that operated from VF-84 aboard the USS *Bunker Hill.* There are any number of excellent scale references available to allow you to duplicate one of the many F4U models.

To start the wings, cut out and assemble over the plans: the 3/16 sheet leading edge with its 1/16 sheet backing, the 3/32 sheet main span with its fore and aft 1/32 sheet doublers, the 1/16 sheet secondary spar, and the 1/8 x 3/8 trailing edge. Notch the bottom of the center section trailing edge at the points where it bends. Then gently shape the strip so that it matches the bend in the wing. Fill the notches with glue to harden in this bend. Notch the spars and leading edge too, for the 3/32 square "cracked" ribs to be added later. Now cut from 3/32 sheet the four center section assembly jigs. Pin them over the center section leading edge, main spar, secondary spar and trailing edge locations. These will serve as temporary supports while you build a center section in place - hump and all! Make one last check to ensure that each jig is centered and then pin the leading edge, main and secondary spars and the trailing edge in place. If you have built these items correctly and cut out the jigs properly, the two should mesh perfectly. If they do not, correct it now. Incidentally, when you place the leading and trailing edges over the plan, do not include the outer panel pieces. These will be added later. Only the main spar and secondary spars are built in one piece. Take a square or drafting triangle and make sure that your leading and trailing edges are correctly located over the plan. Since they are "up in the air" this is the only way to make sure they are following the plan.

Now lay in all of the 3/32 square top ribs. Use two side-by-side at the center dihedral breaks. Also add the 3/32 square bulkhead attach strips aft of the secondary spar. The F11 bulkhead will ultimately attach here, top and bottom. Let the assembly cure thoroughly and gently remove. Turn it over and add the bottom 3/32 square ribs. Note that the rib locations throughout the center section are governed by the spar and leading edge notches only. Do not attempt to follow the rib locations shown on the plans. Due to the slope, their perspective is distorted. Be sure to add the 3/32 sheet gussets as they add



That unique gull wing was Tom's biggest hurdle in the design of the *Corsair.* Study the plans and read the text to see how it's done. Doing so will save a lot of wasted wood, time and frustration.

quite a bit of strength to the dihedral breaks. You should now have a gracefully curved, complete but stub-ended, center section ready for the addition of the outer panels.

These panels are built directly over the plan. Start by carefully locating the port (left to landlubbers) main spar on the plan and pinning it securely. Make sure it is straight and true. You don't want a bent bent-wing, do you? Then pin down the shaped 1/8 x 3/8 trailing edge and the pre-assembled and notched leading edge. Add all bottom 3/32 square ribs by sliding through the bottom notch of the main spar into the notched leading edge. Cut off at the trailing edge and glue them in place. Next add the "cracked" top rib 3/32 squares. You will be amazed at the strength of this wing when you finish. It is very strong and lighter than using sheet ribs. Don't forget to add the three-strip 1/32 x 1/8 basswood molded tip outlines. Use the same procedure as outlined for the vertical and horizontal stabilizers. Let everything set up well and then repeat the process for the starboard outer panel. Finally, add the 3/32 square stringer, topside, midway between the main spar and the leading edge. This fills out the airfoil and acts as a turbulator strip too. If you want plug-in landing gear struts, now is the time to epoxy in the aluminum tubing. See the plans for locations. You now have a set of F4U wings. My bare wings weighed 35 grams. How do yours compare? My uncovered horizontal stab weighed six grams whereas the vertical weighed two grams. Again compare yours.

Now we need a fuselage to go with that beautiful set of curvey wings. Start by cutting out all the fuselage bulkheads from one to 17. Take your time! There are quite a few to do and it may be better to do it in two or three shifts. One through three are built in one piece. 4A through 17 are built in upper and lower halves to enable crutch construction over the top view. Select fairly heavy wood for F1-F4 as you will probably end up tail heavy, so you might as well add functional weight in the nose area. Also cut out the two 1/16 sheet wing saddles and horizontal stab mounts.

Start with the cowl section (one to 6). This is built as a complete subassembly. Using the top or plan view, pin down the two laminated side longerons (3/32 squares) to the plan. Place the upper halves of 4A through 6 over the crutches and glue in place. Add the top longeron (two 3/32 squares). Let dry, remove and repeat for the bottom half of the cowl. Then add the cowl 1/4 sheet rings, one to three. Shape these to the plan outline. Add the 1/16 square stringers all the way around and clean everything up. Set it aside and proceed to mold the top and bottom fuselage longerons.

Due to the slight hump in the turtle deck area, I elected to mold or prestress the longerons to avoid any unplanned fuselage curves that might develop if I simply bent the longerons to meet the bulkheads. This was done by soaking and molding two 3/32 square laminations for both the top and bottom longerons. Note that while the bottom longeron is molded in one piece from 8 to 17, it must be sectioned after molding to admit the wing. The top longeron is molded only from 12 to 17. Forward of 12 it's a straight line.

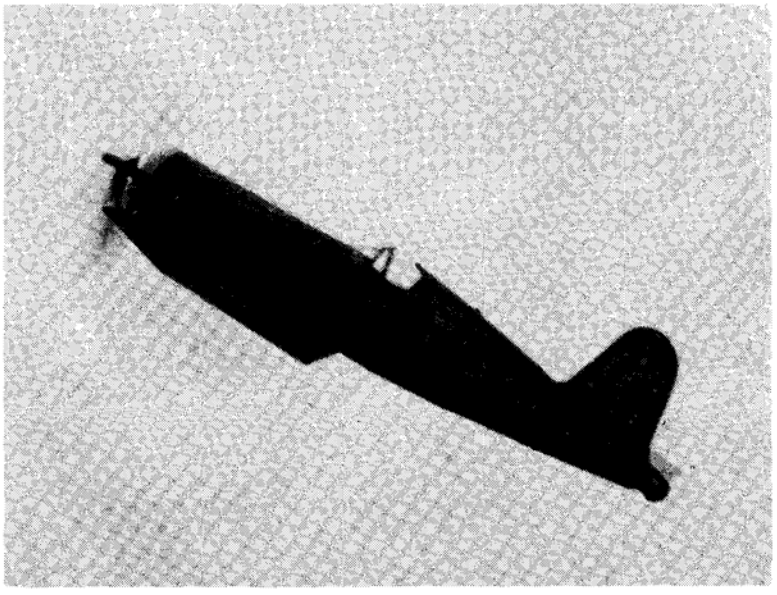
Pin the two side longerons in place over the plan view from 8 to 17. Place all upper half bulkheads in place along with a straight top longeron from 8 to 11 and the molded longeron from 12 to 17. Add the temporary segment between 11 and 12. It will be removed later. When this much has cured, add all the 1/16 square stringers doing one on one side then duplicating its location on the other side. This equalizes stress and keeps the fuselage straight. You may also add the 1/16 sheet horizontal stab mounts at this time. Now sit back, have a Coke and let everything set up. Remove the fuselage half shell from the plan and add the bottom bulkhead halves. Also add the molded longeron but do not include the longeron from 9 to 12. And add the 1/16 sheet wing saddles; note that they must twist slightly to attach to 11 and 12. Retain the bottom sections of 10 and 11. They are installed after the covered wing is glued in place. Now add all the 1/16 square stringers above the wing saddle. The bottom stringers cannot be added until after the wing is finally glued in place.

Carve and shape the 1/4 sheet bulkhead 7 so that it has the radius shown. Attach it to 8 and glue the completed cowl to 7. Shape a piece of styrofoam for the tail cone. Do not use balsa as this bird is precariously tail heavy already! Remove the 3/32 x 3/16 strip temporary support in the cockpit and carve/shape a balsa block mold to vacu-form a .005 acetate or butyrate canopy. SIG sells plastic expressly for this purpose.

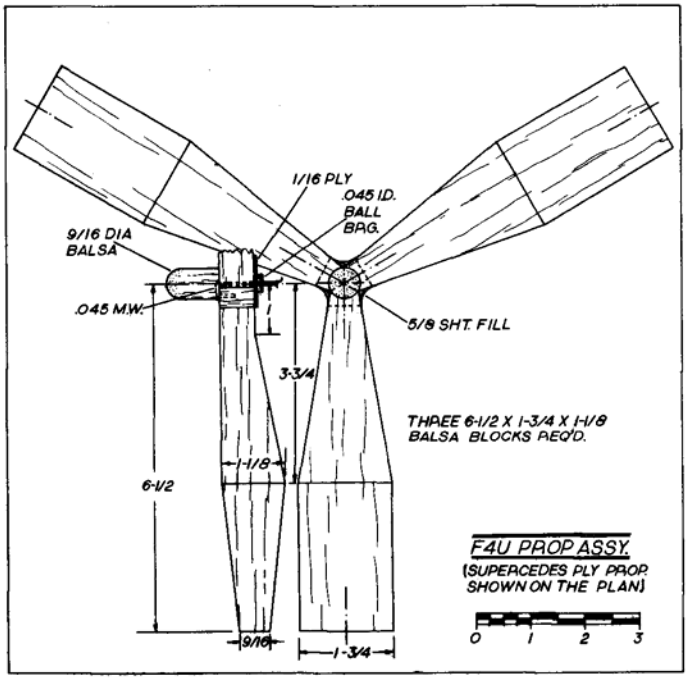
Cover your wings with either the correctly colored tissue or use white and airbrush it. Spray the tissue with a light water mist and when taut, attach the wings to the fuselage. Make sure the wing is centered and snug in the two saddles. Now add the remaining parts of 10 and 11, the bottom 1/16 square stringers and the 3/32 x 3/16 crutch segment. The fuselage and horizontal and vertical stabs may now be covered. Cover the fuselage in strips for the best covering job.

The only subassembly left is the prop/nose block. Start by cutting out two 1/32 plywood paddle blades. Soak in hot water and form by rubber banding to a three pound coffee can at a 20° angle from the vertical. Make sure both blades are at the same angle. Also cut a length of birch 1/4 diameter dowel for the prop hub. Build a jig which sets the two blades at 45° each as measured 2 7/8 inch from the hub. See the plan. This is an adaptation of an idea published in FLYING MODELS by Don Srull. It seems to work well. You'll also need a 1/32 brass freewheel plate, .045 music wire, and 3/32 O.D. brass tubing. Build up as shown on the plans. After the ply blades are formed they are epoxied to the 1/4 inch dowel hub in the jig, one at a time. Use a propeller ball bearing (.045) assembly from Oldtimer Models or FAI supply. The engine cylinders are carved balsa. The nose plug should fit snugly into the cowl so that when the rubber runs out, the noseblock stays put and allows the prop to free wheel. I have not tried a three-blade prop on my bird but it could be done if you wish. I have used them successfully on other scale projects, notably an OV-10A Bronco twin.

There you have it; a completed and covered airframe. As I said earlier, the sky is the limit on color schemes. If you have an airbrush you're all set. If you don't, I strongly recommend that you find a buddy that does. There is no other way to paint this bird that will not build up excess weight; the killer of scale rubber. So please keep your finish as light as pos-



Good flying characteristics hinge heavily on the correct placement of the CG. Put it where shown on the plans; it yields a fast, flat glide.



sible. Ross Jahnke kindly airbrushed an opaque coat of Aero Gloss (highly thinned) Bonanza Blue directly onto the bare white tissue. Insigniae and markings were done by him with paper stencils and sprayed white and insignia blue enamel. The Bonanza Blue is a fairly close match to the Sea Mist blue of the prototype.

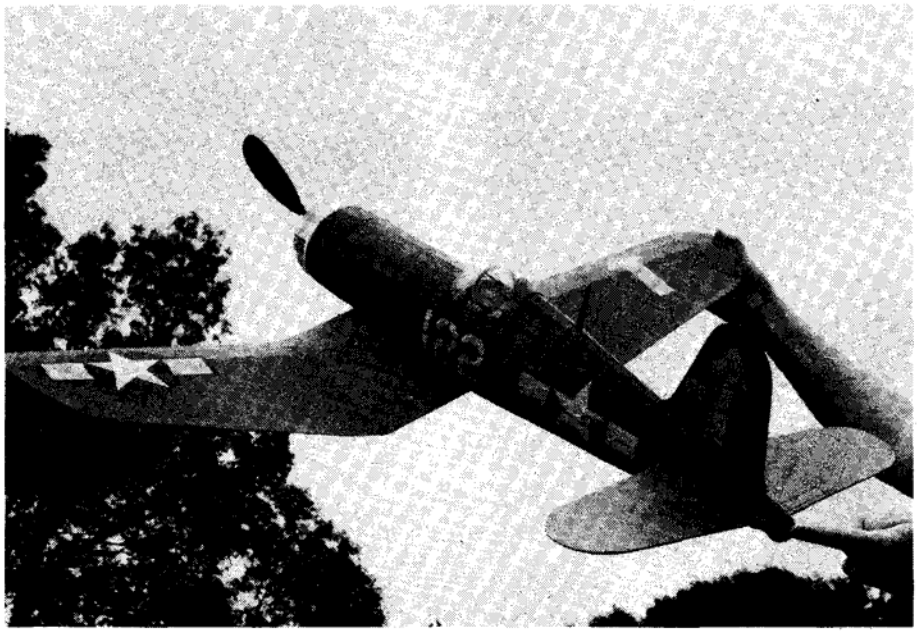
When it came to flying my model I admit to having had the usual knee-knocks. This project is definitely not a shake-the-box type, and when it's all done, with its legs tucked up, it sure is tempting to just hang it from the ceiling as in days gone by. But, Junior Birdmen, this is definitely not in the spirit of flying rubber scale, so it's off to the legendary field of tall grass for some test glides and power trim. I actually have such a field next to my home and it has saved a number of my reluctant-to-fly airplanes in the early stages.

I used Sig 1/4 inch rubber for power but you might want to try some from Oldtimer Models or FAI Supply. Ten braided strands about 30 inches long were used to get a decent climb-out from launch. But before you start packing in that first zillion turns, get the C.G. to where shown on the plan. Mine required packing clay inside the nose plug 1/8 sheet box and a bit more on the radial engine. Packing lead sinkers with the clay would reduce the amount of clay required. When checking the C.G., be sure your motor and prop are installed with just enough turns to tension the rubber with the prop pinned so as not to turn. Do not try test gliding aft of this C.G. The glide should be fairly fast and flat with no tendency to pitch up or down. Make sure that initial glides are made with all trim tabs set to neutral. Slight pitch adjustments can be made with the horizontal trim tabs. These are very effective and are much easier than shimming an adjustable stabilizer.

Try a few powered flights once you have established a nice flat glide. I start with 50-75 hand turns and work up to 400-600 winder wound. Check each flight for bad tendencies. Curiously, I found that very little down thrust and no side thrust were required to get a nice stable left hand power pattern and glide. Typical of larger scale free flight models, this one flies reasonably slowly and is definitely not twitchy like many of the peanut and 1/2 inch scale types. No doubt the scale factor improves and aids stability.

In any case, while the F4U is not (nor was it intended to be) a Chet Lanzo *Puss Moth* kind of design, it isn't an overweight "sled" either. With all outlines scale except for the slightly enlarged horizontal stabilizer and minor dihedral increase, it flies very well. And if you can hold the total flying weight to eight ounces (232 grams) or less, you will have a trimmable and flyable airplane. Anything over that will present problems due to excessive wing loading and rocket-like flight. Less rubber and nose weight, the ready to fly model should weight around seven ounces (203 grams).

So keep it simple. Choose your balsa carefully (strong/light type) or buy it from Micro-X, Old Timer Models, or other purveyors of un-R/C type wood. Your *Corsair* may not fly like mine. It might, for example, want to fly right. If so, let it, but always use a touch of wash-in on the inside panel or a touch of wash-out on the outside panel to keep the inside wing up. Above all, kill any stall tendency with downthrust adjustments early in your power program. And don't forget to enjoy when you launch your bird into the wild blue yonder.



Tom's daughter, Mary, poses with the *Corsair* **(above)**. Done in 1" = 1' scale, the model spans 40.9 inches **(below)** with approximately 330 square inches of wing area. The landing gear was omitted to reduce drag.

Don't forget, next month we will build an A6M3 *Zero-Sen;* the historic counterpart to the F4U.

Post script

After testing the plywood, two blade paddle prop shown on the plans, I decided to switch to a three-blade 3:2 ratio balsa prop for two reasons: the *Corsair* just didn't look right with the two blade prop and the pitch was too great for the airplane weight. The climb rate was reduced due to the excessive pitch. The carved balsa prop provided much better performance and definitely supplied that sought after Corsair "look". When carving the blades (after they are assembled), be sure to carve the backs of the blades first. Dope and tissue the blades for extra strength. The backs of the blades do not have any undercamber; they are flat.