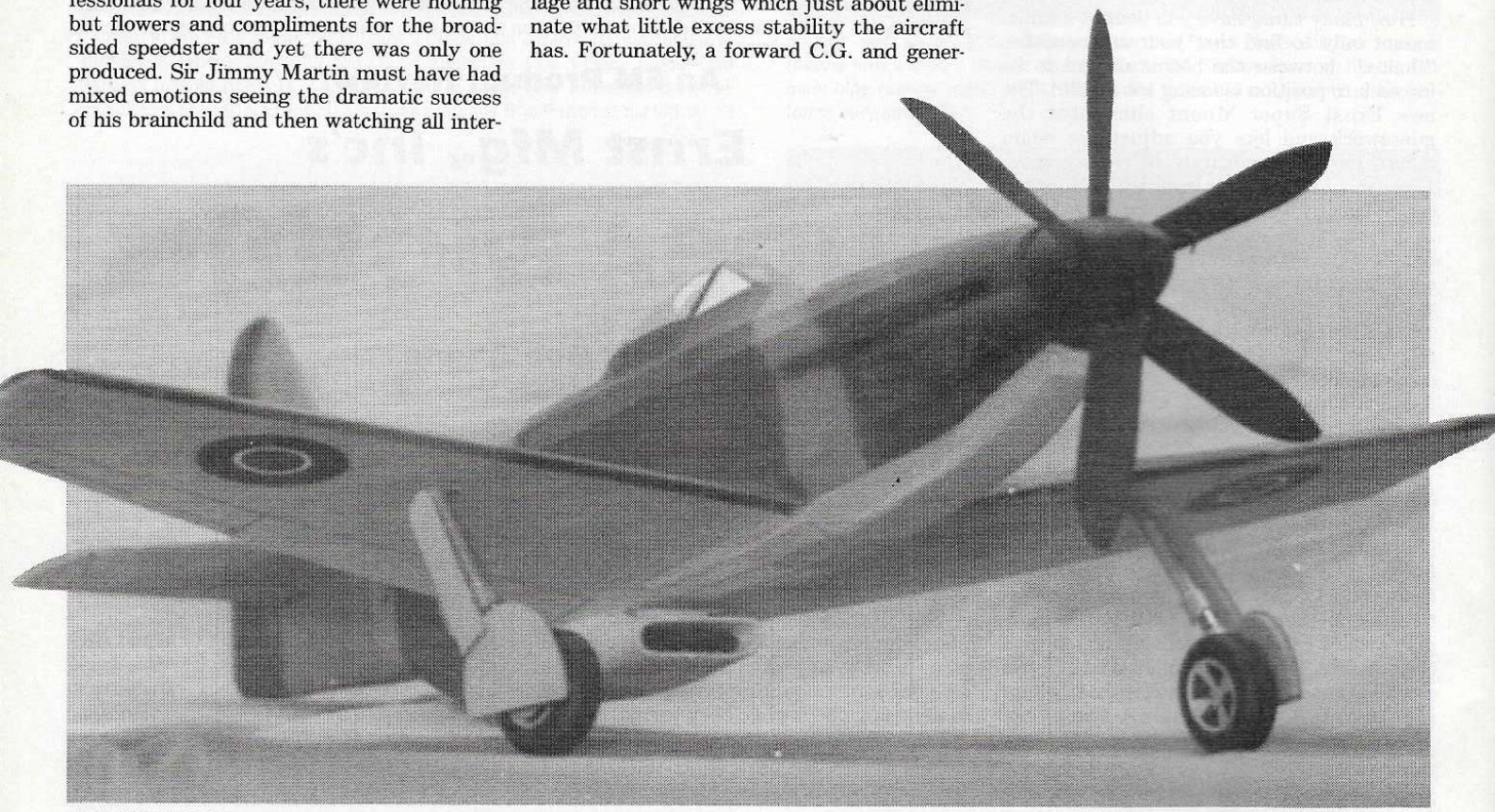
It had to be the most undeserved hard luck story of aviation. The fourth of a short line of experimental fighters produced by the tiny English firm of Martin-Baker, the 6-ton prototype won high accolades from all who flew it. Powered by a 2,000 HP Napier Sabre engine turning a counter-rotating propeller, the corpulent fighter was good for 460 MPH at 20,000 feet and the controls were so exquisitely harmonized that pilots compared it to the highly esteemed *Spitfire*. With almost stubby wings and the long profile of a greyhound it appeared as more of a thoroughbred racer than a fighter. While the pilots praised its maneuverability, the maintenance inspectors wrote glowing reports of its ease of maintenance and fine engineering. The landing gear system, engine installation, and armament were so well laid out that they were recommended for future aircraft of all manufacture.

Demonstrated and tested by aviation professionals for four years, there were nothing but flowers and compliments for the broad-sided speedster and yet there was only one produced. Sir Jimmy Martin must have had mixed emotions seeing the dramatic success of his brainchild and then watching all interest in this ultimate piston-engined fighter quietly fade away as the infant jet age dawned. The aircraft itself had one last moment of glory at the 1946 Farnsborough Air Show when the famed Polish flyer, Jan Zurakowski, put on a dazzling display of aerobatics and then ... nothing. The yellow-bottomed aircraft that was described by one pilot as a "cross between a *Mustang* and a V-2" simply disappeared in history. No records exist where it went and no one has ever claimed to have seen it. It came and went without even a name to recall it by, just a cryptic designation, the MB-5.

While the MB-5 made no great splash on the aviation world, as a rubber scale subject it is delightful. One look at the long nose, large horizontal stabilizer, and broad wings makes one think that perhaps Sir Jimmy Martin had a bit of stick and tissue time under his belt before he designed the MB-5. Countering the advantages is the deep fuselage and short wings which just about eliminate what little excess stability the aircraft has. Fortunately, a forward C.G. and generous dihedral give a manageable subject. Eliminate those at your own risk. While the MB-5 flies smoothly and well, the parameters of its trim are pretty rigid. More on that later. The outline is true to scale with the only deviations being airfoil, dihedral, and of course, propeller. The author is assuming that the builder has a few rubber scale models behind him and that he is looking for a sleek subject to give some competition to his cohorts at the fun flys and contests. Let's get started.

Wings

The MB-5 uses the "cracked rib" construction, mostly because the author hates cutting out different wing ribs. At the Reynolds numbers our model will fly, the flat sections supply a needed turbulator effect and the airfoil section is constant and true the length of the wing as opposed to the "hills and val-



PHOTOGRAPHY: TOM ARNOLD

a true thoroughbred:

Martin Baker MB-5

By Tom Arnold

Move over Mustang. Here's a freeflight scale version of what could have been the greatest piston engine fighter ever.

leys" of a conventional ribbed wing surface. Pick rock-hard 1/8inch balsa for the leading and trailing edges and pin them down. Lay 1/16 inch square medium strips in place as the rib bottoms.

Follow with hard 1/16 inch sheet spars with the rib notches cut im them. Add 1/16 inch square strips for the top of the ribs and finally, the 1/16 inch sheet turbulator spar. Remove the wing after adding the tips and add the light 1/32 inch sheet tissue anchors at the base rib.

Join the two wing halves together at the proper dihedral angle and add a 1/32 inch plywood brace to the main spars at the dihedral break. For R.O.G. events, you will need to install the aluminum tubing on the spar as indicated on the plans. A piece of silk laid over the tubing, soaked in CyA glue, and pressed against the spar is a good start. The gussets and rib doublers go on next—all hard sheet.

At this point, the leading and trailing edges should be carefully shaved to a rough contour to complete the airfoil and sanded smooth. A good way to avoid crushing the delicate framework while sanding is to lay the wing such that the leading edge is at the edge of the work bench. With one hand spread and holding the wing flat at strategic points, the other hand sands the leading edge with a downward wiping motion. The trailing edge is done in much the same manner.

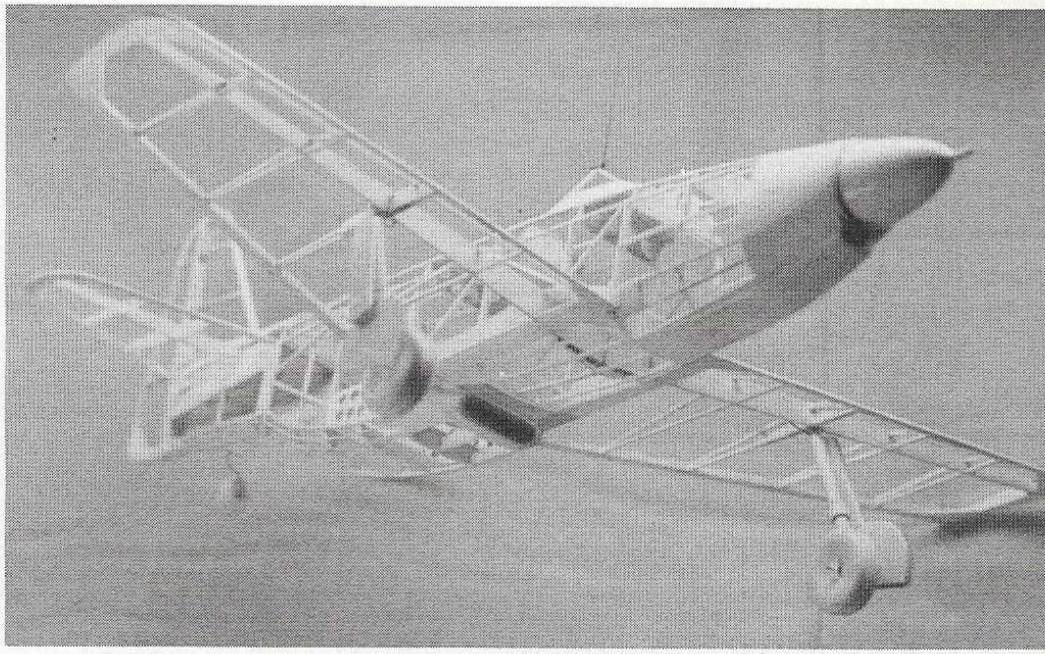
You will probably notice the long, unsupported distance the ribs must bridge between the spar and the trailing edge. To strengthen with little weight gain, lay and glue a short piece of 1/16 inch square against the top and bottom of the rib to serve as an upright. Trim flush with the surface of the wing. So much for the wings.

Empennage

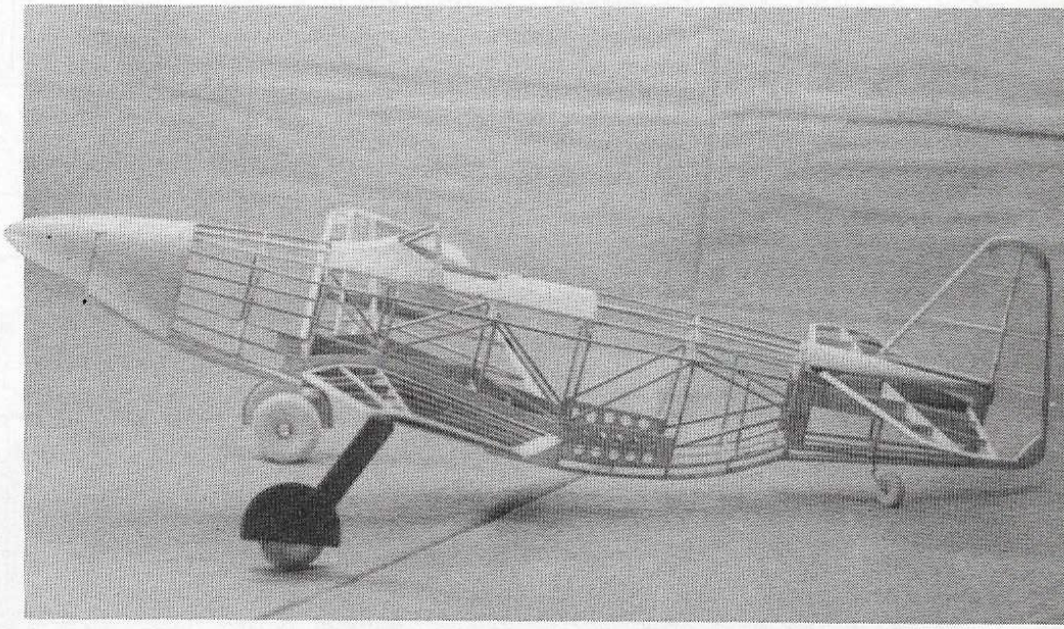
Glue the outlines of the horizontal stab together and block them up off the plans when dry with small pieces of 1/2 inch scrap. Now add the 1/32 × 1/2 inch balsa ribs. They should be just rectangular sections of wood at this point. When dry, unpin the frame and ribs from the plan and sand in a symmetrical airfoil shape. I prefer a rigid stabilizer as opposed to incorporating movable elevators as it allows more precise pitch control by slipping balsa shims between the stabilizer and its fuselage saddle. A movable elevator held with buried wire hinges always seems to get bumped taking it out of the car trunk. The vertical stabilizer is constructed the same way. Note, while you sand, the slight taper towards the tips that the empennage has when viewed head-on.

Fuselage

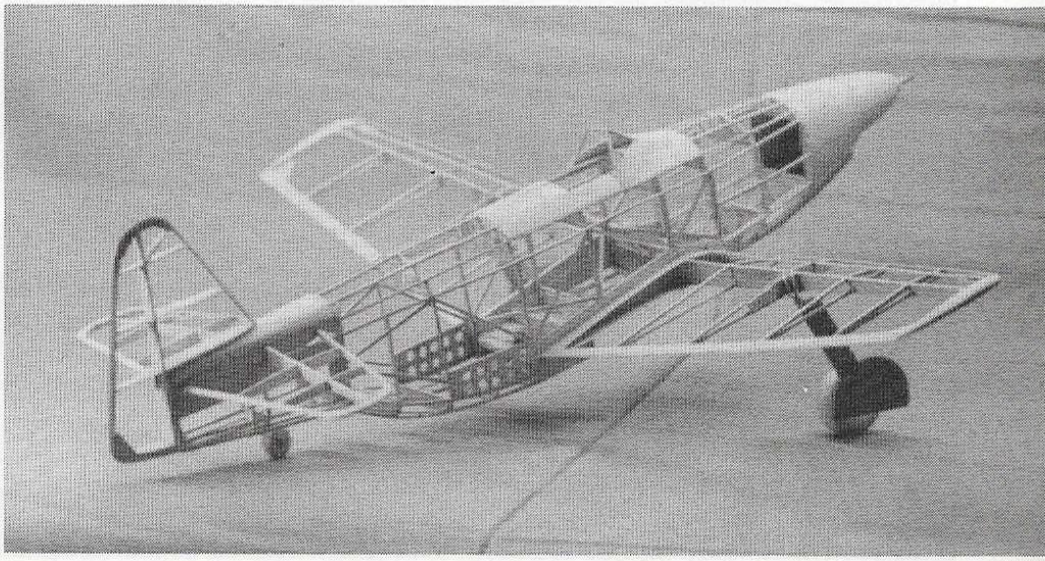
We saved the best till last. The fuselage is conveniently a standard box structure with formers added to the nose section to round it out. Lay down medium light 3/32 inch square longerons and uprights on the plan and glue together. When dry, pull the pins and leave the frame still slightly stuck to the waxpaper over the plans. Lay a second sheet of waxpaper over the frame and now build a second side over the first using the same pin holes as before. When dry, carefully separate the frames from the waxpaper and lay aside. Use your favorite method to "box up" the fuselage frame accurately. There are a number of techniques using internal and external frames but the author finds that careful assembly over the top plan view is as fast and accurate as any. A small triangle is a must to accomplish it though. (A third hand would



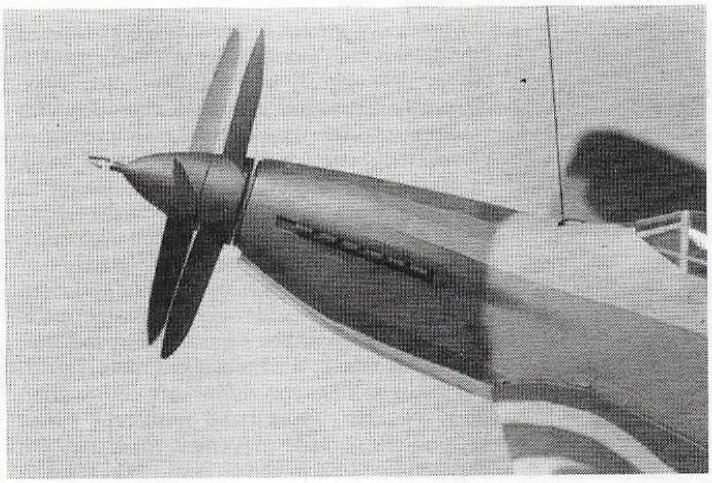
This overall bare bones shot shows the basic framework technique used in the author's MB-5. Not readily apparent are some of the carefully refined techniques used to ensure a strong, light model.

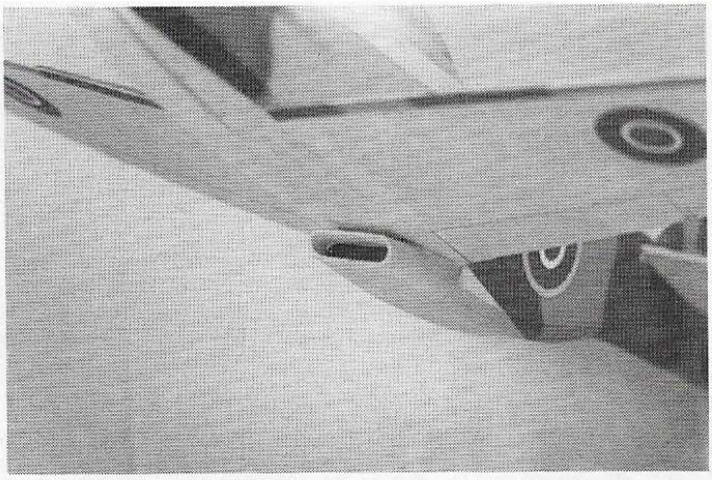


More bare bones shots reveal more specific features of the construction. In this profile view **(above),** you can see the light ply finger rest on the fuselage right behind the trailing edge. Lightening holes save weight without yielding strength. In this rear quarter view **(below)** you see not only the soft 1/32 balsa sheet fill areas but note also the tissue "rests" at the wing saddle area but easier tissue adhesion.



Martin Baker MB-5





Those scale props actually fly the model **(above left)** and are made from plastic cottage cheese containers. They work well but need a different motor size than the 9-inch prop. Several layers of Titebond soaked 1/32 sheet wrapped around a waxed form help create the belly scoop **(above right).**

not hurt either!)

After boxing up the fuselage frame, sight down it with a critical eye to alignment. If you mess this up, do it over again now. You'll never be able to cover up an alignment mistake so bite the bullet early.

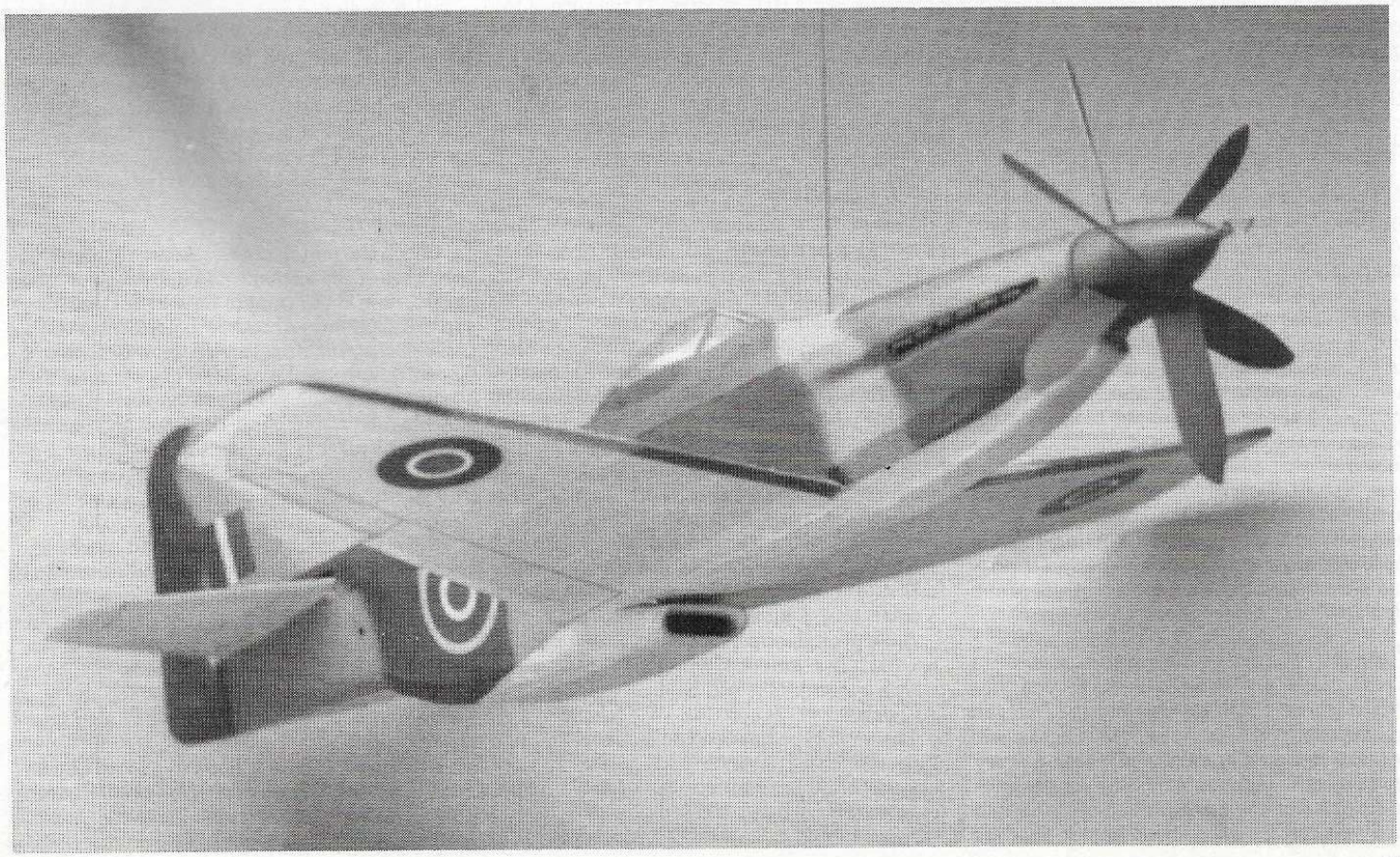
Add the 1/16 inch sheet turtledeck formers and scoop formers but do not put the stringer notches in when you cut them out. They will be added one at a time as you lay the stringers down. Cut out the center of the formers or punch lightening holes as desired prior to gluing.

At this point, make yourself a notching tool, it will save a lot of aggravation. Take a piece of hard balsa (or plywood), 1/16 × 2 × 1 inch thick, and glue one edge to the back of a large sheet of medium grade sandpaper. Now take a razor and run it along both sides of the piece of wood through the sandpaper. Now you should have a piece of wood with a 1/16inch wide sandpaper edge. Take a hard piece of scrap with a straight edge for a runner and glue the edge parallel and precisely 1/16 inch away from the sandpaper edge. Use a 1/16 inch stringer as a spacer to help you measure that distance. Your notching tool is ready; just saw the sandpaper edge back and forth on the edge of the former and it will eat its way down exactly 1/16 inch and the runner will prevent any deeper cut.

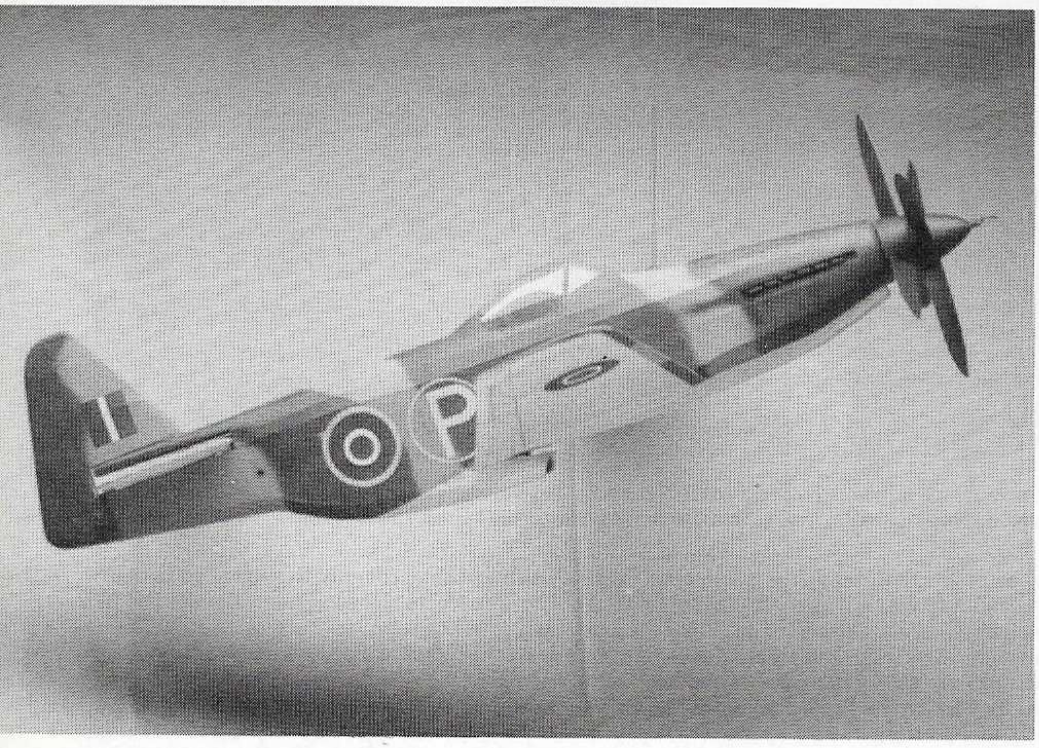
Stringers are added by using the tic marks on the designated formers as a guide and laying the stringers across the formers, marking where they lay. Notch the formers with your tool and glue in place. Remember to do alternate sides to keep your fuselage alignment intact. Fill in around the nose with dead-soft balsa and sand roughly to shape. Notice that the area where the wing passes under the fuselage is left open.

At this point, sand the framework smooth, add the 1/32inch sheet around the canopy area, and go over the entire framework with a critical eye looking for bumps, weak stringers, and corners where the tissue may wrinkle or have insufficient base to stick to the framework. Scallop the formers between the stringers, with the exception of former #F9, to allow the tissue to run fore and aft without touching the formers. This will prevent that "starved horse" look seen on many otherwise fine subjects.

Cover with Japanese tissue leaving the bottom of the fuselage open from nose to tail. Fit the wing into its fuselage saddle at this point taking time to insure you've got good



Martin Baker MB-5



The author credits a new line of acrylic model paints with a first rate paint job. The Pactra or Tamiya brands come in a variety of military colors and are non-toxic and water soluble for easy cleanup.

alignment and the wing incidence (2°) correct. Glue and fill in any gaps with scrap balsa. Now we add the belly scoop under the wing and put in the remaining stringers across the bottom of the wing.

You may wish to add some sheet fill to the bottom of the scoop if you plan on flying without the landing gear. Properly trimmed, that scoop will always kiss the ground first. Final tissue covering of the fuselage bottom comes next and—what do you know—it's beginning to look good! Give the entire aircraft one coat of 50/50 thinned dope, and insure the stab and fin have not had any warps creep in. A good way to prevent this is to pin them down while the dope is drying.

Now make yourself up a temporary nose and propeller assembly. Don't bother about a spinner, just bend a shaft with a "Z Bend" for the rubber hook and an arrowhead winding loop for a nine inch Peck-Polymers prop. Lay the horizontal stab in place and hold with a rubber hand from around the fuselage and across the top of the stab back down, and held in place with a pin stuck in some handy place under the tail post. Hope you remembered those little keying blocks on the bottom of the stab that rest inside the fuselage frame to keep the stabilizer from slipping around. Tack glue the fin in place using small 1/16 inch spacers between it and the fuselage. You'll probably be cutting the fin loose a number of times to make adjustments and these spacers will take the abuse from glue and razor cuts instead of the fin.

Flying

Now, let's go flying! "What?" you say. "What about finishing this lovely?" If you are anything like me, the trim flights will look like repeated kamikaze attacks on every hard object in sight so why ding up a beautiful finish? Get the bugs worked out now and then you can lie later about how it flew off the board. Start by taking off the prop and ballasting with clay and do a number of hand glides to get that straight long glide over the legendary tall grass (you can tell the author is from the hard dirt of Southern California). Power flights should start with low powered winds and gradually increase the power. Each flight should do what you want it to. Don't expect that more power will cure anything except a lack of climb. If the turn is too tight or the bank angle too high or the stall unwanted, adding more power at this point is only an invitation to disaster. Counting your winds and staying at a particular "count" until a trim bug is eliminated is the stuff pros are made of.

Be aware that with each increase in winds, power goes up, speed goes up, and the natural result is the famous "Zoom to Doom" i.e., a half loop or a power stall. This is normal for all models. Just keep coaxing it away from that situation with side thrust, down thrust, and perhaps rudder. If your thrust set-ups get extreme (6°+) go back to square one with the propless glide and move the C.G. back a bit. Work your way back up to the original number of winds where things started to deteriorate. Don't forget to reduce your thrust settings as you start over too. Keep the C.G. from getting too far aft or you'll start getting a constant roll-off with a smooth, non-recovering dive to the ground. The prototype model has a smooth, wide, flat climbing pattern to the left with little bank. The glide is similar, only a bit tighter.

As expected, down and right thrust will be needed. The amount will vary since your warps and gremlins will be different than the author's.

The prototype flew well on a 3-loop, 36-inch long stretch of 1/8 inch FAI motor. It's as easy to braid an odd number of loops as an even number. Here's the secret.

After lubing a loop of 1/8 inch rubber 108 inches long, attach a small piece of tape at the 1/3rd points along its length. Now stretch it out very slightly from a nail on your workbench and prewind enough turns such that the motor is evenly twisted along its length. Now, with the winder in your right hand, keep the rubber taut and pinch the motor at the first tape mark with your left. Swing your right hand over to the second tape mark and hook the winder around the motor. Swing your left hand over to the nail and loop the rubber end around it. Keeping the rubber taut, allow the winder to unwind and . . . presto! . . . a nice braided motor.

Before taking the motor off the winder, loop a small rubber band numerous times around the ends to prevent it from unraveling and install it in the aircraft. Actually, the whole process is easy to do but awkward to explain.

Finishing

Now, for a finish to do those flights justice. Build up with a number of wraps of soft balsa the sloping base that the canopy sits on. This perhaps could be molded in the canopy if you wish to try; otherwise, carving and sandpaper should do it. Mold or vacuform a canopy and save it to mount after the painting with a tiny bead along the edge of R/C-56 glue.

The spinner, because of its size, requires some careful alignment. My method was to take a block of balsa of the appropriate size, drill a 1/8 inch hole in it and CyA glue a brass 1/8 inch tube along the entire axis with one end sticking out to serve as a mandrel for a Dremel Moto-tool. The block was roughly carved to a cylindrical shape and then chucked in the Moto-tool. A rough sanding block was then used to true the cylinder up and medium sandpaper to smooth it to the final diameter.

Using a template, the cylinder was then shaped to the final shape using sandpaper while holding the tool in the other hand. Go easy and don't press hard. Use fresh sandpaper on a block and let it do the cutting. Hard pressure will bend the shaft, misshape the spinner, and heat up your Moto-tool. As the final form is reached, use fine #400 sandpaper.

Check the match of the spinner diameter to the nose of the airplane and if it does not look right, now is the time to do a little doctoring to create a smooth curve between the two. While the mandrel is still mounted, it's a good time to seal and dope the spinner. The sanding between coats can be accomplished by merely turning on the tool and lightly holding a piece of #400 grit against the wood. Take the mandrel out of the finished spinner by gently twisting it back and forth with pliers.

Normally it will break loose and can be extracted. Using one of those onion-shaped routers in the Moto-tool, the spinner is hollowed out to accommodate the propeller. Cut notches for the prop in the spinner and insert a piece of 1/8 inch I.D. brass tubing in the tip with a ramp-type notch cut in it for the free wheeling loop. CyA this tube in the spinner generously and set aside.

Bend the "Z" motor hook in a piece of wire and slip on the 1/16 inch ply circular nose block and thrust button. Add the brass-teflon-brass washers and the spinner back-

plate. (This backplate is only used to center the spinner on the shaft and if you are careful, you may forego it.) Next, the nine inch Peck Polymers Prop, then the telescoping aluminum tubing that serves as a spacer for the shaft in the brass free wheeling ramp, and finally, the spinner is slid on the shaft. Bend the arrowhead winding loop at the extreme nose.

A six bladed "cottage cheese carton" prop that resembled the scale prop was also tried with good success. The smaller diameter and mass was not quite as destabilizing as the big Peck prop and made for some interesting R.O.G.'s.

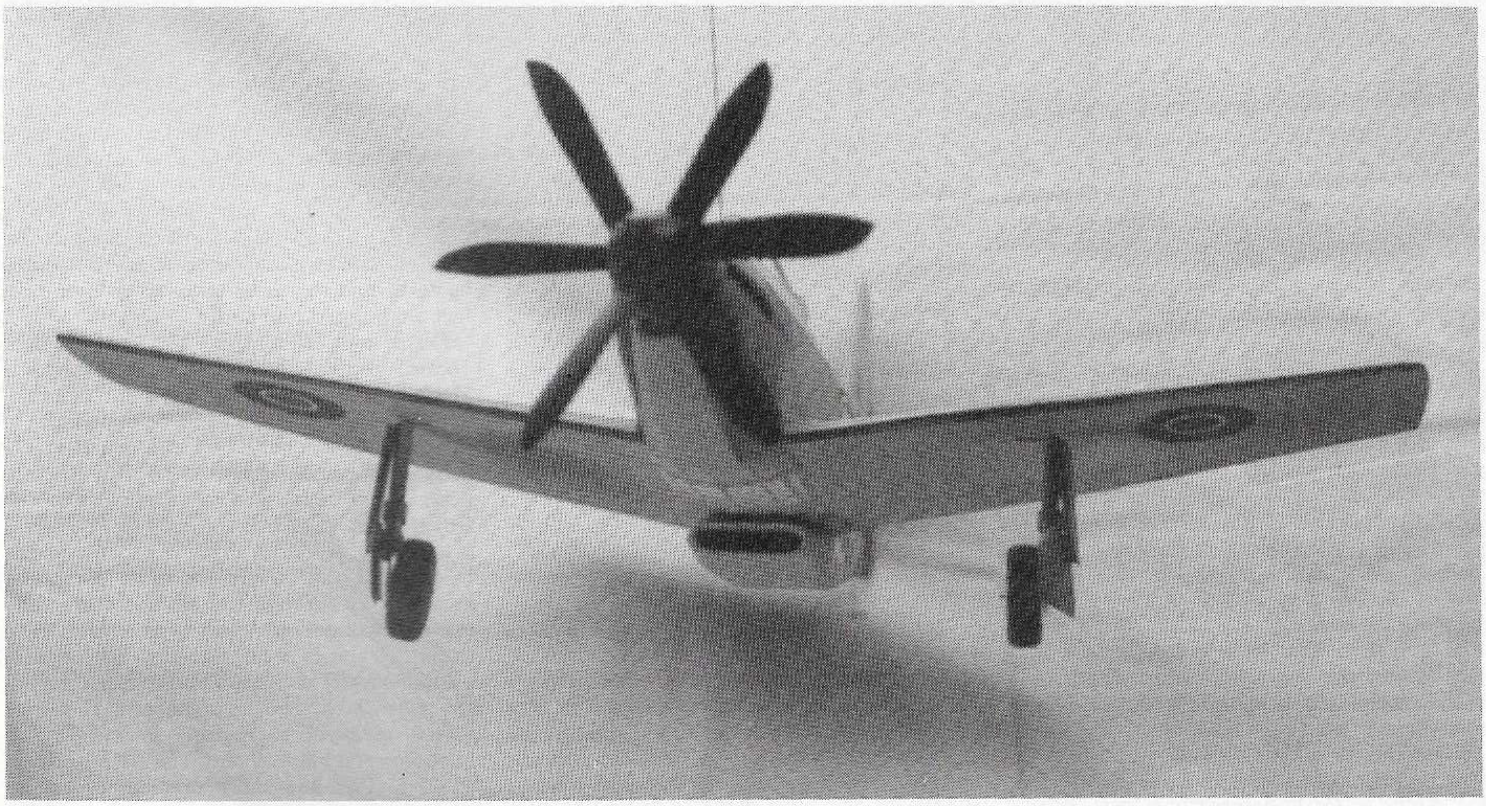
Painting

The author is really sold on a line of acrylic paints that both Pactra and Tamiya have recently brought on the market for plastic models. The line comes in many military colors, is non-toxic, cleans with water, and with a 10% dilution out of the bottle (Tamiya only) airbrushes on like a dream. The pigment is ground exceedingly fine which results in a little paint going a long way. So little is needed, I find the weight buildup quite negligible. Looking closely at photos of the full-size aircraft, the demarcation line between the grey and green really is not a sharp line but is a very tight sprayed line. So, for those who wish, don't mask. For those who love (?) masking, go ahead because at the scale of the model the overspray is so tiny it might as well be a mask!

Start with the yellow bottom first. Just a light misting coat will do it. Mask the yellow off from the top sides and again, a light coat of grey is all that's needed. See if you can make it almost translucent. The green, being darkest, is last. This whole scheme could be duplicated by colored tissue very easily. Notice that the green and grey scheme extends around the leading edge and tip to end on the underside of the wing.

Insignia

Tastefully done, markings can transform an ugly duckling into a mighty hawk. The secret is to execute a few very neatly as opposed to a collage of sloppy work. The British have always been extremely "cooperative" as their markings are quite easy to duplicate. The roundels were all made by cutting concentric circles of different colored tissue. The tissue was prepared by gluing (dilute solution of white glue around the edges) large pieces of tissue to squares of cardboard. Then the appropriate Tamiya paint was sprayed on in a nice, even, opaque layer. The drying paint then shrank the tissue and, when dry, the tissue was cut by a compass with a #11 X-Acto blade CyA'ed to the scribing end.



Diluted white glue, brushed on the backside of the tissue, worked well and if the model surface is a little damp, you have plenty of time to line up the circle before blotting the excess glue/water off. When finished, each roundel was four layers of tissue thick but the drying flattened everything nicely. Let each circle almost completely dry before adding the next.

The circle-P for "Prototype" was done the same way. First a large yellow circle was affixed then a smaller one of green or grey goes on top, followed by the letter P. The fin flash was done by laying a strip of white and red on the cardboard holding the blue tissue and letting it dry. Then the fin flash was neatly cut out and affixed to the tail.

As you airbrush the model, you may notice the tissue start to get damp and sag. No cause for alarm here as it tightens up again as it dries. It is, however, an indication that you may be getting too much paint on with one coat. Two light mistings are always preferable to one heavy coat. An unusual phenomena may also occur in which the tissue will wrinkle slightly, catch more paint pigment in the folds as you hamfistedly pour it on, and then dry smooth with the wrinkles literally painted on! This, I'm sure, would be greatly reduced with more coats of dope applied prior to painting.

Among the final steps is to attach the canopy, and, using strips of painted tissue, lay on the canopy framework with a diluted solution of white glue. It looks like a mess when dry but the milky film is easily "scrubbed" gently off with a small paintbrush and water.

The landing gear is of the plug-in type to allow the model to be flown in both AMA and Flying Aces events. The struts are covered with a balsa and paper wrap with the hydraulic collars represented by strips of paper wound around the struts. Tires are turned using a Moto-tool much like the spinner with paper disks representing the wheel rims.

Possible Modifications

Due to the type of flying field, the author uses (hard dirt and sticker-burrs), and the aforementioned trim sessions, the MB-5 is probably a bit overly built. A worthwhile modification to try is to build the fuselage frame from hard 1/16 inch square versus the medium 3/32 inch square. The weight savings for the frame would be about 20% but you may need some additional bracing and your alignment would be harder to achieve. Another, for appearance sake, is to reduce the dihedral. But stability will progressively lessen. Scale dihedral is 4°, with 6° - 10° the flying model range. Colored tissue versus paint is a possibility as well as experimenting with wing incidence, propeller, and motor.

Now, aren't you glad you test flew before you finished it? Oh, go on, tell 'em it flew right off the board. I won't snitch. Happy flying.