

# P-40!



By COL. ART JOHNSON . . . That designer/builder/flier who brought us a fantastic P-38L "Lightning" just three years ago this month, brings us the historically famous fighter that held up our our end of air defense in the early days of WW-II. And it couldn't have been better researched . . . he flew it himself!

• P-40. If there is one World War II aircraft that almost everyone can identify by a simple letter and two numbers, it has to be the Curtiss P-40. Writers sometimes called it the Warhawk and the RAF hung the names Tomahawk and Kittyhawk on it, but to those American pilots who flew it, it was never called anything but the P-40. Well . . . maybe we called it something less printable when fighting a ground loop after the tail wheel unlocked on a landing. With the addition of a whole alphabet of letters to the original designator, the P-40 was developed into a long series of radically different appearing aircraft. When Curtiss finally got through modifying the design, the only thing in common with the original was the basic wing structure.

In my opinion, the classically streamlined original P-40 was the most appealing of all the P-40 variations. The P-40 (there was no P-40A model), the P-40B, P40C, and the RAF Tomahawk were all

identical airframes with external differences only in the wing guns and pilot's windshield. The early P-40 is the aircraft that popularized the shark mouth paint job. The set-back lower cowl of this model is positioned just like the lower jaw of the shark. It was a natural for the shark treatment, while this effect was lost to a degree with the deep-forward placement of the cowl on later models of the P-40.

The early model P-40 was the plane used by Welch to shoot down Japanese aircraft during the Pearl Harbor attack. It was the model used shortly after Pearl

Harbor by the AVG (Flying Tigers), and it was used in combat long before Pearl Harbor by the RAF in the Western Desert fighting. Over 1600 of these early models of the P-40 were produced and shipped all over the world. To the best of my knowledge, not one of these aircraft exists today, not even in a museum.

Lack of an existing prototype may explain why all of the P-40 kits and plans for R/C models are of the later versions of the aircraft. When I decided to build an R/C model of the early P-40, I knew that I would not be able to measure and photograph an original. I would have to depend on available photos and drawings. Fortunately, I had a couple of things in my favor. I had flown the original model P-40 extensively in the summer of 42. I had built a solid model of this aircraft while I was flying it (39 years ago) and painted it as per the original. I still had color photos of this model and I had also taken black and white photos of the original plane from a number of angles.

These photos are somewhat unique in that the P-40 is sitting in the middle of a grass field with the engine running and no pilot and no chocks. I left the flaps down by mistake (I made mistakes back then too). The reason for the odd photos is that in the months after Pearl Harbor, cameras on the flight line were assumed to be in the hands of official photographers or spies. To get photos of my aircraft, I had to hide the camera in a pocket, fly the plane to an outlying field, land and take the pictures. The big wheels on the P-40 were great for grass fields, and yes, it did have a parking brake!

A good three-view was the next problem. I think the people who draw three-views for publication must take pride in making their drawing a little different from the next guys. I have yet to find two three-views that check out against each other. Squadron/Signal publications, "Curtiss P-40 in Action," contained the most accurate three-view that I could find of the early P-40, and this is the one I used. Profile Publications' three-view has errors in the wheel fairings and other dimensions, and is grossly different from Aero Publishers drawings, and so it goes.

The size of this model was determined by several factors. First, it has been obvious for some time that larger models are more realistic in flight (I know that your MB Editor found this out many years before I did). I wanted a model large enough to take advantage of the power available with the new .90 engines, but light enough to compete in either AMA Sport or Giant Scale. I have never understood those modelers who insist that a model must be built to a certain scale to be interesting. The only thing that matters is whether it will fly realistically on the power available. There is nothing more ridiculous than a fighter plane stooging around like a primary trainer, unless it is a primary trainer blasting around at fighter speeds. I can't wait to meet the clown who builds a quarter-scale B-36. It would turn out larger than a full-scale P-38! For those who might still be interested, the P-40 comes out at 1 to 5.6 scale. At this scale, the more than 1000-square-inch wing carries the weight of the model rather nicely. The model is to exact scale

outline, as in a model this size there is no reason to change anything to make it fly better.

One feature that identifies and adds to the character of the P-40 is the absolutely unique large pointed spinner. At the time I built this model, there was nothing available with this shape in a 5-1/4-inch diameter. The model was actually started by making the spinner, testing it on a block with the OS .90, and then literally building the model from the spinner back.

A spinner plug was turned from redwood on a wood lathe, finished and waxed, then the fiberglass layup made with the plug still in the lathe. Four layers of six ounce cloth worked best with micro balloons added to the last resin layer. Before the resin was dry, the outside of the spinner was turned to final shape with wood lathe tools. When dry, it is sanded primed and painted. Before removing from the plug, a short lip is turned into the base of the spinner. The lip fits into a groove turned into the aluminum base plate same as the CB and other spinners with an aluminum back

plate. An old Veco aluminum spinner nose nut was used to retain the original spinner. Turning the outside of the spinner while it is on the plug gives a uniform shell thickness, and I have had no trouble balancing these spinners in spite of their size.

The model itself is constructed using balsa and plywood. The 1/8 light-ply fuselage crutch pieces establish the wing incidence and thrust line. The maple motor mounts are epoxied to these, and the pieces are then assembled to the ply firewall and formers. I installed the engine with spinner at this point and completed the front of the fuselage before adding the spruce longerons and rear formers. It just made the unit easier to handle while shaping the cowl.

Tack glue a 1/16 balsa spacer with Hot Stuff between the spinner back plate and ply former #1. I used 1/2-inch balsa blocks to fill in between the firewall and the spinner. The detachable lower cowl separates at the scale location as shown. When you reach this point with the balsa blocks, add 1/2-inch block at the parting line between F-2 and F-3. The cowl joint is faced with 1/64 ply on both sides to give a sharp separation line when installed.

The cowl can be built up from balsa block or carved from urethane foam. I used balsa and left it about 1/4-inch thick on the completed cowl. F-3A forms the back of the cowl and separates with it. Prather cam locks have worked fine for cowl attachment on all of my models.

The rest of the fuselage is built in a slightly unorthodox manner, in that it is not built in a jig or on the board. With the rest of the former locations marked on the hardwood longerons, the rear formers are added to the forward part of the fuselage. Top and bottom balsa longerons are added. To check for possible twist in the fuselage at this point, make sure that vertical and hori-

zontal reference lines are marked on the formers before assembly. Tack short lengths of 1/4-square balsa on each former parallel to the reference lines so they stick up past the fuselage outline. If you sight down these and they all line up, your fuselage is perfect. If not, you know where to make changes.

The fuselage is planked with 1/8 balsa, starting with a couple of pieces three inches wide over the main longerons. The rest is strip planked with 1/8x1/2-inch material. The dished insert providing rear vision to the pilot is best formed by wetting sheet balsa, curving to shape and installing after it is dry.

It is a good idea to install the retractable tail wheel mechanism before sheeting the bottom of the fuselage. It is a bit awkward to work on it through the door openings. The urethane foam fairings on the fuselage bottom are added after the fuselage and wing are completed.

Wing construction is pretty straight forward. The hardwood main spars were used partially to take the shock of landing a fairly heavy model. The plywood dihedral braces extend out to the gear locations and the forward brace goes completely through the wing. Note that the rear spar locations are not marked on the rib patterns. I found it easier to lay out the spar location with a straight edge after the ribs were in place on the main spar. The ribs are blocked up to provide 2 degrees washout at the tips. A 1/2x1/2 square balsa strip angled under the rear of the ribs will do this for you. Check this angle by tacking long straight balsa strips to the centerline of the center and tip ribs. When you are happy with the alignment, notch the ribs and install the rear spar and aileron leading edge. Install the trailing edge and sheet the wing with 3/32 balsa before removing from the board. The bottom rear spars are added in the same manner and the aileron and flap areas sheeted. Ailerons and the split flaps are cut from the wing at this point.

Join the wings, adding the dihedral braces, but leave the sheeting off the bottom between the spars until after the servos, bellcranks, horns, and landing gear retracts are installed. For added insurance, cover the wing joint on both sides with six-inch-wide glass tape and resin. Wheel well openings are cut after the wing is sheeted and glassed.

When I first showed the P-40 plans to some of our local scale builders, they asked, "Where are the tail rib drawings?" Well, I believe in doing things the easy way and the answer is that you don't need any. The stab, fin, rudder and elevator main spars are blocked up from the plan with 1/16 scrap balsa. The leading and trailing edges are blocked up on the plan so they center with the spars. The ribs are cut from straight strips of balsa, all with the same thickness. When the frame is dry, it is shaped to match the streamlined outline shown on the top and side view of the plan. Rough out with a knife then use a long sanding block. This method is fast and more

accurate than trying to shape a bunch of odd rib sizes before assembly. When shaped, the stab and fin are covered with 1/16 sheet balsa. Ribs on the elevator and rudder are in the scale position, as these surfaces were fabric covered on the original P-40. The elevator and rudder were covered with silkspan paper. I wanted to keep the tail light and wouldn't you know, the model was nose heavy on the first flight. FabriKote would do fine on these surfaces.

The rest of the model was finished with the standard 3/4-ounce glass cloth and resin system. For strength in the event of nose over, the lower cowl was covered with six-ounce cloth. I also covered the entire front of the fuselage, back to the wing with 2-oz. cloth. I did not want the .90 to shake anything loose. More 2-oz. cloth went over the flaps and the area where the tail wheel doors are cut out. The flaps are a bit thin, and the glass keeps them from warping. Same for the tail wheel doors.

The P-40 has a flush-riveted, all-metal skin with over-lapping panels. After a couple of coats of sanded auto primer, I built up all the panels on the wing and fuselage with auto spotting putty smoothed against a couple of layers of masking tape. This is sanded, primed once, and sanded again with the tape still in place. One light cost of primer after the tape is removed and the model is ready for the finish coats of epoxy.

All P-40s except those produced under foreign contracts were painted at the Curtiss factory in the standard WW-II olive drab on top and neutral grey on the undersurfaces. P-40 serial number 39-280 was no exception. This plane came off the line in 1940 and was not exactly new when I first flew it. The O.D. paint was pretty well worn off where refueling hoses were dragged over the wing to gas the plane, and there were other scuff marks from pilots and mechanics climbing around on the plane. So that I could later simulate this wear, I painted the whole plane with an undercoat of Hobby epoxy silver. After this first coat, the rivet and Dzus fastener detail was added using a sharpened piece of tubing in a Dremel tool. Flush rivets on a painted aircraft are not very visible so use a light touch. I find that this technique works best if done in the epoxy base coat just before the final paint job. The auto primer undercoat is too soft and you lose the sharp edge on the rivet. One of the small Dremel saw blades is handy to cut the screwdriver slot in the Dzus fastener.

The neutral grey and olive drab paints were mixed from K&B Super epoxy. Neutral grey is a good match to Fed Stuck number 36173, but WW-II olive drab is a bit different from any of the currently listed colors. I just happened to have parts of a model laying around that I built from a Cleveland kit back in 1944. It was painted with olive drab paint that I obtained from Air Force base supply (On loan of course). It took me a couple

of weeks of mixing to get it right. Olive drab is not the easiest of colors to match. The shark mouth was insignia red and insignia white, spinner was insignia red and the tail numbers were identification yellow. After all paint and markings were complete, steel wool was used to produce the wear patterns where the aluminum undercoat shows through. Although this technique works well, I could not bring myself to make the model look as beat up as the original. Maybe after a couple of hundred flights, it will begin to look right.

All of the shark mouth designs were painted on these aircraft in the field and I doubt if any two were exactly the same. For example, the eyes on #9280 are not in the same place on both sides. However, if you are modeling a specific plane, you want to match the paint job including any mistakes. I tried three times to draw a template of the shark mouth for this model and never got close. I finally remembered that I had a negative of the original in an almost exact side view. Using a photo enlarger turned on it's side, I projected this view of the shark teeth directly onto the model. It worked. A photo of a three dimensional object when projected back on to a three dimensional object will put all the lines exactly where they belong regardless of what odd shapes are involved. The outline was drawn right on the model and later masked for painting. You can do the same by copying an existing photo of the plane of your choice.

The P-40 had a very large wing fillet. To keep this fairing light, start with the 1/32 ply base and build to the fuselage by adding triangular pieces of urethane foam. The whole thing is smoothed over with micro balloons and resin.

For some reason the exhaust stacks on this model have turned on everyone who has seen them. It may be just a happy combination of paint and gloss. They are carved one at a time from balsa, but this goes a lot faster than it sounds. They are finished with resin and primer, and the flange and weld joint added with strips of aluminum tape (The type sold in K-Mart for auto body repair). Black paint with a little silver mixed in and a combination of satin and gloss catalyst creates the welded metal look of the originals.

The pivot point for the P-40 retracts was below the leading edge of the wing, so a fairly large fairing was used to cover the mechanism and the strut when the gear was retracted. This fairing is easily carved and sanded to fit the wing using urethane foam. Two layers of 2-oz. cloth with resin cover the foam. Scrape the foam from the inside and cut out the operating gear doors. Robart hinge points were used on these doors and the tail wheel doors. The gear cover fairing is detachable to permit easy access to the retracts. Four sheet metal screws hold it to ribs W-3A and W-4A.

When I started this model, I figured that the rotating retracts then on the market would be marginal at best. I

decided to build my own, as I needed a gear that would retract 95 degrees and rotate 95 degrees at the same time. I hand made the gear used on the initial flights from brass pipe fittings, hobby shop brass tubing, and scrap aluminum. An air cylinder from Dave Platt's retract gear provided the push to lift the heavy 5-inch Dubro wheels. The gear worked fine but the brass tubing proved a little soft for repeated use. At this time, Bruno Brunelli, a retired machinist in our local club, offered to turn out aluminum parts for the gear on his metal lathe. It took a bit of testing before we evolved just the right thickness aluminum for the gear parts, but the end result was worth the effort. Landing loads are absorbed by spring loaded oleos and operating scissors.

Just recently, Dave Platt has come up with a rotating version of his heavy duty retract system and there may be other systems available by the time you read this. I even suspect that Bruno could be talked into producing a few copies of my original retract gear.

I chose the Royal Palm Polo grounds for the first flights on my P-40. This is a large grass area allowing take-off in any direction, and the sympathetic manager used to fly P-51s. The early P-40 was short coupled as compared to the stretched-fuselage later models and the gear legs were longer. It actually sat at 14 degrees nose up on the ground. I remembered the original as not having the best ground handling characteristics of the fighters I had flown. Much to my surprise, the model tracked out like an arrow for a long smooth take off with only a minimum of rudder needed. Problem One out of the way.

The model was a bit nose heavy on the first flight. Moving the battery pack back to about the rear wing bolt position cured this. Dead stick practice started early on this bird. In fact after three flights I was beginning to think I would never find out how it landed with the engine running. No matter how I set the mixture, the engine lost power and quit after about four minutes of flight. Disgusted, I pulled the engine only to find that the plug I had put in the backplate hole had come out on the first flight. The hole had been drilled for a Robart pump pressure fitting that I decided not to use. Some testimony to the OS Max .90 that it would start and get the plane in the air with that size hole in the crankcase.

In spite of the early P-40 being more short coupled than later versions, the model proved very stable in flight. I built this model while Dave Platt was building his large Me 109 with a slightly reflexed airfoil. I decided to try a modification of this airfoil on the P-40. I have no way of knowing whether this airfoil helped the stability, but I suspect it accounts for the almost hands-off inverted flight. Not that you should try much inverted flight for contests. The engine would quit on the original after only a short time inverted.

With a 15x6 Dynathrust or Zinger

prop, the P-40 flies at very realistic scale speeds on about 3/4 throttle. To jog my memory on P-40 flight performance, I picked up a reproduction of the Pilot's Handbook. I never saw a handbook when I was flying the original. Check-out in those days consisted of the crew chief showing you how to start the engine. In the Handbook is a table of airspeeds showing that at maximum continuous power settings, the P-40 would hit 276 mph indicated airspeed at sea level. This gives a scale speed of 50 mph for the model and is the speed that would not normally be exceeded on a fly by, Figure Eight, or other level flight maneuver. Slow roles in the P-40 were prohibited above 285 mph IAS (scale 51 mph), and snap roles prohibited above 140 mph IAS (scale 25 mph). The OS Max .90 will pull this model at considerably more than 50 mph, so throttle back if you want it to look right. After all, the original P-40 was limited to five minutes at full throttle.

As the gear comes up on take-off, there is some pitch trim change. With the heavy Dubro wheels, about a pound of weight moves back seven inches around the balance point as the wheels come up. In addition, the wheels turn almost flat to the airstream as they retract, producing a nose down rotation from drag. As they go into the well, the drag stops; this and the rear movement of the balance point produces a nose up change. Not as bad as it sounds. I trim for level flight and leave the trim alone. Slight nose down for take-off helps hold it on the ground for a scale t.o. When the gear comes up you are back to normal.

Put the gear down for landing and you are slight nose down again. I quote from the pilot's handbook, ("Landing gear DOWN — Nose heavy until retrimmed.") On the model, about half-flaps puts the trim just where you want it for landing. Ergo! No need to retrim throughout the flight.

Actually, the P-40 is a very forgiving flying model. It had to be to get away with the "head up and locked" goofs that I have managed to date. It came out to a few ounces under 15 pounds ready for the first flight. Changes to beef up parts of the retract system and addition of the Dubro wheels brought the weight up to over 15 pounds. For this reason, the model has only been flown in Giant Scale. With a little care, the weight could be kept under 15 pounds for entry in Sport Scale competition.

The model static scores very well, coming in second with one point behind the top giant scale static scorer at the 1980 Nats. It also received the National Association of Scale Aeromodelers, Scale Recognition Award, at the same Nats. If you build this model, you will wind up the proud owner of one of the best known and most historic aircraft of World War II, and if you live in Ohio, you might still obtain a flight spinner for your model at no cost. Just look in the bean patch behind the Wilmington Nats flight line #2!