P-51D

BY FRANK BAKER

Pattern performance with an all-time scale favorite.

SEVERAL years ago I attended a major mid-west radio control contest which was typical of the major contests held throughout the country. There were 25 contestants in Class III multi; 24 of them were flying a Taurus or aircraft indistinguishable from a Taurus in the air. The 25th, "Red" St. Alban, was flying an aircraft from his own plans. The flying also was typical of major Class III contests throughout the country in that the 60-powered multi-bombs were zipping through their maneuvers at a frantic rate of speed and at 100 yards away you could not tell one plane from another. The flying was consistently of a high caliber and only a very experienced person could distinguish the millimeter differences between the maneuvers flown by the various pilots. An occasional tail-slide which did not hook in, or an occasional vertical-eight, which was a little wobbly, would be the difference between first and second place, or second and third place. Such consistency of performance between aircraft which are virtually alike does not generate a great deal of spectator interest or interest even among the pilots themselves. In fact most of the multi-pilots spent the day sitting in the shade or conversing with one another about radio equipment with very little attention being paid to the actual flying, except for an occasional glance at the score board to see the point spread between various fliers. The spectators were even less interested in that they could not tell one airplane from another nor one maneuver from another, and were content to let junior listen to the roar of the engines and watch an occasional toy airplane go zipping through the sky. Such was the contest for the major portion of the two days during which it was being held.

However, there was a glaring exception to this rather humdrum routine and this was generated by the 25th airplane entered in Class III. "Red" St. Alban was flying, as he usually does, a scale aircraft in the multi-competition. This particular year "Red" was flying a scale F4U Corsair painted in the colors of a post-war Thompson Trophy Racer a lá Cook Cleland. His Corsair was a brilliant red with white trim powered by a .60 engine whose propeller blades just barely cleared the edge of the radial engine cowling. From the minute "Red" started the engine of his aircraft, he completely stole the show. As he taxied out, even the most jaded multi-flyer got up out of the shade to watch this gross intruder into the multi-field. "Red's" takeoffs were extremely pretty and scale-like. Once in the air, his aircraft flew the complete AMA pattern slower, but with as much precision as any of the highly specialized contest-type machines. A few of his maneuvers, such as vertical-eights were a bit shaky to the expert eye; however to the spectator they were the same as the rest. The landings made by the scale Corsair were a thing of beauty in that "Red" did not slam it into the ground and hold it down with a nose wheel as is typical of multi-ships, rather he made a beautiful scale-like Navy approach in which he dragged the tail-wheel for a few seconds before the main gear dropped onto the ground. With the inverted gull wing and the tail down low, there was an extremely exciting landing with the aircraft wing tips wobbling just slightly as the plane settled down into the ground. Although "Red's" landing probably did not get as many points as the hot multi-planes, it nonetheless looked like a real carrier landing and the spectators in the crowd could appreciate that it was a good approximation to the way a Corsair actually lands. After watching "Red" steal the show from the major hot pilots in the mid-west, I was firmly convinced that multi-scale stunt is the only way to go.

The next summer I attended the Experimental Aircraft Association Fly-In at Rockford, Illinois, and had a chance to observe a large number of different aircraft, both antique and home-built. Much to my delight about a half dozen P-51's were also on display at this fly-in. During the air show portion of the afternoon, a flight of P-51's flew by in formation and then Bob Hoover's P-51 put

on an aerobatic demonstration which was like nothing I have ever seen. He came across the runway at top speed, no more than 5 or 10 feet off the ground as he did slow rolls the full length of the field, pulled up doing victory rolls, followed by a wingover, and right back down on the deck across the airfield again. The airshow with the P-51 was nothing less than spectacular. "Red" St. Alban had convinced me that multi should be scale and Bob Hoover convinced me that a P-51 was the perfect airplane.

Going back through my model airplane magazines, I found that although the P-51 is a natural stunt aircraft, as a radio control model it has been one of the most butchered designs. Typically, it is a hodge-podge between a misshapen P-51D fuselage, a P-51H wing without the wheel well bend, and a spinner which is a ridiculous one-third scale size. I was extremely disappointed at the lack of reasonable approaches to the P-51. Therefore, I decided to go ahead and design a P-51D of my own. As a source, I obtained the Morgan P-51 book which has a set of factory three-views in it with body cross-sections and also a Monogram plastic model of the P-51D (kit No. PA-77). In addition, at our local airport a privately owned P-51D was available so that I was able to compare my own plans and the real aircraft. Checking the plans of the P-51, I discovered to my delight that the moments were almost identical with those of a Class III Orion, the only difference being the nose moment arm was about one inch longer than that of the Orion. However, the relationship wing to elevator is nearly the same. Therefore, I decided to build an aircraft of roughly the same general size as an Orion. One other consideration was to draw it of such a size that the engine could be completely cowled. There is nothing more annoying to me than to see a scale aircraft with a big model airplane engine cylinder hanging out where it doesn't belong. Although the moment-ratios of the P-51 are nearly perfect for a model airplane, the airplane is typical of World War II fighters in that there is almost a one-to-one ratio of wing span to body length (37′ to 32′) which results in rather large fuselages for a reasonable amount of wing area on a model airplane. To get around this problem, I cheated just slightly in the design of the wing as it was lengthened approximately two inches on each panel and one inch of chord added to the wing. Such a differnece is so slight that unless one actually measures the plans, computes the wing span to body-length ratio for both the airplane and the plans, one would not be able to detect this difference. In addition, for model airplane flying, one needs a slightly larger elevator than is true of the World War II fighter planes. Here again, by maintaining the same ratio between tip-chord and center line chord of the elevator, the scale illusion is maintained. Unless one measures with a calipers, you will be unable to detect that the elevator is not scale size as it is proportioned properly. Other than these two slight deviations in the basic P-51 design, there have been no variations from scale in this model. I am sure that these deviations are smaller than those typically encountered in the usual scale event, let alone in the multi-stunt event.

Before discussing the construction of the P-51, a word or two about the resulting flying characteristics are in order. The actual P-51 is very sensitive to the controls and I also find it true of the model. I find that with my Digitrio it requires only very slight stick pressures to obtain various acrobatic maneuvers. It is not an airplane where one hauls the stick from corner to corner. If you do, you will find your aircraft is all over the sky. After having read the description of flying a P-51 in the Morgan book, I find that my scale P-51 handles much the same as the real aircraft. Rolls are performed with very minute pressures on the stick from one side to the other; for loops, one merely puts back the pressure on the stick and around she goes. One of the most spectacular maneuvers with this P-51 is to do a low fly-by. I usually do a 180° overhead approach and bring it down off the runway about two or three feet at full bore and then pull up doing a victory roll on the fly-out. Members of our Madison Area Radio Control Club who have been P-51 jockeys are swept with a wave of nostalgia as this maneuver is performed. Touch and go's with this aircraft are also extremely nice as the P-51 tends to settle in in a rather flat attitude, the landing gear looking as if it is reaching for the ground. As was the case with the real P-51, you do not dare firewall the throttle to get off the ground to continue a touch and go. If you do, you will very quickly discover the aircraft rolling sharply to the left and snagging a wing tip. Many a real P-51 pilot met his end with this maneuver. However, if the throttle is eased forward gradually and air speed built up properly, the aircraft goes straight on out in a normal touch and go. I also find that with a scale-type aircraft it is much more impressive to fly close in so people can see the canopy, the landing gear details and the registration numbers as the aircraft is flying by. My P-51 was powered with a K&B 45, which is less than optimum power. I would strongly suggest putting in a Supertigre .56 or possibly one of the new .60-size engines in order to get it to go through the vertical-eight with a little more ease. The current aircraft will do it; however, it is much like "Red" St. Alban's Corsair in

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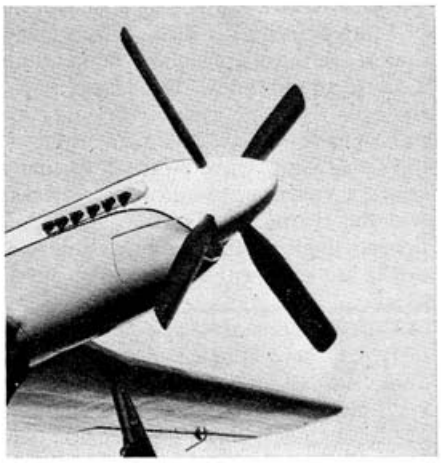

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that they get a bit sleepy toward the top of a power maneuver. By and large the people who have seen this P-51 fly have been very impressed not only with its looks, but also with its flying characteristics for a multi-type aircraft. If you are now convinced that this is really the way to go, let us take a look at the construction of this scale P-51.

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The body is a straightforward multi-type construction which is begun by cutting out the body sides from 4-inch wide 3/32" sheet and epoxying in the doublers which go all the way from the nose to the trailing-edge of the wing. The 3/8" by 1/8" reinforcers should also be installed. The P-51 is essentially slab-sided to a point about three-fourths back of the wing, at which point the body starts to round and by the time it gets to the leading edge of the elevator, the body is egg-shaped. Therefore, I normally start from the front and work towards the back. Glue in all the formers through former #8 and allow them to dry. Once the body from former #8 forward is firmly assembled, I soak the rear of the body sides in hot water and then glue in formers 9 through 13, holding the body sides in with rubber bands or masking tape. The remainder of the body, top and bottom is covered with 3/32" sheet. I am a balsa bender which is done by soaking the sheet in hot water and gluing it to the formers with white glue which is water soluble. No difficulty whatsoever was encountered in using one sheet of wood for each quarter-round area of the top and bottom of the body. One of the usual difficult problems in a scale aircraft is one of how to attach the front wind screen to the aircraft after the body has been built. On the actual P-51 the front windshield flows very smoothly into the body in a rather unusual curve and the windscreen does not look as if it were bolted to the frame afterwards. In order to solve this problem, the canopy was moulded out of 1/16" plexiglass in two pieces, the first piece goes from former #6 to the separation line of the canopy. This includes a portion of the body as well as the windows themselves. So what was done was to cover the window area on the plexiglass with masking tape and leave this masking tape on throughout the rest of the construction of the airplane. The plexiglass section was then glued into the body and Hobbypoxy stuff used to flow the body into the plexiglass in such a way that it looks as if the windows are built right into the airplane. The net result of this is to give you front and side windows on the P-51 windscreen which look like they do on the real airplane. The canopy also requires special treatment in order for it to fit the body. On the actual aircraft the body humps very sharply from former #8-C forward in order to meet the canopy which is coming down vertically. In order to accomplish this hump, I glued balsa blocks to the half round of the upper body from the body sides up to the point where the canopy meets the body and at this point cut them off level in order that the canopy fits properly on the fuselage. Then carve these balsa blocks so that they are flush with the body sides, the canopy, and also curved into former #8-C where the top of the body sheeting points the blocks. What happens here essentially is the body is flat as it comes around the canopy and then between former #8 and #8-C the blocks are carved down, flow into the half-round top of the fuselage. It is very difficult to describe how these blocks look; however, they are necessary in order to have a canopy which is essentially wider than the half-round fuselage, meet properly and also slide back. If you will notice the top of the plans, the blocking is straight all the way back to, roughly, former #8 so that as the canopy is pulled back and open, it has tracks to ride on. The only other feature of the fuselage which is at all different is that a hole is cut through formers #2, #3, and #4 in order to be able to insert a plastic gas tank through the wing opening. On this particular aircraft, I wrapped 3/32" balsa around a gas tank, glued it, and wrapped it with masking tape in order to maintain its shape. After this tube was dried, the masking tape is removed and the tube inserted inside the fuselage in order that the gas tank is supported throughout its full length. The tube also prevents fuel from leaking down into the fuselage where you can't get at it to wipe it up, etc. Another thing done at this point is to squirt GE clear-seal around the hole in former #2 and then insert the gas tank, without its cover, through this hole in order to form a nice silicone rubber seal. In use, the gas tank is inserted through the tube and then the cap is screwed on in the engine compartment. The hole in former #2 is not large enough to take the cover itself. There is, however, plenty of room to screw the cap on in the engine compartment. The rudder construction is also conventional, but one does have to be careful to watch that the body flows into the rudder below the line of the elevator. Although the rudder is relatively straight-tapered from its top down to the elevator, it then bulges quite a bit in order to complete the flow of the egg-shaped body out to the trailing-edge of the rudder. On the plans the rear rudder post shows how this flows. However, one should build the body first and then after having inserted the vertical fin, carve the rear post to match the body and the vertical fin. The dorsal fin should be covered with the same 1/16" sheet as the vertical fin in order to eliminate any sheeting joints which might appear where the dorsal fin joins the rudder.

Because the P-51 has an unusually large spinner, I was unable to commercially obtain a spinner for this aircraft and was forced to construct my own using the method advocated by the people who sell Hobbypoxy glue. I turned a spinner out of soft pine which was approximately 1/16" smaller than that shown on the plan, then wrapped this form with Saran wrap, or a similar household wrap, and then proceeded to use a very heavy grade of boat fiberglass cloth in conjunction with the Hobbypoxy glue and the balloon technique. One layer of cloth is not sufficiently strong for the spinner, so three coats of cloth and glue were used with a heavy sanding between each coat in order that the Hobbypoxy glue has something to grasp. After the final sanding, one more coat of glue was laid on and held down with a balloon until hard and this gives a very smooth, glass-like finish. Regular

Veco spinner hardware was used to hold on the fiberglass spinner to the engine. There is real need for the manufacturers of spinners to produce some scale spinners for aircraft of this particular size. The spinner is approximately 3¼ inches in diameter which is bigger and slightly different shape than the usual commercial spinners. However, in order to maintain scale, it must be as shown on the plans. A commercial 2¾-inch blunt-nosed spinner as used on a typical multi looks ridiculous on the front of the aircraft so I strongly advise obtaining a scale spinner.

The elevator assembly is also conventional and is completely covered with 1/16" balsa. I believe the plans are quite clear on how to build it.

The wings are also constructed in a very conventional fashion and are covered from the wingspars forward with a 3/32" sheet and from the wingspars back with 1/16" sheet. One of the big problems in building a P-51 is to build in the bend in the wing which is required by the wheel wells without weakening the structure. After looking at this problem for a long period of time, I decided that any system which would break the leading edge at this point would be exceptionally weak. I finally settled on the procedure used on the plan in which the leading edge of the wing is actually brought all the way through the center section ribs to the center line as if it were a conventional wing, except that it passes through the ribs and not forming a leading edge at this point. An additional leading edge is then inserted in front of ribs 1, 2, 3, 4, and 5. It is necessary to carve the shape of the leading edge from former #3 out through former #6, roughly, in order that one sheet of 3/32" can be used to cover the total leading edge of the wing. This requires some fairly tricky fitting in order to flow smoothly from rib 6 through rib 3. However, from there on, it is a very straightforward matter of getting the sheeting to match up properly. On my model I really had no trouble in doing this once I discovered that I needed to carve the leading edge as indicated previously. I also hate to build ailerons so that on the original model I actually laid out a trailing edge which is a 1/16" sheet all the way from the center section to the tip, installed the aileron spar in the wing, and also the leading edge of the ailerons as if they were spars within the wing itself.

After having completed the basic structure of the wing, a razor saw was used to cut through the trailing edge material and lift out the aileron. One should also install the nylon strip aileron

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