



SHOW TEAM SPECIAL



Good grief — not another ME-109!!

Not really, but it kind of looks like a ME-109. It also sort of looks like a P-51C. And resembles a Hawker Hurricane, or maybe a P-40, or a MIG-3, or a Lavochkin LaGG-3, or a Kawasaki Ki-61, or a Dewoitine D-520, or a Yak-1, or . . .

The attrition rate of planes used in the “dogfight” segments of our Barons Flying Circus Air Shows is quite high, and we simply cannot afford the time and money required to field high-quality scale models for this activity. Since the spectator appeal lies mainly in the excitement of spirited pursuit and near mid-air collisions, the configuration of the planes can stray quite far from true scale without detracting from the performance. Colors, markings and general outline can convey the scale impression adequately — we really don’t need true scale models for Air Show combat.

Consequently, I was searching through the old files and magazines for something suited to our purpose and happened across a construction article by Danny Reiss entitled “Two WWII Fighters for Sunday Flying.” Danny presented a basic airframe that could, with merely cosmetic alterations, be either a Kawasaki Hein “Tony” or a ME-109. These were very attractive models, with no pretense of being exact scale, and designed for easy building and sport flying. He called them “semiscale.” (Editor’s note: Romey Bukolt designed the “Warbirds,” a three-in-one 1/2A powered model that appeared in RCM, April 1973.)

With Danny’s plans as a jumping-off point, I developed the plans into what we needed for the Air Show Team — a basic plane that could, with minor modifications and appropriate color schemes and markings, resemble a ME-109, a Hawker Hurricane, a P-40C or even a P-51C. This gives us the planes we need for our Normandy Invasion Segment — the Bad Guys bomb our tanks, then are set upon and driven off by the Good Guys. These aren’t Scale airplanes, they are Sort-Of-Scale.

Your imagination and a few cosmetic changes to the basic Show Team Special design allows you to build a wide variety of Stand-Off Scale aircraft.

By Darrel C. Stebbins

Even that terminology must be regarded as a broad-stroke description.

For our purposes, the planes are completed with an absolute minimum of sanding and such. Painted with flat or low-gloss camouflage color schemes, with all the identification markings we can reasonably find room for, from 50’ away they exhibit all the authenticity the uninitiated eye requires — they are indeed Messerschmitts and Hawkers and Warhawks and Mustangs. There is almost no expensive balsa or aircraft plywood used in the construction, they go together very quickly, and they fly very, very well.

A plane that is quick and easy to build, cheap, attractive, identifiable, and flies well. Exactly what we needed for our Show Team. You may find a use for one, too.

Materials:

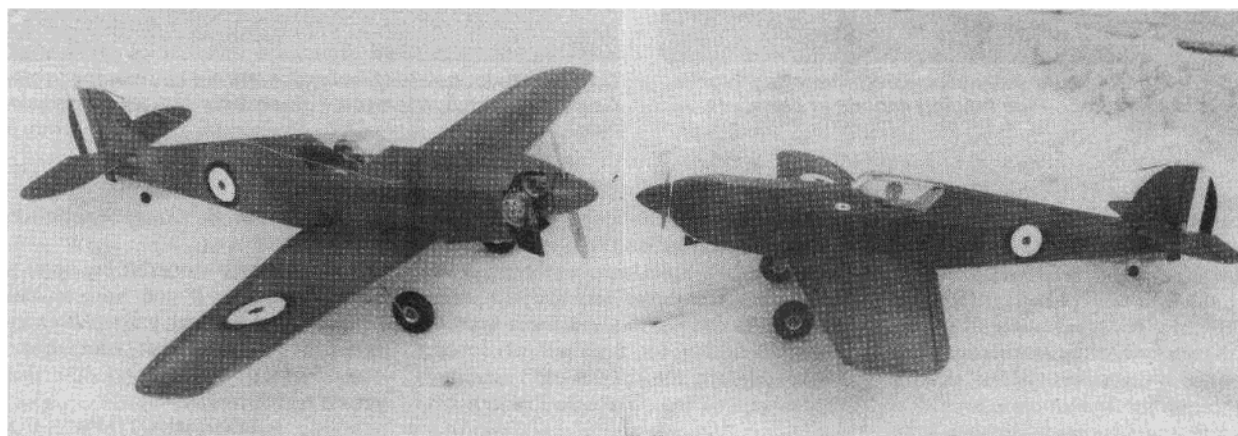
As some of the materials used are not commonly found in kits, a brief discussion of materials is in order:

Basic construction material for the fuselage and empennage is 3/16” Foamboard. This material is an inexpensive, lightweight laminate of 1 lb. per cubic foot density foam core with glossy coated paperboard on both sides. It can be found at art supply houses, some hobby shops, or can be ordered from Sig if you don’t have a local source. It costs about one-fourth as much as balsa. Using it will require you to learn some new building techniques, but it is easy to work with once you get used to it.

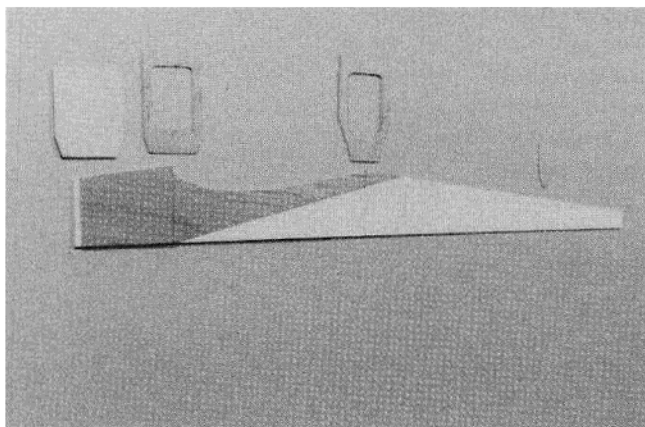
The wing is made of cardboard-covered foam cores, also very easy to build once you understand the process. The cardboard we

SHOW TEAM SPECIAL Designed By: Darrel C. Stebbins

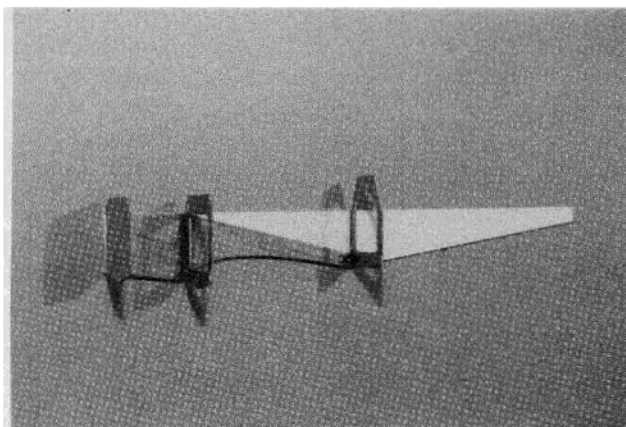
TYPE AIRCRAFT	Sport Semi-Scale
WINGSPAN	49 3/4 Inches
WING CHORD	Root — 12", Tip — 6"
TOTAL WING AREA	444 Sq. In.
WING LOCATION	Low Wing
AIRFOIL	Semi-symmetrical
WING PLANFORM	Double Tapered
DIHEDRAL, EACH TIP	1 1/2 Inches
O.A. FUSELAGE LENGTH	45 3/4 Inches
RADIO COMPARTMENT AREA (L) 11 1/2" x (W) 3 1/4" x (H) 4"	
STABILIZER SPAN	19 Inches
STABILIZER CHORD (incl. elev.)	4 1/2" (Avg.)
STABILIZER AREA	85.5 Sq. In.
STAB AIRFOIL SECTION	Flat
STABILIZER LOCATION (ME-109) Mid-Fin (P-51) Mid-Fuselage	
VERTICAL FIN HEIGHT	4 3/4" or 5 1/2"
VERTICAL FIN WIDTH (incl. rudder)	6 1/2" (Avg.)
REC. ENGINE SIZE	.40 to .61 Cu. In.
FUEL TANK SIZE	8-10 Oz.
LANDING GEAR	Conventional
REC. NO. OF CHANNELS	4
CONTROL FUNCTIONS	Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION	
Fuselage	Foamboard & Ply
Wing	Foam Core & Cardboard Skin
Empennage	Foamboard & Balsa
Wt. Ready To Fly	78 Oz.
Wing Loading	25 1/4 Oz./Sq. Ft.



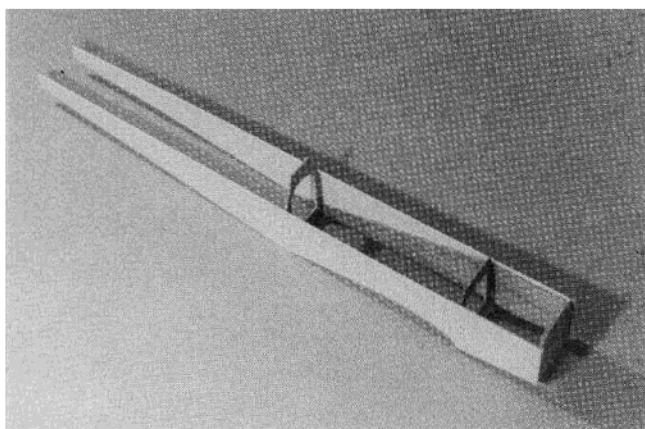
2 views of the Hawker Hurricane version built by Dick Motz of the Barons Flying Circus Air Show Team.



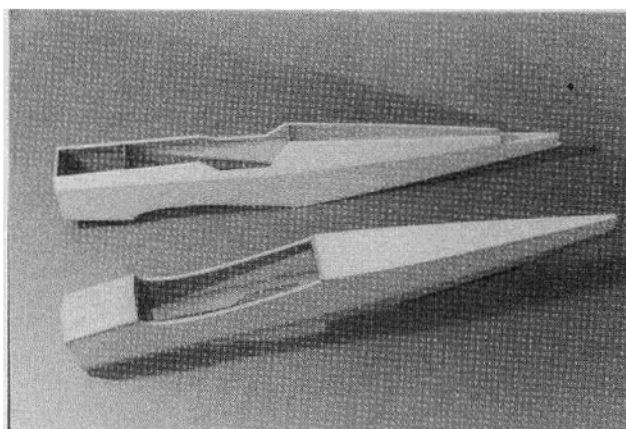
Foamboard fuselage side with ply doorskin doubler, 1/4" birch ply firewall and ply doorskin bulkheads.



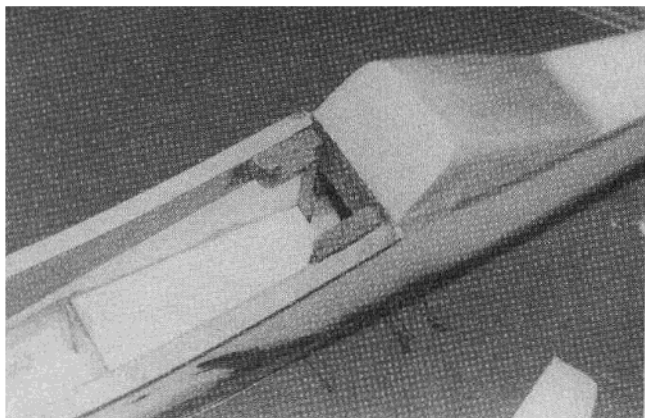
Bulkheads in place on fuselage side.



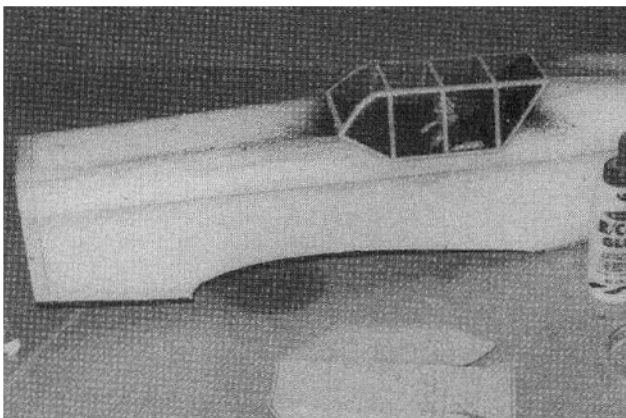
Fuselage sides in place on bulkheads.



Top and bottom of fuselage. All foamboard except forward fuse bottom between firewall and first bulkhead.



P-51 fuse bottom w/foam belly pan, wing mounting blocks, foamboard cockpit floor. Pins holding canopy in place.



Cockpit interior painted black, pilot and acetate canopy in place. Canopy frame made from card stock. Note canopy pattern along side.

use is called "Tagboard" and is available from art supply stores. It is the same color as a standard file folder, but a little lighter weight material. Other lightweight cardboard can be substituted: Railroad Board, Kromekote or Bristol Board. The tagboard will cost you about half-a-buck for enough to skin the wing.

Doublers and bulkheads are cut from "Doorskin" plywood. This is the facing material used in fabricating hollow-core

doors — if your local lumber yard doesn't stock it, they can order it for you. You may have to buy a 4' x 8' sheet, but the big sheet will probably cost you less than a 1' x 4' sheet of aircraft plywood, and you'll have enough material for a couple of dozen planes. Lighter, too. If you can't find the doorskin plywood, Sig Lite-Ply can be used.

Our aileron stock is cut from cedar house siding — beautiful, strong, light, and

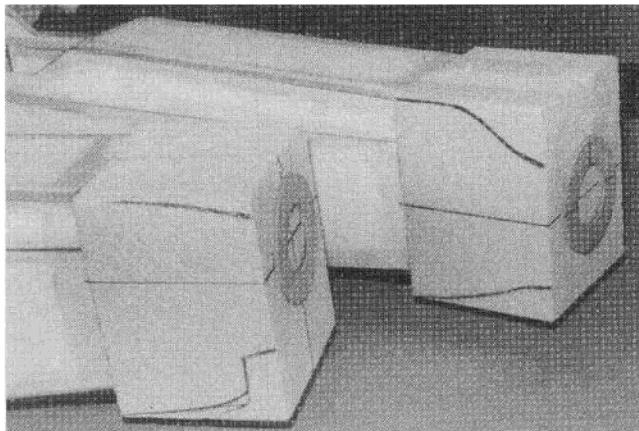
straight-grained. Balsa may be substituted if you prefer.

The cowlings are a one-off lay-up of glass cloth and epoxy. If you want to make a bunch of them, you can pull a plaster female mold from the first one; but for one-of-a-kind, the method described is easiest and cheapest.

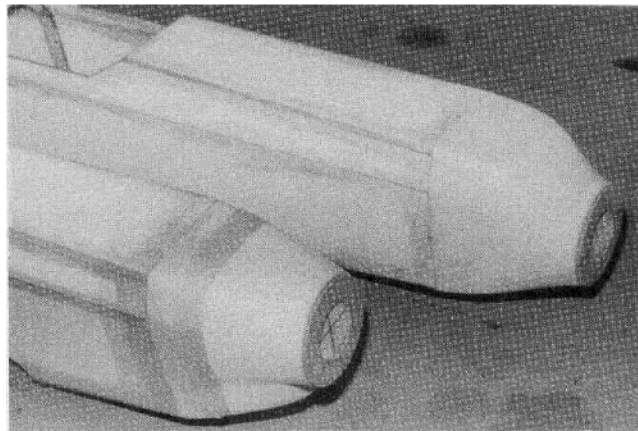
CONSTRUCTION

Wings:

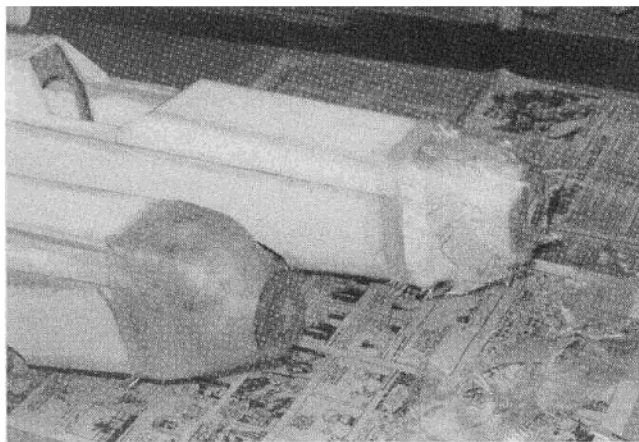
The wing is of very standard



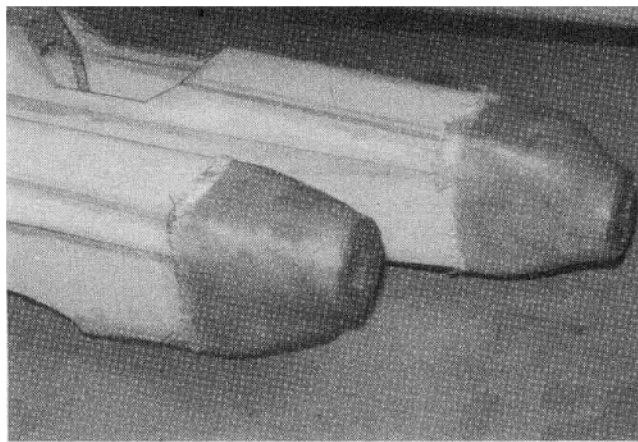
Foam blocks glued to firewall (P-51 L & ME-109 R). Felt tip pen used to outline shapes. Ply nose rings glued in place.



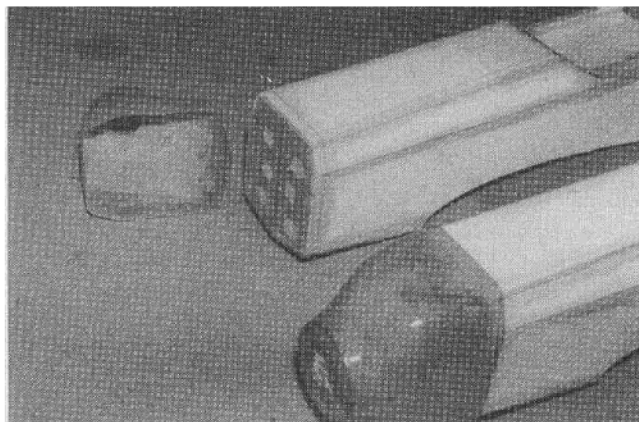
Foam blocks carved and sanded to shape. Saran Wrap used to prevent cowlings from sticking to fuselage.



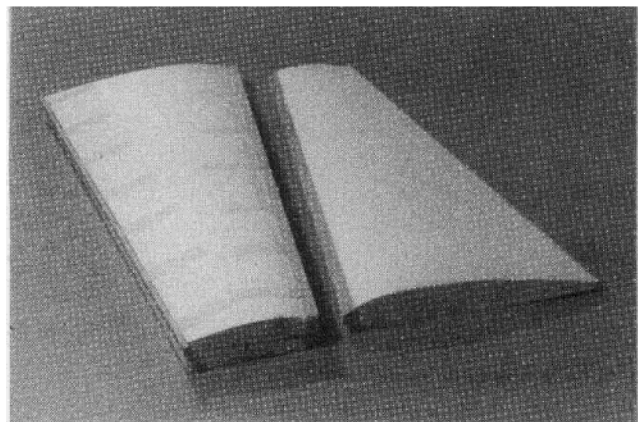
Epoxy-fiberglass layup for cowlings. Good use for scrap pieces.



Epoxy-fiberglass layup complete. Next, sand smooth with 80 grit, 100 grit, then 150 grit. Final step, coat with 5-Minute epoxy.



Completed cowlings popped loose, trimmed, placed back on fuse and line drawn on fuse for location. Foam can then be removed from cowl.



Wing cores with leading and trailing edges taped in place while glue dries.

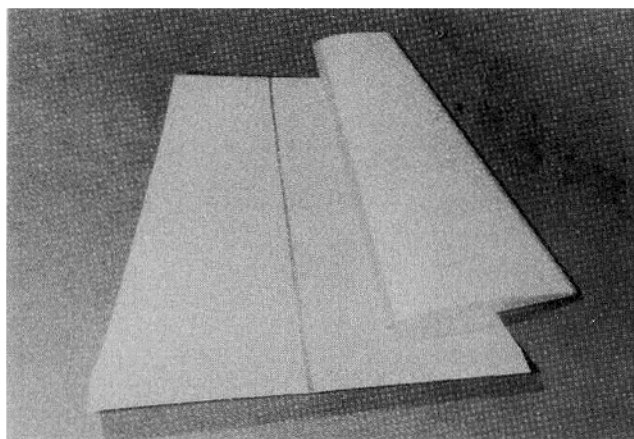
construction, foam core and tagboard covering. When cutting the cores, be sure to line up the tip template as shown to provide the 1° washout. The leading edges and wingtips are just about the only balsa used in the construction of the model — substitute cedar if you so desire.

Sand the wing cores carefully with a long block sander to remove cutting wire lag marks and to insure that all surfaces are in a straight line span-wise. Cores cut with the

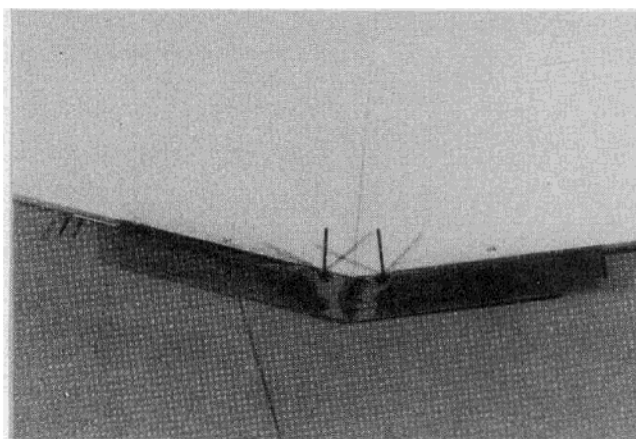
wire too hot usually exhibit a concave line between the templates; lay a straight-edge along the thickest part of the wing span-wise and check for any concavity. Install the leading and trailing edges, plane them down flush and round the leading edge as shown. Sand them smooth, vacuum all the balsa and foam dust away, and you are ready for covering.

The tagboard covering is wrapped completely around the wing panel in one

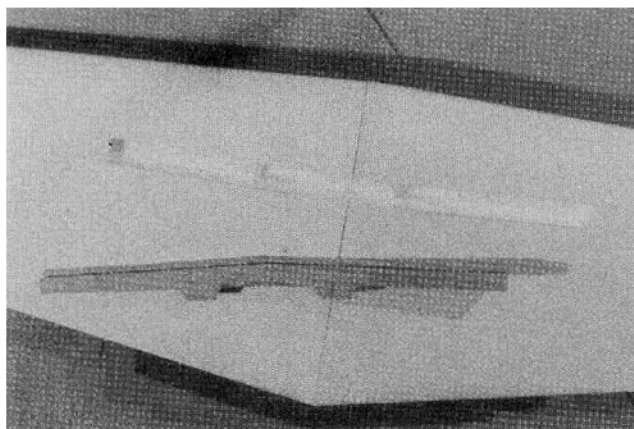
piece, which generally requires a little persuasion at the leading edge. Lay your tagboard on a smooth, hard surface and lay a straight-edge where the centerline of the leading edge is to be. With a ballpoint pen, using a moderate amount of pressure (you want to actually bruise the paper slightly), draw the centerline of the leading edge. Now draw three more lines at each side of the centerline — spaced 1/32" at the tip and 1/16" apart at the root. These little



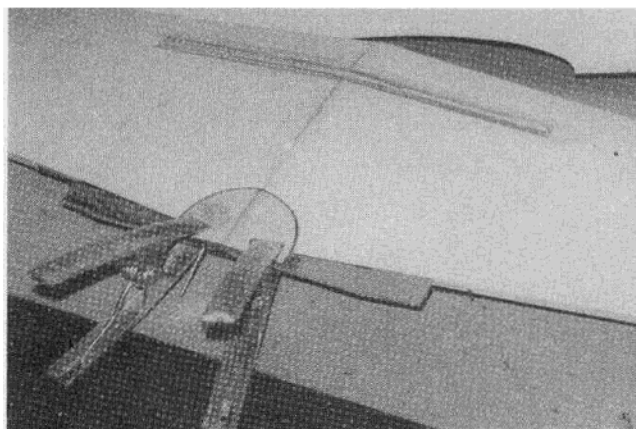
Tagboard wing skin with leading edge centerline marked to locate skin on core.



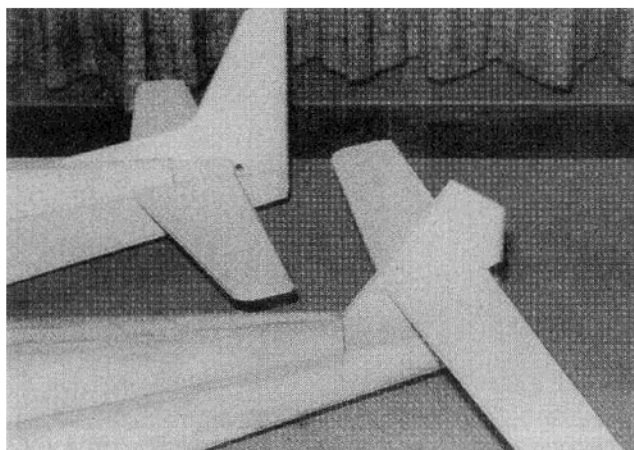
Cedar trailing edges with strip aileron horns in place.



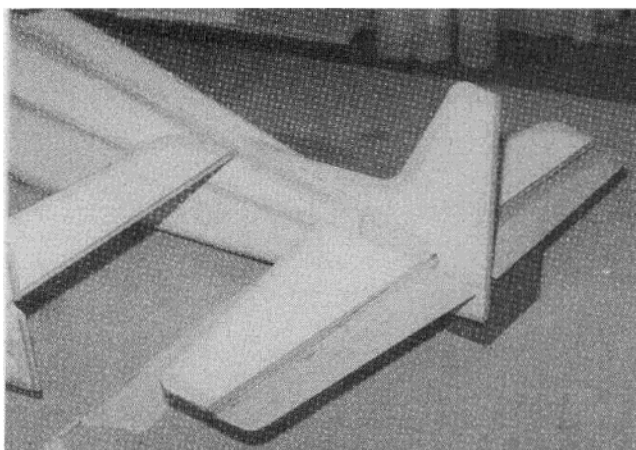
Covered wing cores has recess cut for hardwood landing gear block.



Landing gear block epoxied in place. Wing bolt reinforcing plate being epoxied in place.



P-51 tail group in background. ME-109 tail group in foreground.



P-51 elevators installed. These are made from 3/16" balsa.

corrugations are drawn on the **inside** of the covering, and will help it to bend around the leading edge. (You will omit this step as you become familiar with working with the tagboard, but it might help you on the first wing.) Lay your core on the tagboard and draw around the perimeter with a soft pencil. Flop it over and trace around the other face, then cut the covering shape out of the sheet, leaving about 1/2" excess all around.

Mix up about 2/3 ounces of Hobbypoxy II epoxy glue. Spread newspaper over your workbench, or the floor, or wherever you are going to be working, and lay your wing skin down with the inside (contact surface) up. With a polyethylene squeegee (or 1/16" plywood, or micarta, or aluminum or whatever), spread the 2/3 oz. of epoxy over the entire surface of the wing skin. You may think you don't have enough glue, but 2/3 oz. is plenty — just work it out with your

squeegee. Get it spread as evenly as you can, with a slightly thicker coat around the perimeter and down the center. Now go wash off any epoxy you may have gotten on your fingers, and you'll be ready to apply the skin to your wing panel.

Incidentally, I would highly recommend that you wear rubber or throw-away plastic gloves while working with epoxy. Some folks are, or can become, highly allergic to epoxies — and once you become sensitized

you can't even stand to be in the same room with the stuff. Play it safe and keep your skin protected from the glue.

Hold the wing core with the trailing edge up and place the leading edge on the centerline you previously drew. Roll the bottom of the core down on the tagboard, then wrap the upper surface over the core. Working on the top and bottom sides alternately, smooth the tagboard into snug contact with the core. Work from the leading edge to the trailing edge, getting the covering very tight at the leading edge. When you have it all snug and smooth, pop it back into the foam blocks you cut the core from and weight it down for an overnight cure. Repeat the process for the other wing panel.

This method will result in a smooth, light and very strong wing. The epoxy "case hardens" the tagboard for a true stressed-skin construction. Do not spread glue over the foam core — enough will transfer from the tagboard to provide an excellent bond. Coating the foam core with glue will only use up a lot of glue and add a lot of weight. Do not use latex glue or contact cement — it doesn't provide any strength to the tagboard.

When the panels have cured overnight, trim the excess tagboard with a sharp knife and sandpaper. Sand the proper bevel at the root ends to provide $1\frac{1}{8}$ " dihedral under each wingtip. Line the panels up properly and glue together with 5-minute epoxy. Cut the trailing edge stock to length and epoxy the outboard lengths in place. Form the aileron horns from 3/32" welding rod or piano wire — don't forget to slip on the 3/32" i.d. brass tubing bearings before you make the final bend on the wire, and be sure to make one left hand and one right hand assembly. Groove the trailing edge stock pieces at the wing root to accept the aileron horns and epoxy them in place.

Glue the wing tips in position and sand the tips and the trailing edges flush with the tagboard skin. Avoid sanding the tagboard — it's very thin and scuffs up easily in its raw (unpainted) state.

Cut the landing gear block from hardwood (bass, maple, alder) to the shape shown — note that it is one-piece, which provides a tremendous amount of strength at the wing center section. Groove and drill it as indicated for the 5/32" piano wire landing gear struts. Measure the exact position of the block on the undersurface of the wing and, with a very sharp hobby knife, cut straight down to the proper depth all around the perimeter. Strip off the tagboard and dig the foam out to the required depth. Dig it out with the knife point to almost the proper depth, then dress down the final 1/16" or so with rough sandpaper glued to a small 3/4" wide block. Trial fit the landing gear block in the recess — it should slide easily into place and be flush with the tagboard surface.

Combine sufficient Hobby epoxy II and micro-balloons to make a syrupy mix, coat both the foam recess and the landing gear block with the mixture and press it firmly in

place. Scrape off the excess epoxy as it squeezes out around the block — to avoid having to sand it off later. After an overnight cure, trim the leading and trailing edges at the center section as shown, to fit the fuselage wing saddle. Wrap the center section with a 4" wide strip of fiberglass cloth epoxied in place. This wrap is not so much for center section strength as it is to provide a hard, tough surface where the wing contacts the wing saddle on the fuselage.

Fuselage:

You'll find the foamboard an easy material to work with, but there are a couple of precautions: the paper-foam-paper laminate will dent with excessive pressure — press your thumb into a scrap piece to get an idea of how much pressure you can safely apply; and always use a very sharp knife to cut the foamboard to avoid ragged paper edges. Sanding will scuff up the surface, so wipe or scrape off excess glue as you go, to avoid as much as possible having to sand it off later on. All exposed edges must be coated with epoxy, as painting solvents will attack the foam if they are left uncoated.

Trace out the patterns for the fuselage panels and the empennage on the foamboard and cut to shape with a sharp hobby knife. Cut out the plywood formers and doublers, and laminate the doublers to the foamboard sides with epoxy, aliphatic glue or contact cement. Carefully mark the former locations on the fuselage sides with a soft pencil, and shave the aft ends of the fuselage sides so they will feather nicely into the vertical stab.

The firewall is laminated from two pieces of doorskin plywood, epoxied together; or use 1/4" aircraft plywood. Square up the firewall and Formers "B" and "C", and draw a vertical centerline on each, then epoxy them in place on one of the fuselage sides — making sure that they are at exactly 90° with the fuselage side. When the epoxy has cured, set the assembly upright on a flat surface and epoxy the other side to the formers, checking to make sure that the fuselage sides are square to the flat surface.

Block the fuselage in place over a centerline drawn on your building board, lining up the centerlines you drew on the formers with the centerline on the building board. Draw the aft ends of the fuselage together, with a temporary 3/16" spreader between them, and epoxy Former "D" in place with its centerline directly over the building board centerline.

Cut the vertical stab to shape (note that it is to extend clear to the bottom of the fuselage) and trail fit it in place. If all is well, coat the leading edge of the stab (where it contacts Former D) and the shaved ends of the fuselage sides with epoxy, draw the sides together on either side of the vertical stab, and clamp in place with clothespins. Before the glue sets, check to make sure that the aft end of the stab is directly over the centerline, and that the stab is vertical and correctly aligned fore and aft.

Cut the upper fuselage sides to shape and bevel the bottom edge as shown. Note that

the bottom edge of these panels is not a straight line — it will have a slight curve aft of the cockpit due to the bowed shape of the fuselage as viewed from above. These panels stop at Former "D" — you can continue them all the way to the trailing edge of the stab, but it's easier to fit a shaped balsa block at this area.

Level the top edges of the upper sides with a sanding block after they are glued in place, then install the fore and aft fuselage tops. When the epoxy has cured, trim and sand flush with the upper fuselage sides.

The forward fuselage bottom pieces are cut from doorskin plywood and glued in place, then the aft fuselage bottom installed. Install the cockpit floor and front.

Rounding the corners to a 3/16" radius is easy once you get the hang of it, but try it on a scrap piece of foamboard first. Gently draw the flat side of your knife blade lengthwise along the raw edge of the foamboard at a 45° angle — to bend the paper surface and slightly crush the foam. Repeat the stroke, varying the angle of the blade until you have a nicely rounded corner. Once you have the corners of the fuselage taken care of, you can proceed to round the edges of the tailfeathers in the same fashion — working first one side and then the other until you have a nice smooth radius on all edges.

As previously stated, all the raw edges of the foamboard must be coated with epoxy. Smooth the epoxy on the edges with your fingertip (inside a rubber glove, remember). A somewhat smoother job can be had, if you are fussy, by thinning the epoxy slightly with alcohol, sanding the edges after the first coat, then applying a second thinned coat.

Cowling:

The cowling is an epoxy-fiberglass cloth lay-up over a styrofoam male form. The first step is to determine the proper length — your engine and mount will establish this. Cut the foam block 3/16" shorter than the total length of the mounted engine to the front side of the drive washer. Make sure that the faces of the block are parallel. Tack glue the foam block to the firewall. Mark the centerlines top and bottom of the foam block, and the thrust lines on the sides. Continue the lines across the front face to locate the centerlines of the nose ring. Glue the nose ring in place on the foam block and you are ready to start carving. The foam can be easily carved with a very sharp paring knife; get the main contours worked out, then rough it down with sandpaper. If you gouge too deep, build it back out with spackle. When the foam is at the proper shape, and reasonably smooth, tape a strip of Saran Wrap or Solarfilm backing over the junction between foam and fuselage, lapping 1/2" or so onto the foam and 1" or 2" onto the fuselage. This is to keep you from epoxying the cowl to the fuselage.

Coat the foam and nose ring with Hobby epoxy II (1/2" past the foam-fuselage juncture). Let it set up 'til sticky, then start laying 1" wide strips of 6 oz. fiberglass

cloth into the epoxy. When the cowl is completely covered with cloth, apply another coat of epoxy. Repeat the cloth application, trying to run the cloth strips at right angles to the first layer. Now one more time, with 3/4 oz. cloth, for a total of three layers. By this time it will be messy and lumpy, but you'll have a nice light tough cowling. Coat the whole mess with one more coat of epoxy, using the 5-minute kind this time. When set-up, start sanding to get rid of the lumps and bumps — work it down reasonably smooth with 80 grit paper. Now another coat of 5-minute epoxy, and let it set up overnight. After it is cured out, break the foam loose from the fuselage and trim the overlap smooth — leaving about 3/8" overlap onto the fuselage. Mark a line around the fuselage to indicate the overlap.

Melt the foam out of the cowling with thinner or solvent, or break and scrape it out. Trial fit it to the fuselage just to make sure all is well, lining it up with the line previously drawn. Drill four holes for the mounting screws; then remove the cowl, install the engine mount and engine, and make the required cut-out for the engine, needle valve, muffler, etc. Complete the sanding to smooth down the outer surface of the cowling.

Epoxy the wing-locating dowel in the leading edge of the wing. Line up the wing and epoxy the plywood reinforcing plates at the rear center bottom of the wing. Install the wing hold-down blocks, position the wing and drill for the wing hold-down bolts. Drill and tap the hold-down blocks as shown.

Empennage:

The hinged sides of the tail surfaces are stiffened with 3/16" dowels. These provide strength as well as a tear-out-proof edge for the figure-eight thread hinges. Wrap a piece of 320 sandpaper around a 1/8" dowel and sand a groove in the foam between the paper sides of the foamboard to receive the 3/16" dowels. Cut the straightest dowels you can find to the proper length and epoxy them in the grooved foamboard.

Do not neglect to install the piano wire stiffener between the elevator halves. The dowel goes straight through, of course, but the wire stiffener gives the elevators a little more authority. Epoxy the wire to the dowel and to both elevator halves where shown.

Hinges:

All control surfaces are hinged with 8 lb. limp nylon fishing line, laced in a figure-eight pattern. Drill sets of six 1/32" holes, 1/8" apart and 3/16" in from the edge, in each surface where hinge locations are indicated on the plan. Double sew the fishing line through — up through the hole, down through the gap, up through the opposite hole, down through the gap, and so on. Wedge the lines in the end holes with a toothpick dipped in epoxy, then cut the toothpick off flush with the surface.

Modifications:

Get out your three-views, and use your imagination. Shapes of the empennage, wingtips, cockpit canopy and cowling can

be altered to resemble a number of prototypes. Distinctive silhouette features, like the P-51 belly scoop, need not be full scale, just provide sufficient indication to convey the general impression.

Epoxy-coated foam blocks will do the job.

The location of the thrust line may be varied within reason to alter the cowling configuration; as can the vertical location of the horizontal tail.

Try to keep the areas of the tail surfaces about the same as shown — the outlines can vary considerably. Do not alter the tail moment arm appreciably, as the long moment contributes to the smooth flying of the airframe. If you must shorten the tail moment, you must also increase the empennage area.

Painting:

Spray or brush on a coat or two of primer; sand with 200 grit paper, taking care not to scuff up the cardboard wing covering or the paper surface of the foamboard. Paint the cockpit interior matt black or matt dark green, install your pilot, install the canopy.

Find a color scheme to fit your plane — a matt camouflage paint job requires less paint and hides the rough spots better. For the Show Team planes, we don't try for a super finish — if it looks okay from 20', it's good enough for us. Do it your own way, but keep in mind that these are not even Stand-Off Scale, so don't waste time putting a contest finish on a sport airplane.

Flying:

Balance where shown on the plans. The landing gear stance is wide enough to cut down on the ground looping tendency of tail draggers, so just feed in a little right rudder, let the tail come up, and don't lift it off too soon. Get a little altitude and try gentle turns until you get the feel of the plane. When you have it trimmed out to fly straight and level, pull the nose up a little and see how it rolls. When you figure out what you need to do with the roll rate, try a loop to see if you have a heavy wing. Grab a little more altitude and see if it stalls straight ahead or snaps — if it snaps, you'll probably need a little nose weight.

Bring it around in the traffic pattern and try a landing — at about 40' above the ground. If all is well, bring it on in the next go-around. Change your pushrod lengths as necessary to bring your trim levers back to neutral.

Ours fly well — quite fast and very responsive. We can put on one heck of a dogfight — without worrying about wiping out six months of work by cutting it a little too close. And the audience really enjoys seeing Mustangs mixing it up with Messerschmitts — rather than red Ugly Sticks chasing yellow Ugly Sticks. □