



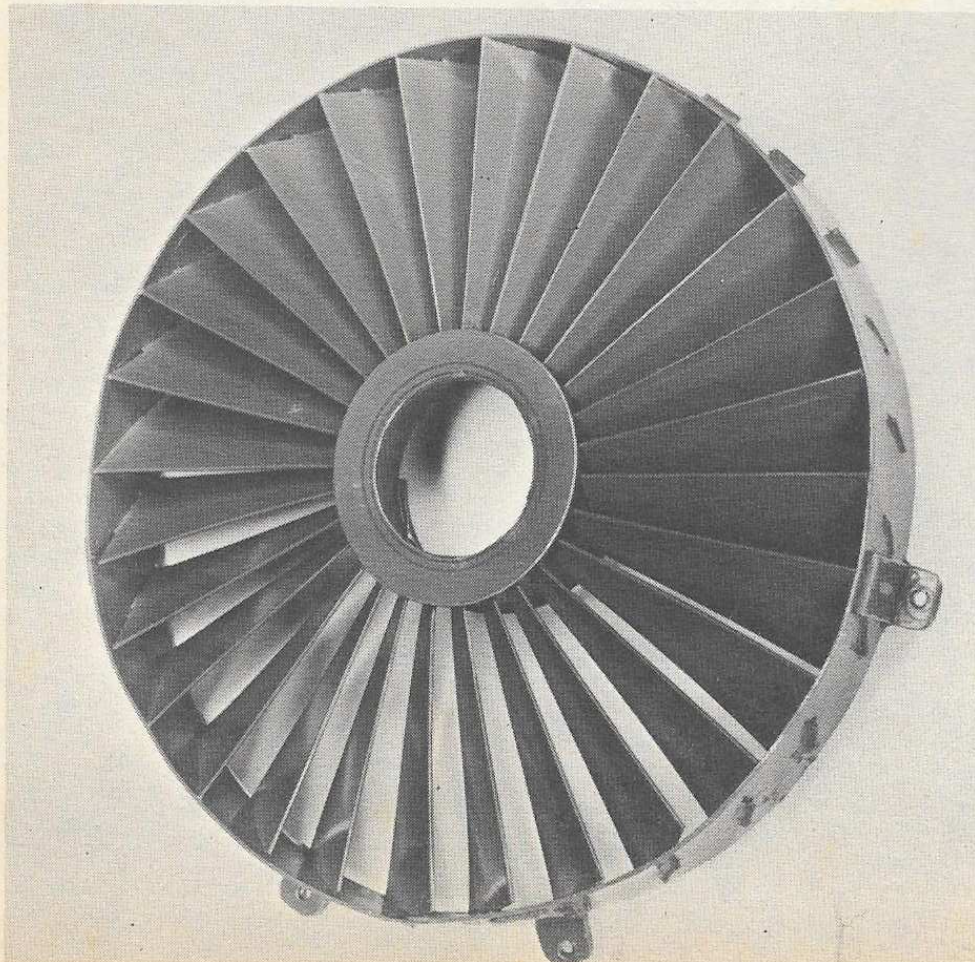
Come out from behind those dark glasses Claude, our readers know you. Man size machine, isn't it!

# YAK P or PM

By CLAUDE McCULLOUGH

Photo shows radiator shutter unit that fits just inside front on the cowling. It is made of Air-

O-Sheet plastic, the covering material that is used on all of the Lanier "ARF" planes.



► The YAK story begins on a cold day in February, 1967. An Iowa-type blizzard had given me all the excuse necessary to retire to the workshop and cut a little wood for a multi-engine scale I had underway. It was bugging me not a little that despite years of beating the aviation history bushes, no cockpit pictures for this bird could be found. Without them, the otherwise good and rare scale documentation I had collected seemed incomplete. For this and perhaps other reasons (would you believe *three* inverted engines?), I had temporarily lost some of my enthusiasm for the project.

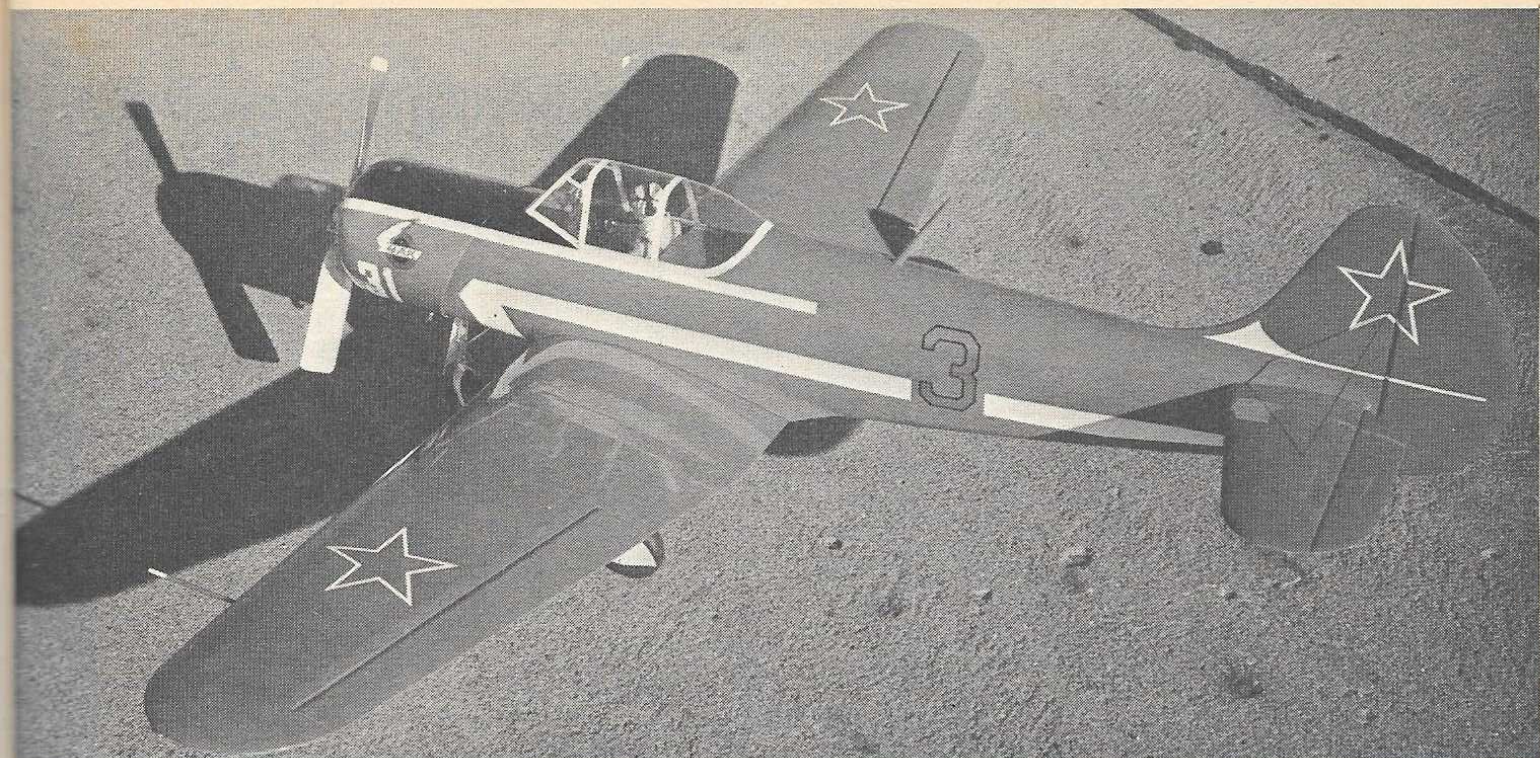
Into this scene comes the rural mail-carrier, plowing through the drifts in his trusty VW. Amongst the hog feed ads he left in my box was the January issue of the English aviation mag "Flying Review." It opened to a page liberally sprinkled with shiny red, star bedecked YAK's. Several weeks before I had drooled over James Gilbert's color photos of the YAK 18PM's at the Moscow World Aerobatic Championships in the January issue of "Flying." Now here were not only more photos, but also three views of various types and a complete breakdown on their history.

Red airplanes have always hypnotized me. With the trike gear and classically beautiful, functional lines staring up at me from the plans, something snapped! The X-acto knife slipped from my fingers and I groped for divider and ruler to check and measure. Then I wrote letters to such widely scattered spots as Australia, Czechoslovakia, and that strange foreign land, Southern California, searching for additional data. The multi-engine job was cast aside and forgotten.

The wind blew and the chips flew and soon it was July with the ship nearly done and test flights scheduled for the following weekend prior to leaving for the Nats the next weekend. But here the fickle finger of fate intervened and I found myself in the hospital instead of Los Alamitos. By the time I got back on my feet everything was over but the shouting for Lou Proctor and his Nieuport.

Spending my long planned vacation in bed was a bit dispiriting. It was some months before I got around to the little bit of work necessary to complete the red Red. At this point, M.A.N. at Work entered our script. Perhaps I should say tried to enter, for while he, Hazel, Glen, and Maxey stood on the porch pounding and yelling, I worked away oblivious in my darkroom, a radio talk show running in my ear. But they finally got to me. To make a short story shorter, that is why the YAK appears in these pages and will be a Sig kit soon.

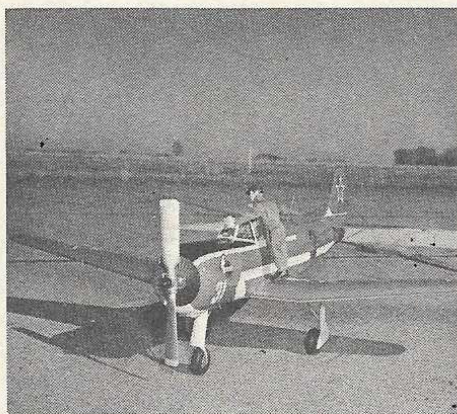
Walt hoped to be able to stay around for the test flights. However, the next



Side view of the Yak shows the incredible finish that Mac always achieves on his scale machines. Note reflections on wing root and stabilizer.



Added detail is this crewman receiving instructions from the pilot. Looks real, doesn't he?



Here we have the crewman diligently completing his chores. Clean windshield important to pilot.



Close-up of nose or cowling details plus scale prop and landing gear. Note Yak decal.

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day brought high winds, postponing the tests until after he had gone back to the Big City. Maxey Hester always gets handed my testing chores for I feel his quick reactions as a crack Class III (C?) flier are just a little better than those of ole "Who's nervous?" It's those fractional second decisions that can kill you on first flights. Having a top-drawer test pilot is the best insurance you can buy to have your new scale to fly another day.

In the case of the YAK, I never was happier *not* to be on the box on that first outing. As befits a copy of a World Champion aerobatic design, the model proved to be very sensitive to the controls. There were some hairy moments just after takeoff but the man from

Montezuma's computer quickly adjusted. He began to move the stick like a brain surgeon's scalpel. We quickly gleaned the comforting news that it was not a snap-roller for in the first ten seconds it got into several vicious stalled attitudes from over-control on the elevator but broke out cleanly without falling off on a wing. The ailerons were also overly co-operative—all you had to do to roll was fidget! A quick landing and a clevis readjustment all around. This helped a lot, but we soon were fresh out of adjustment holes and things were still too sensitive. By now, the whole crew was well-frozen (except the test pilot, who sat in the car keeping his hands warm for those critical moments when he was needed) so we

called it off until changes in linkages could be made.

You will note on the plan that the scale elevator hinge line is shown but not used. When building the model I mistrusted this particular feature (though the tail area is exact scale) and used the movable area shown, about half the scale amount. I don't like to depart from scale at all, but if it appears to be absolutely necessary to have a model that will fly more than once, then I (*Continued on page 49*).

## Yak P or PM

(Continued from page 27)

reluctantly do it. Even with this precaution and a fairly long horn, the model was super-sensitive and the horn had to be lengthened considerably. This modification produced the desired result and elevator reaction is now smooth. My advice is that unless your name is Kraft Weirick, leave that scale hinge line where it is—on the plan!

After the changes (which are on the plan so you won't have these problems) the model really showed what it could do. I wish we had a movie of one landing in particular, the smoothest, most scale-like, flap down, nose high grease onto the main gear a judge could ask for. Maxey decided on the spot to build a PM version and keep it light to emphasize the stunting capabilities. By the time you have this issue, we should have a readout on the characteristics of his plane.

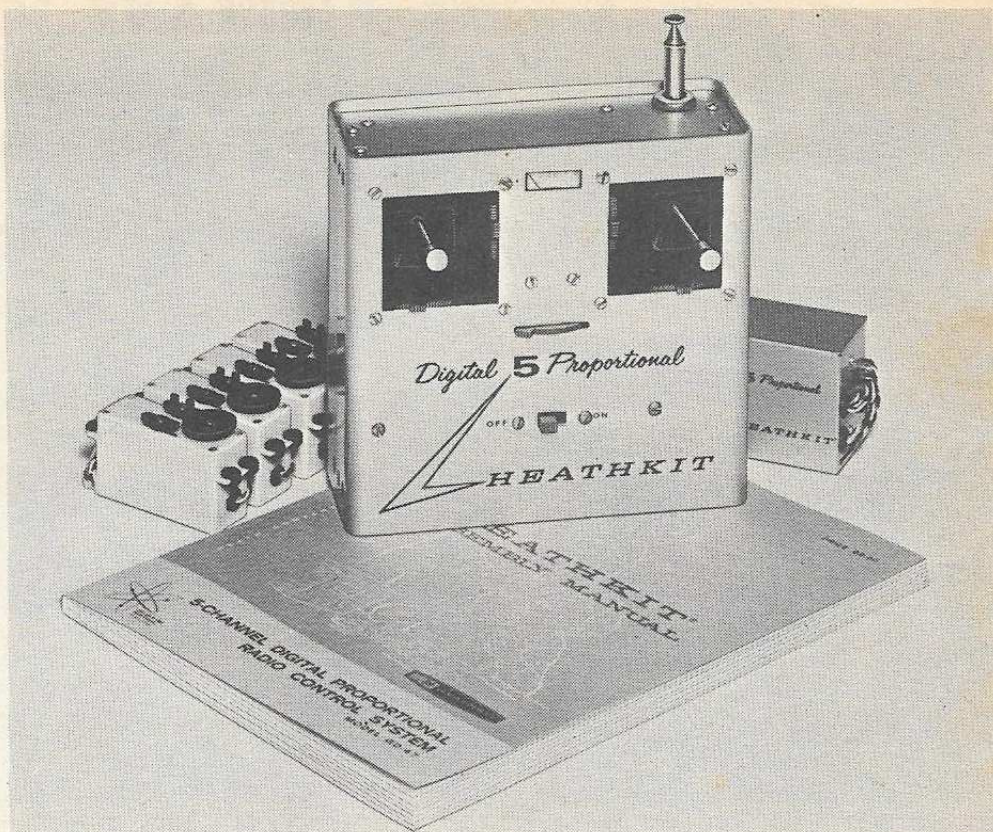
The differences between the P and PM are distinctive but the plans can be used to build either variant. The 18P, a special aerobic and sport craft, came from a long line of YAK 18 trainers. It was used as the Russian team aircraft in the 1964 World Aerobatic Championships in Bilbao, Spain. While a spectacular performer, it did not win the individual championship and further modifications to increase the aerobic characteristics were undertaken. The result was christened the 18PM. At the Moscow 1966 World Aerobatic meet, it really took the laurels, winning the first four places in both the men's and women's individual championships and the team trophy as well.

The modifications made on the 18P to produce the 18PM were as follows: Dihedral reduced from 7 degrees 20' to 2 degrees to improve inverted stability. Cockpit moved to the rear to move back the C.G. and increase maneuverability. Oil cooler on starboard wing enlarged. Flap replaced by a much smaller air brake on the former flap hinge line.

You can see these features on the working plans and elsewhere in this issue on the three view by Capt. Halls of the 18PM. Builders of the 18P should also get a copy of the January, 1967 issue of Flying Review so that the differences are apparent to scale judges.

I selected the 18P because the forward cockpit was better located for inclusion of complete cockpit detail and still have the servos in the proper place. This decision was made before the appearance on the modeling scene of Ny-rod and its derivatives. Now it would be easy to mount the servos ahead of the cockpit in a PM and route the controls along the walls and still have space for a complete cockpit and pilot. I also thought the larger dihedral of the 18P was a better choice for my flying skills and finally I liked the looks of the forward cockpit.

The scale of the model is just over 2" to the foot. Purists complain about uneven scales, but I maintain that a model of say 2.046" to the foot is just as much to scale as a 2" to the foot. In this case, the reasons for the size were compelling. At 2" the engine stuck through the cowling, whereas a small increase got it inside. The new rules for RC Scale require that if you use an unusual scale the judges must be provided with some way of relating the model to the 3-view provided. Take the Halls 3-view to a photo-copy place and have it enlarged so that the wing span on the three view is an exact multiple of the wing span of the model. Present this to the judge with a notation of the multiple to the model size. This will fulfill the rules and please the judge as well for it is much easier to check a model that is an



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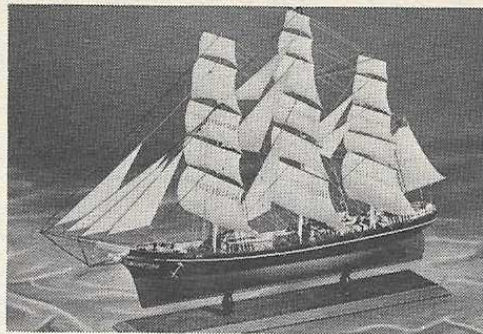
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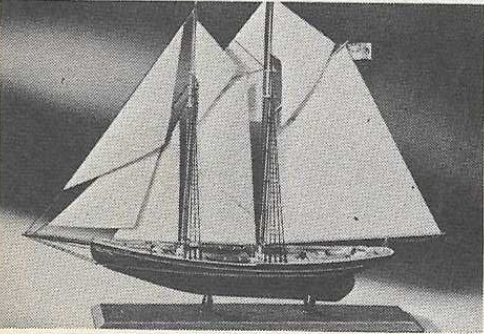
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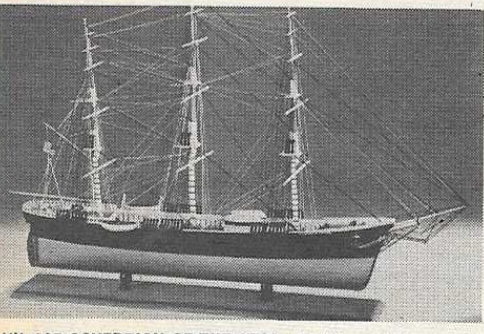
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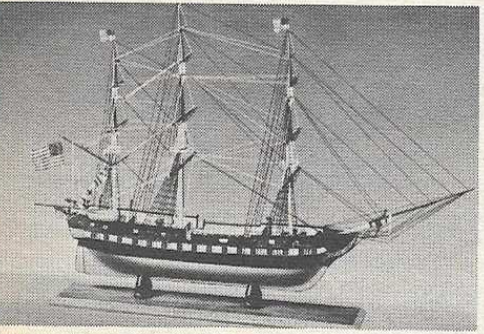
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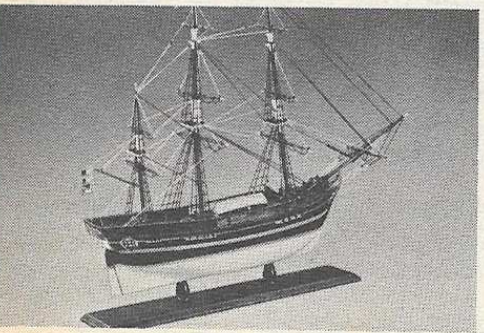
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even multiple of the scale plan than to have the double chore of converting from the scale used, even when it is an un-fractioned figure. An alternate way would be to make a special scale ruler with dividers which would read model dimensions when applied to the 3-view. (Step off the model wingspan on a dimension equal to the 3-view span, then all other dimensions of the model can be read directly from the 3-view using the special ruler.)

The model uses what may seem a rather old fashioned style of construction. I make no claims that you can build it in a week, but it is strong and can take lots of punishment as well as the pull of many coats of dope. Besides, I think there are still a lot of model builders around as opposed to mere assemblers. I'm not throwing rocks at ARF stuff. I use them myself for practice to save building time which I apply to scale projects.

Most of the building information is on the plans or can be deduced from study of the cross sections. However, there are some unusual items I'll touch on as long as the space holds out.

The fuselage is built on a ¼ sq.in. main frame with formers on top and sides, partially planked with ⅛" sheet and the rest open framework, just like the full-scale airplane. Note that "FW", the ¼" sheet piece that shapes the cavity for the wing, extends from the firewall to the wing trailing edge.

If you build the PM, you will be doing in model form exactly what was done when the prototype was built, i.e., the 18P canopy, not trimmed so close, will be moved backward to a new location. This, of course, requires dropping some formers and using others, as the plan details. The main difference is the block "FPM" used at the rear of the canopy in the PM fuselage. Since the fuselage has started to taper at this point the canopy doesn't quite fit and the purpose of the block is to change the fuselage curves just a little to meet the canopy. The best way to get this shaped correctly is to refer to the picture of the PM on page 29 of the December, 1966 issue of Air Progress. This shot shows the area clearly.

A ready made canopy will be available soon from Sig and as a scarred veteran of stretch moulding efforts, I recommend that you get this—or do you like plastic smeared all over the kitchen oven?

A Sig product that is unfamiliar to many builders was used for making the fillets. Improperly done filleting can ruin the looks of an otherwise perfect model. With Epoxolite Putty the job is a cinch. This is a sort of epoxy plastic balsa, light and sandable yet very strong and non-shrinking.

First complete the fuselage, including wing mounting attachments, covering and fillercoating. Apply the 1/32" plywood pieces "FF" to the fuselage with epoxy glue to keep them from pulling out of shape as the glue sets. Lay a piece of plastic sheeting such as Handi-wrap across the top of the finished, covered, and fillercoated wing and mount in place, using the wing attachment bolts to draw it up tight. If there are any places where "FF" does not fit flush against the wing, drive some toothpick wedges between it and the fuselage to force it down snugly against the wing surface. Allow the glue to set.

Mask the fuselage fillet line with Scotch plastic tape (it can be easily curved) to keep a clean edge. The wing fillet line is the edge of "FF" and the plastic covering already applied will keep the goop off of the wing. Mix a batch of Epoxolite according to the direction and slop it on. Roughly squeeze out the bead to fillet shape with a rounded object. Allow it to

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set up slightly before trying to get a more perfect shape with a wetted instrument or finger. After complete setting, finish with sandpaper wrapped around a round form.

The nose gear used on the original model was a twin coil Franklin (English) bulkhead mount unit built up to scale diameter with brass tubing. A ready-made special YAK gear is being hatched in the Sig works that will be made from nylon and steel. This looks very strong and will not need much work to complete the scale touches since it will feature a fork and tubing leg.

Particular care should be taken in mounting the motor to insure it is centered on the cowl. The best way to do this is to mount the cowl first, using the rear attachment points only since C-6 will not yet be available. Then cut a corrugated cardboard ring the same diameter as the opening in the cowl and put it on the prop shaft, shimmed so as to be right in the cowl opening. The engine should be mounted on the mounts with the thrust shim glued in place. Set this unit on the firewall, fuselage vertical, with some tack glue spots. Drop the cowl on and fasten, bringing the engine into correct alignment by positioning the cardboard ring directly in the cowl opening. Allow the tack glue spots to dry, remove cowl, mark the mounts for bolting in place in this position.

The cowling is spun aluminum, a job I had custom made in Omaha with the help of Dr. Bill Clark. Sig will produce one for the kit and it could also be made from fiberglass.

One of the unusual features of the YAK is the use of radiator shutters, evidently required by those famous Russian winters to maintain cylinder head temperatures. It is a good feature in the model for it effectively fills in that gaping hole in the front of the cowling that so often spoils the looks of a scale craft without having to resort to the job of building a dummy radial engine. It may look like a difficult project but it is as easy as a kindergarten puzzle. Cut the patterns on the plan from 1/32" Air-O-Sheet. This is the soft plastic sheet used in Lanier ready-builts and is easily cut with an X-acto, is heat moldable and has a smooth finish that requires no filling and takes butyrate type dope. The dope should be sprayed on in light coats to avoid over softening the plastic.

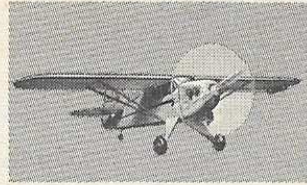
C-2 and C-3 should be wrapped around round forms of the proper diameter and baked in a 300 degree oven for about five minutes. It is possible, though a little more difficult to handle, to make them without this heating. Make C-2 and C-3 1/4" longer and curve them into shape cold, overlapping the ends, clamping and cementing with Air-O-Sheet cement. This is a special item that quickly welds joints of Air-O-Sheet together. It is water thin and flows into the joint readily and melts the plastic together. If you heat treat C-2 and C-3, use a butt joint and reinforce with a scab over the crack.

Pin C-2 and C-3 in place on the front view of the cowl and add the 28 C-1 pieces by plugging the tab on the top of each one into the hole in C-2 and the corresponding slot in C-3. A drop of Air-O-Sheet Cement is put on each seam for initial assembly and after drying, coat each seam (on the outside of C-2 and the inside of C-3) with Sig-ment for additional strength. Add the front ring, C-4 and the brackets on the side for mounting. The brackets are made by bending Air-O-Sheet into a 90 degree angle and cementing two pieces together to make 1/16" thickness. 2-56 bolts and blind nut then fasten the shutter unit to C-5, the plywood bulkhead. This in turn is fastened, by tapping holes, to the motor mounts. If you aren't set up to tap holes you can make a small

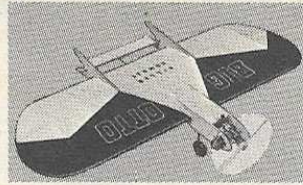
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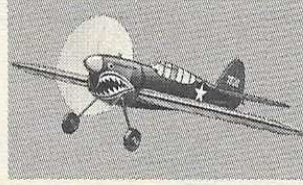
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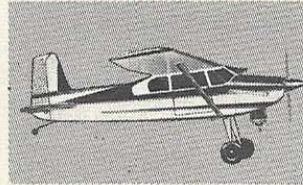
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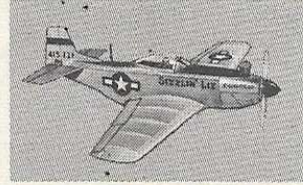
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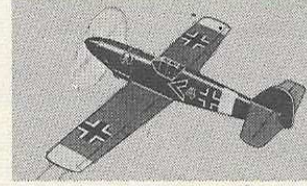
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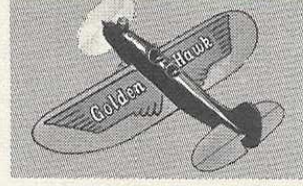
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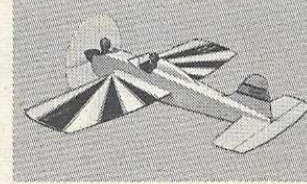
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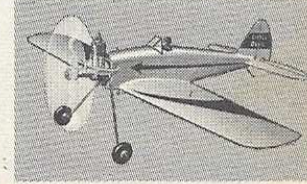
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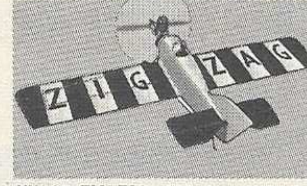
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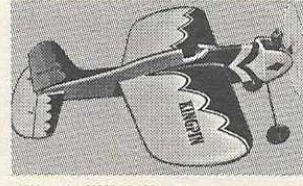
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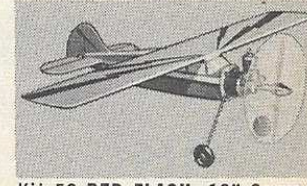
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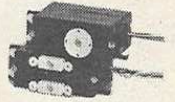


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angle bracket of sheet aluminum and bolt C-5 to the motor mounts instead.

The spun aluminum cowl is very sharp looking but it brings along the problem of getting paint to stay on the metal. You may have your own favorite metal primer for this job. My solution takes a little longer but really does the job. I treat the cowl just like any other part of the model. Sand paper the metal, paint it with a coat of dope, lay on wet silk, stretch smooth and dope down. Turn the edges of the silk inside lap with epoxy glue to tie down the on the cowl inner surface. Go over this inside lap with epoxy glue to tie down the edges firmly. If you don't do this, the silk tends to separate from the metal along the edges after a period of being flexed. Epoxy must be used because the shrinking action of dope or ordinary cement tends to pull away from the cowl on the inside rather than toward it as it does on the outside. Fill the pores with several coats of fillercoat and sand smooth, ready for color doping at the same time and in the

same way as the rest of the model. I've used this method for years on spinners and cowlings and though it sounds strange, it works! The silk and fillercoat form a shell that will not chip or crack.

The lower air scoop C-8 is carved from a soft balsa block and is best fillercoated and painted separately and added to the cowling after it has also been painted. For a good picture of this scoop and the openings in it, see the photo of the 18P on page 36 of the August, 1966 issue of "Flying."

This photo also shows the scale prop details to good advantage. Often neglected by scale builders, this is a very necessary touch for realistic appearance and good for competition points as well. If you have carved a rubber model prop you can do this just as easily. I made the hub from pieces of copper pipe, epoxied washers on the front and back and filled in the gaps with Fred Angel's Epoxybond Hobby Putty, a very handy product that can be shaped and smoothed with a wet knife blade or

finger. The pitch weights were made from pieces of dowel fastened to a ring of Air-O-Sheet.

Equally neglected is landing gear detail. I also used Epoxybond here to give shape to the nose wheel fork. Landing gear cover doors were made from Air-O-Sheet. The nose gear door is curved and this effect was achieved by tying a piece of the plastic to a tin can and baking it in the oven. When you are doing this, make the piece large enough that the places where it was tied down or fastened to the can are on waste space because an image of anything touching it is impressed into the plastic during the baking process. Semi-flexible polyethelene tubing was used on the 3/16" main gear to bring it out to scale diameter. To paint this tubing, sand off the gloss and use Hobby-poxy.

The wing should bring back fond memories to some of you ex-free-flyers who built Carl Goldberg's epic creations, the Zipper, Sailplane, etc. with the ribs

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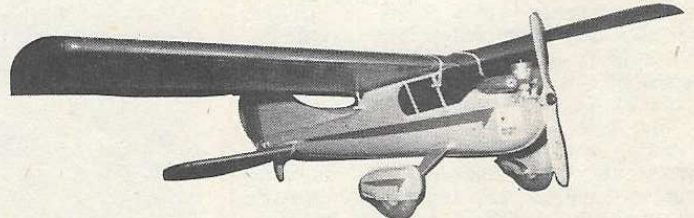


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slipped over the spars. The ailerons are built as an integral part of the wing. After installing the outer planking and finishing the trailing edge, cut them off with a razor saw blade removed from its frame. This will be easy if you have carefully marked or slit the planking during assembly so the cut will be in the correct spot. Angle the open face of the ailerons with a sanding block and face with 3/32" sheet.

Speaking of sanding blocks—for this type of wing, with exposed rib edges not concealed by planking (scale!), an invaluable aid is a Delta straight-edge sander. It is the only practical way to get the wing in shape for covering. It's also very handy for beveling the fronts of the ribs before installing the leading edge. Just lay it down on the building board in front of the assembled wing and slide it gently back and forth against the ribs.

The color scheme on the Halls 3-view is basically correct for the 18P as well. The differences can be seen in the photos of the model. The 18P Russian team aircraft in 1964 had gold numbers "1" through "4" with black outline on the fuselage sides. At the World meet, competition numbers were assigned each entry and these are the white numerals on the cowling, "29" on "1", "30" on "2", etc. The badge of the Aero club on the cowling was used on the 18P without reversing on the right hand side, that is, the wings were backward. They evidently decided, and I sure agree, that this doesn't look quite right. When the 18PM appeared at the 1966 Championships the cowls sported right and left hand versions of the badge. (See color photo of badge, P-38, January 1967 "Flying".)

Sig will be producing this emblem as a decal but I painted mine on. Since I think the process will be of interest to scale builders in general, I'll say that it wasn't

nearly as hard as it looks and the result turned out much better than I thought it would. I used regular drawing instruments, a ruling pen and compass, with dope in them instead of ink. Thin the dope slightly with anti-blush thinner to slow the drying time and make it flow easily through the pen points. Prepare a paper pattern of the emblem from the 3-view.

The painting sequence is as follows: Dope the emblem, stripe and number areas white. Outline the outside edges with a red line. Mask off the white. Spray the cowling red. Remask and spray the black top. Remove the masking. Using compass and ruler, outline the blue half circles in blue and hand paint them with a small brush. Outline the gold area and paint it in by hand. Finally do the same with the red letters reading "YAK". If you think I'm going to say that next I drew the small letters, you're a better artist than I am. These were done with Instant Lettering slot car (you should pardon the expression) decals available in gold at most any hobby shop. Some of the crazy Cyrillic alphabet will take a little combining of letters or turning them over, but it can all be done very neatly.

Incidentally, I made my own gold dope for the rest of the badge so that it would match the shade of the rub-on decal lettering. Art supply houses have bronze powder in various shades and just a dab in some clear dope is all it takes. I found my home made gold had less tendency to streak when hand brushed than commercial gold dope. I also used this mix for the gold "3" on the fuselage side.

On first test, it generally appears that Instant Lettering decals cannot be doped over because they dissolve in dope. They will if you slobber a wet coat directly on the bare decal. However, if you hit them

several times with a fine mist and slowly build up a little clear dope over them, allowing it to dry thoroughly between coats, you can soon spray more normal coats and shortly will have completely buried them and have a 100% durable and fuel proof decoration.

Another color scheme, a little bit easier to do, appears in a color photo in the Nov. 1967 issue of "Sport Flying". A complete list of scale source information that shows other patterns, cockpit detail, etc. appears on the plan. You should try to get as many of these as possible. Photos of the actual aircraft can show nuances of curve and shape that no plan or description can manage. All possible sources of available information are itemized with the exception of an article from a Russian aviation magazine, the masthead again in that topsy-turvy writing, which you couldn't get and we couldn't reproduce. (Ken Sykora claims the English translation of the name of this publication is "String Beans.") Interesting item: The Russian 3-view has some obvious errors in outline and detail!

Since I can't cover everything in the space available, I'll try to answer any questions you may have. Send me a stamped (that is a Scotch name) self-addressed envelope at Rural Route 5, Ottumwa, Iowa 52501 and I'll be glad to do some yakking about the YAK.

Right now I'd better get back to that multi-engine project. If any of you scale nuts out there in model building land ever run across some cockpit photos of the Bellanca 28-92, beg, borrow or steal them. Hang it all, there's got to be some pictures somewhere, the bird won second place in the '38 Bendix. With the data on hand, maybe I can get this monster done—IF no more red airplanes suddenly turn up!