Curtiss F6C-1 HAWK

By EUGENE MARTIN . . . A highly detailed 2-inch scale model of the Navy version of the Army's distinctive P-1 Hawk (see Pete Westburg's scale drawings in this and the preceding two issues). Text includes a wealth of detailing techniques of use to all scale modelers.

• Who doesn't know of the flamboyant Curtiss P-6E Hawk fighter, with its talon-decorated wheel pants? What a sexy airplane! Unfortunately, this is not the story of this colorful AAF pursuit ship, but rather its all-silver, not-so-gawdy granddaddy, the Curtiss F6C-1 Hawk (alias P-1A).

The genius of my Hawk model was actually a spinoff from an old "Giant Kit" of the F-11C-2. I had built the kit, only to discover when I went looking for documentation that the model was totally out of scale. I used a Wylam plan book to check out the discrepancies, and as I leafed through the pages, my fantasies began to wander to some of the other biplanes illustrated. A two-page drawing of the F6C-2 caught my eye, and soon I was planning its probable success as a scale subject. I recalled a mention by Dave Platt in his book *Scale In Hand*. He said, "How about the P-1? It should make an excellent flying scale model."

Further examination revealed the streamlined cowl was deep enough to conceal the engine and exhaust system, and I would also not have to detail a radial engine. The fuselage was a simple box with no compound curves or intricate structures. The wing sported a Clark-Y airfoil, and the tail surfaces were extremely generous. The landing gear had large wheels (to help avoid nosing over) and the gear was mounted well forward of the center of gravity, which usually means good ground handling. Finally, the amount of scale detailing required would be simple and at the same time interesting enough to make a very competitive model.

Since my building practices were totally oriented to kits, I decided to keep the structure of my Hawk as much like an out-of-the-box kit model as possible. The plans, therefore, are just like something you would find in a kit. You can be sure there are no surprises in store for you if you build this model.

One of the most important design features of my Hawk is its light weight. I set 7-1/2 pounds as my goal. The judicious selection of woods and the use of Monokote kept the Hawk at its target weight. However, since the *Scale R/C Modeler* article, a new landing gear has been made (full scale, including shocks) which has increased the weight to 8 pounds. Interestingly, the extra weight had no effect on the performance of the model.

RCMB's editor asked me to include some construction and finish notes on building the Hawk. After restudying the plans and retracing my building steps, I decided there are only a few areas worthy of comment. Being an all-balsa airplane, there are no exotic materials to chat about, and I'm not about to tell you scale buffs how to glue wood together. It is an honest model to build for anyone who can follow a set of plans. The materials and hardware are called out by manufacturer and item numbers. All required patterns are also on the prints and called out by name or number, or both.

It should be noted that the wings get progressively thinner toward the tips. This thinning happens equally on the upper and lower surfaces of both the top and bottom wings. Therefore, the upper wing, which hasn't any dihedral, isn't flat on its lower surface from tip to tip, and it would rock on its center rib if set on a flat plane. The same is true if the wing is turned over and set on its upper surface. Only the center line of the upper wing will be true to the flat test plane. On the lower wing, which has 1-1/2° dihedral, the dihedral is not set to the flat-bottom surface of the Clark-Y airfoil. The wing is again constructed around a common center line, and that center line is where the 1-1/2° dihedral is set. Therefore, if by chance the dihedral is measured on the bottom surface of the lower wing, it would be somewhat more than 1-1/2°.

Building wings of this type can be difficult. The task can be made easier by building the wing in a jig. A simple jig can be made by using two flat 1 x 12 x 36-inch boards. Set the two boards on one flat 1 x 12 x 72-inch board. Using nails, secure the two boards to the baseboard at the center only. Then lift and block the two boards at the outside ends to the bottom contour of the wing. When alignment is complete, secure the two boards at the wing tip ends. A jig of this type can be adjusted to accommodate both the upper and lower wing of the Hawk. Note: the rear spar of each wing already has the proper tapers built in and can, therefore, be used to assist in setting up the wing building jig.

On both upper and lower wings, the spars are one piece. They are not spliced in the center. Select the wood for the spars very carefully. The grain should not vary more than 15° in the entire length of the spar. It should not have more than a 10° slash, and should have at least 20 grains per inch. Finally, front spars of the lower wing should be steamed and jig bent at the 1-1/2° dihedral bend points. Note: the F6C-1 is capable of very vigorous maneuvers. Therefore, use the best material you can find for the spars. Also, the flying wires are a functional part of this model. The nylon clevises on the ends of the wires allow for breakaway, if necessary, as well as ease in assembly.

The tail carriage is built as a separate unit and is held to the fuselage with four No. 2 screws or four spots of 30-minute epoxy. I used the screws, allowing me to remove the tail easily if necessary. Also, I find it easier to build a model in modules which can be built separately and then be plugged together. The real planes are made this way, why not the models? As builders, we all want ways to control the amount of damage to our models in minor mishaps. If a tail carriage, attached in the manner described, snags an obstruction, it will break away from the fuselage rather than taking half the fuselage with it. Let me emphasize again, the flying wires in the tail carriage *are functional*.

The fuselage, as you can see, is of standard construction, except I like to use 1/4-inch square hardwood (spruce) main frame stringers. The hardwood makes for stiffer construction. Here I would like to talk about glue. I find 30-minute epoxy or white glue a must in high stress areas. Five-minute epoxy tends to pop loose like an old scab. However, I discovered a marvelous use for five-minute epoxy. The nose of my Hawk has four coats of five-minute epoxy mixture on it. The mixture is five-minute epoxy thinned with M.E.K. to the consistency of water. The M.E.K. will keep the glue from hardening until it has evaporated and will allow the glue to penetrate completely through the balsa. Brush the mixture on all outside and inside surfaces on the planked nose section of the Hawk. Besides strengthening the nose of the model, the mixture will stop the wood from soaking up fuel and oil.

I would also like to pass along a neat method I have for aligning the cabanes. Once the bottom wing is seated on the fuselage and aligned with the stabilizer and thrust angles, the cabanes are fitted to the fuselage and left extra long. Then a box-like structure, much like a scaffold, is temporarily tack-glued to the fuselage sides. This is simply four balsa uprights with longitudinal crossbars onto which the wing can be set. These horizontal bars are pinned so that they are parallel to the fuselage crutch, which serves as a datum line. The wing is placed in the cradle, checked for trueness, then the Proctor clevises are soldered to the trimmed cabane wires. Now the scaffold is removed and presto! Instant wing alignment. I would also like to state at this point that the incidence angle of both wings is a negative 2°. This incidence is set on the flat bottom of a Clark-Y airfoil wing; not through the center line of the wing. *Again*, when designers using the Clark-Y set the incidence they use the flat bottom as the datum plane. The incidence of both wings on the Hawk must be set at a –2° on that datum plane.

The landing gear (standoff version) is shown on the prints. The static scale version is on the second sheet. Both are

interchangeable and are attached to the fuselage as a module. The gear can therefore break away if snagged by some obstruction. I find that silver solder is the best way to assemble the landing gear. However wire-wrapped 60-40 solder joints will work also. They are just bulkier.

The controls of my Hawk are set up just like the real plane. I use servo-controlled quadrants, which operate the control surfaces through flexible cables. However, most builders have their own system of controlling a model, therefore I do not show a control installation.

I do, however, show how to make and install the aileron torque rods in the lower wing. These rods have been carefully tested. Do not make your rods from plastic or music wire, as it will twist too much and cause aileron flutter. Also, do not change the size of the aluminum tubes. If you must change something, change to brass tubes instead of aluminum. The weight will not affect the model, and the wear factor of brass is superb.

As for finishing, I chose Monokote as the covering. It is light, easy to handle, and reasonably strong. However, before I covered the model, I completely assembled all components including all controls, wires, wheels, motor, etc. After everything is checked and adjusted as required, disassemble the model for covering. The wood is prepared by careful sanding, the last sanding being with No. 400 paper. Then the entire model is painted with two coats of Balsarite. First I cover the lower panels of the wings. I used one piece of Monokote for each wing. The lower wing is easy; however, on the upper wing, the location of the wing attach points creates a problem. Carefully cut rectangular slots in the Monokote to accommodate these attach points. Then slowly stretch and work the covering over the attach points. Tack and seal the Monokote around the attach points first. Then pull and stretch, tack and seal the balance of the lower surface of the wing. When I attach Monokote, I stretch it, cold, almost to the point of breaking balsa. That way, when it is heat shrunk, the Monokote will resist sagging in the sun.

The tops of the wings are done the same way, except the cutout situation is reversed. After the wing is covered, make small Monokote rectangles with slots in them. Make them just large enough for the attach point lugs. Carefully attach and seal these rectangles at each attach point lug on both wings. The fuselage and tail are covered much the same way, by stretching, heating, expanding, using cold, wet cloths, and finally heat shrinking. All surfaces of my Hawk are covered with Monokote. This means even the cabanes, fairings, blisters, and cowl. Even the fire extinguisher is covered with Monokote, except for the red handle and black ends. The only paint I used was on the wires, spinner, wheels, cockpit detail, and final trim.

Raised panel lines on the upper portion of the fuselage and at the access doors on the wings can be made by outlining the panel with 1/8-inch white striping tape. (If you use a darker color, it will show.) The tape bond can be straightened by passing a sealing iron over it. Set the iron at lowest heat. Then cut a piece of Monokote from a pattern to the exact size of the panel. Next, lay the Monokote over the tape and seal it to the tape. Now start at the center of the panel and touch seal it down. Work slowly toward the striping tape, sealing as you go. Be careful not to overheat, especially next to the tape. Finally, wet, cold cloth in hand, quickly pass the sharp point of the iron along the inside edge of the tape, and just as quickly pat it with the wet cloth. When repeated on all sides of the panel, the result will be a beautiful raised-edge panel. If the panels are set progressively one on top of the other, start with the lowest and work to the highest. The results will be impressive. One other point. *Monokote has a grain.* When simulating panels, rotate the grain. Light will then reflect differently from each panel, enhancing the beauty of your model.

The wire studs simulating the panel hold-downs are made from small wood beads cut in half. Each half is Hot Stuffed to the model, then a .020 aluminum wire is slid into the remaining half-holes of the beads. The wire is cut to length and bent over on the ends. Finally the beads are painted the same color as the model. It looks just like the real thing. The panel screws are common pins with a black slot painted on them. The hooks for the lacing are common pins Hot Stuffed into the balsa backing. The lacing is black upholstery thread Hot Stuffed to the pins. Finally, the laced panel outline is defined by a very fine black thread. The crank is made from balsa painted black, and the handle is covered with black friction tape. The bomb sight is made from an old ballpoint pen and its cap. All the holes or cutouts that are not functional are simulated and are made from black trim sheet and outlined with 1/8-inch black trim tape to give the illusion of depth. Flush panels are made from trim sheet the same color as the model. Then, before the backing is removed, the edges are colored with a black felt-tip pen. This gives the illusion of a seam instead of a line.

I made my own instruments, however, it would be easier to buy them from Tatone. The gas caps are made from a 3/8-24 thumb-nut, the kind that holds the glass to your bedroom light fixture. If you set up your model for the slipper tank, the rivet detail on the tank is the old white glue routine. However, I find it works much better with the sharp point of a toothpick. The lettering on my Hawk is done with dry transfers purchased at the local stationery store, and the insignias are, would you believe, made from Monokote. Finally, the fire extinguisher is made from balsa, Monokote covered. It has a bamboo handle and a fire extinguisher label from a Sears catalog.

An excellent source of detail and documentation on the Army version (the P-1) can be obtained from Peter Westburg. My documentation on the F6C-1 came from Wylam book 2. After I had all the detail on my Hawk, I used steel wool and sort of burnished the simulated metal panels. I then took No. 400 wet-or-dry and lightly scratched the Monokote, first one way, then at 90° to the first way. This scratching is done to simulate fabric. Scratch it only at carefully selected points. We are only going to create an illusion of fabric, and it's very questionable that fabric threads could be seen with heavy dope paint on it.

Now I was ready for the last step in completing the finish on my model. After cleaning the model with Hobby Poxy thinner, I mixed some Hobby Poxy with satin finish catalyst. Instead of adding one part thinner, I added 1-1/2 parts. Thus, the Hobby Poxy will dry faster, and two coats allows for better coverage. Using an airbrush, I gave the entire model two coats, one right after the other. The effect was stunning. The bonus was that all trim details were sealed and stuck in place, and all the Monokote seams were almost completely hidden.

After assembly, the finished Hawk is an impressive model. It's large for a biplane, with a 63-inch span (top wing) and a 44-inch fuselage. My F6C-1 Hawk handled very well in its ground test. It was much better than any of the other biplanes I have flown. The forward gear and the big tires made even crosswind handling an effortless affair. In the air the Hawk is a rolling fool, and it's no slouch in the other departments either. The light wing loading really paid off in several significant areas. The model could be slowed down to a very realistic speed without fear of stalling. In maneuvers such as an immelman, square loops and Cuban eights, the power-to-weight ratio helps pull the model effortlessly over the top.

No, the F6C-1 Curtiss Hawk isn't as colorful as the P-6E Hawk, but it makes a contest-winning 2-inch scale model. It was my first scratch-built effort. To date, my F6C-1 has placed first in every contest it's been in except one. In that contest it placed second only to my own Sparmann P-1. Its highest honor so far is 1st place in team scale at the 1979 Western Scale Nationals. If you choose to build the Hawk I am sure it will bring you all the pleasure it has brought me.●