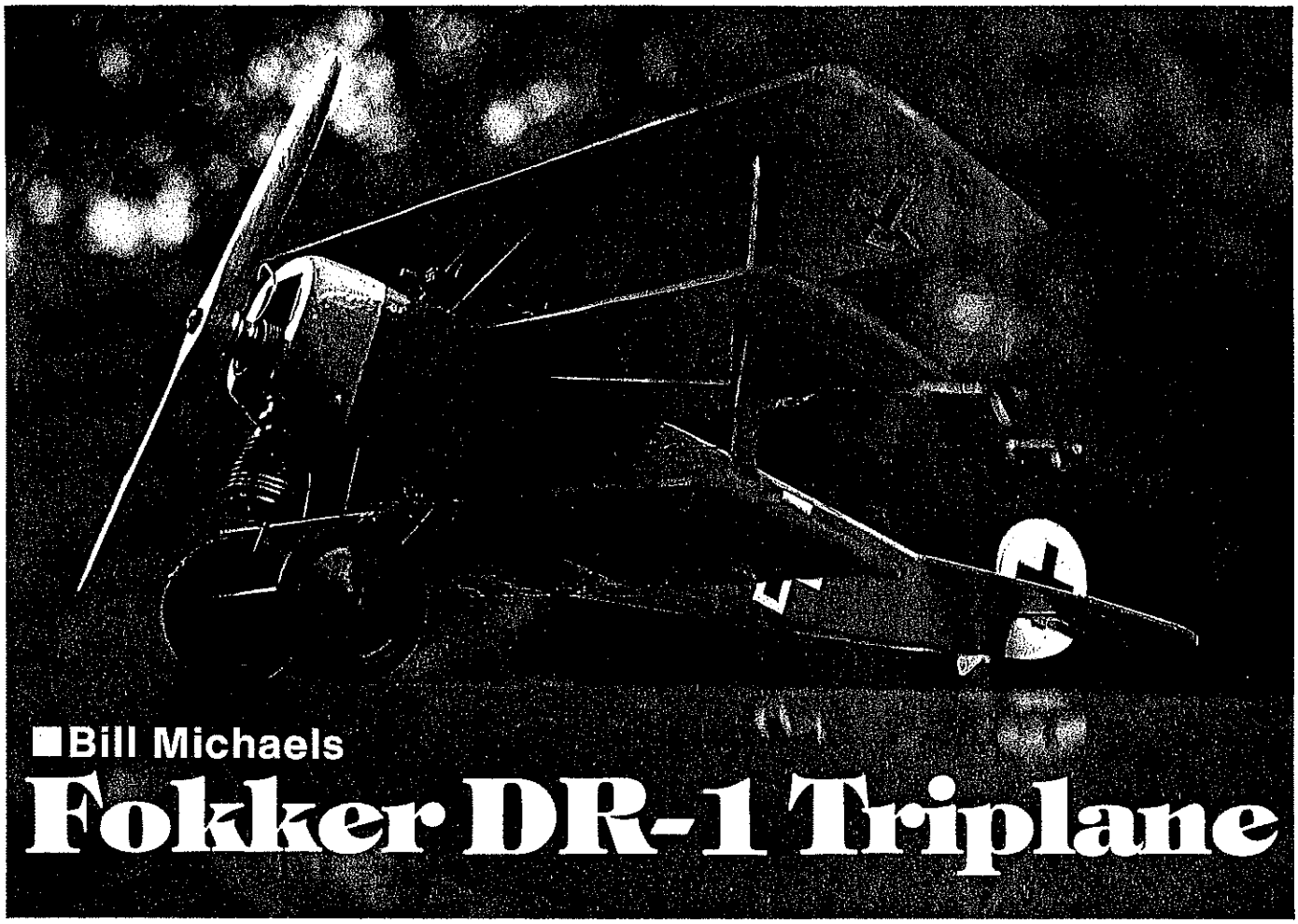
#548



■Bill Michaels

Fokker DR-1 Triplane

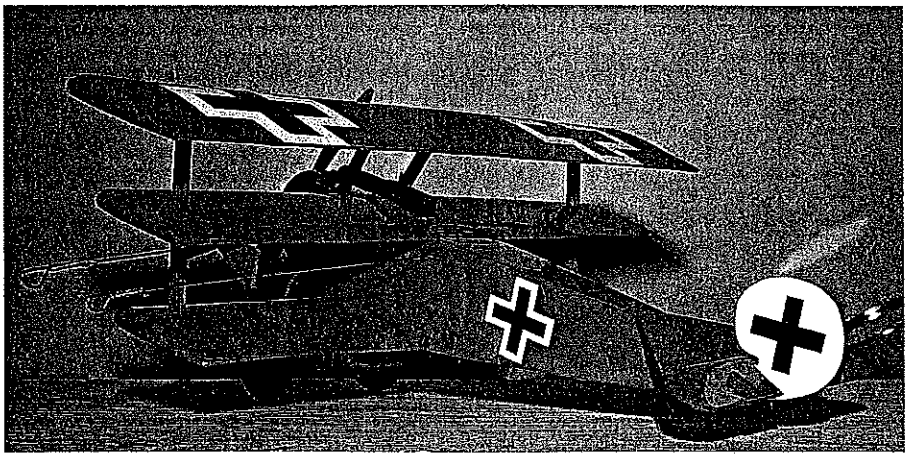
For its size and simplicity, this semiscale ½A Control Line model has lots of eye appeal. It's certainly different from most of the other models you will find at the flying circle.

OF ALL THE fighter planes of World War One, the German Fokker DR-1 is probably the best known. Even people with virtually no knowledge of aviation history recognize the Red Baron's airplane. The success that Baron von Richtofen and other aces enjoyed while flying the DR-1 certainly contributed to the plane's fame. Of course, its distinctive appearance no doubt helped to secure its place in aviation history as well.

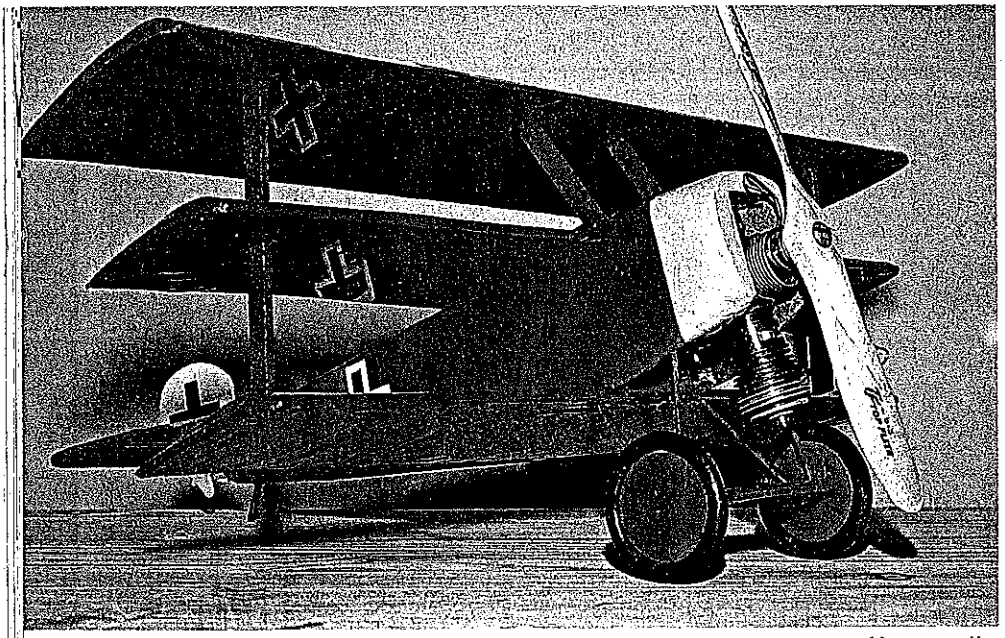
Actually the DR-1 saw front-line service for only a fairly short period of time. With rapid advances in aircraft design and power plants during WW I, planes became obsolete faster than today's computer systems. The DR-1 entered service at the end of August 1917, and was retired from combat nine months later, in May 1918.

Many think the DR-1 was the first successful triplane, but that is a misconception. The idea for a triplane came to Anthony Fokker in 1917 after he observed the maneuverability and high rate of climb of the British Sopwith Triplane. Fokker returned to his factory and had his chief engineer, Reinhold Platz, design a triplane fighter. Included in Platz's design was an armament of two machine guns, a marked improvement over the Sopwith's armament of only one gun.

The DR-1's strengths were its excellent maneuverability, high rate of climb, and powerful armament. In a dogfight, it outclassed all Allied planes except for the Sopwith Camel. Its weaknesses included a low maximum speed and poor performance at high altitudes. The fault was that of the low-power Oberusel rotary engine, the only suitable power plant available to Fokker at the time.



The model is compact with only 12 in. wingspan and nearly all-sheet construction. Short tail moment is offset by fairly small elevators, so the model is fairly easy to fly. The lead-out guide is made from 1/16 ply, and lead-outs run under the middle wing to keep construction simple. Machine gun is made from scrap balsa. Cockpit opening is a black oval of Trim MonoKote. Easy-to-make markings, vintage wheels, and wood prop all add character.

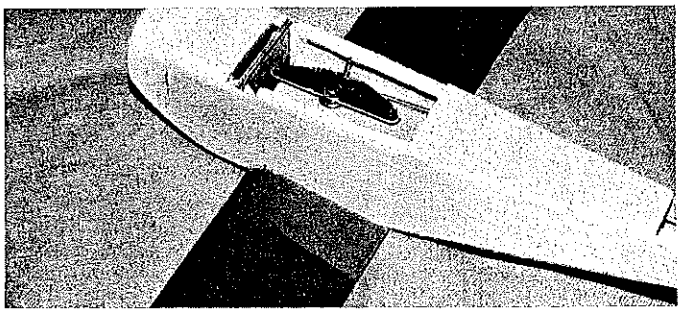


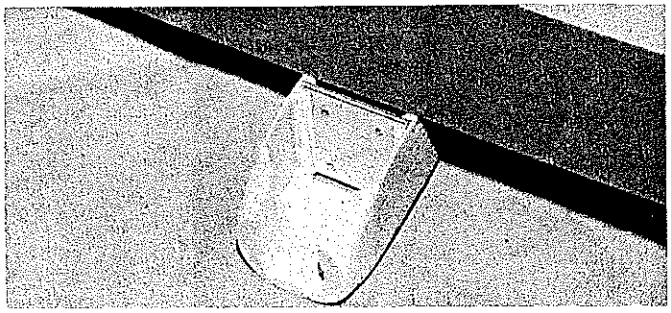
Cox .049 Black Widow engine is mounted inverted for better appearance and because the top wing is rather far forward. Wood prop is only for display; flies with a 5-in. plastic prop.

This model is a semi-Sport, stand-way-off Scale design, which looks better than a profile model but is still easy to build. Covered in bright red MonoKote and with simple-to-make markings, the model is really an eye-catcher.

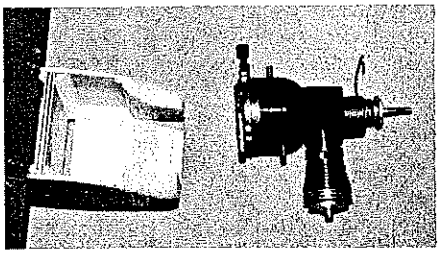
Construction. Use cyranoacrylate (CyA) everywhere except for the firewall and landing gear, which are glued in with epoxy. Cut out all parts first and test-fit before beginning construction. Any plastic iron-on covering, such as MonoKote, can be used.

Begin by building the wings first. The bottom and middle wing use the same rib pattern and are the same, except that the middle wing is longer. The procedure is the same for all three wings. Start by cutting out the top sheeting from 1/32 balsa. Make it about 3/16 in. wider than the cord dimension to allow for the longer path caused by the curvature of the wing's upper surface. Draw lines on the inside surface where the ribs

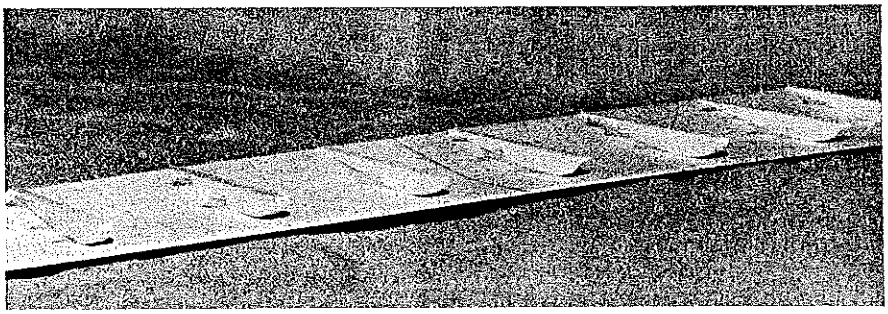




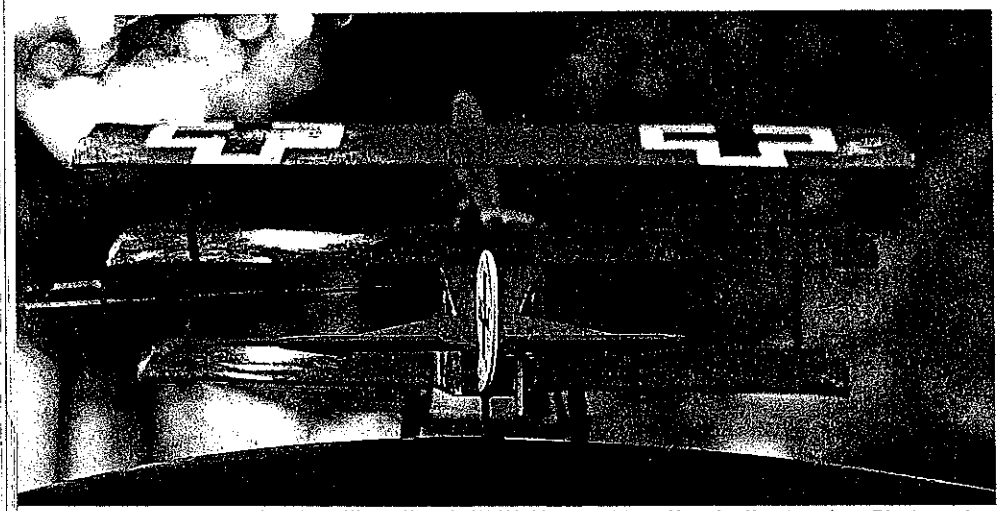
Left: Bellcrank is mounted on a 1/16 ply floor just aft of the firewall. Lead-outs are attached before the middle wing is glued in place. Note that the middle wing leading edge is forward of the firewall. Right: Cowl is made from three layers of 1/4-in. balsa glued in place and then sanded to shape. Square opening is needed for access to the engine mounting screws. Tri-stock balsa braces the engine compartment.



Modified Cox Black Widow .049 ready for installation. It is held in place with screws (treat holes with a drop of Hot Stuff to prevent stripping out the threads). Fuel-proof inside the engine compartment thoroughly.



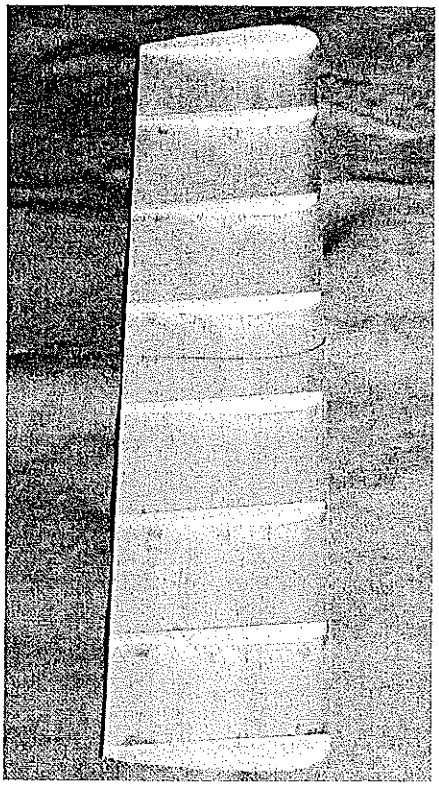
First, the rear two-thirds of the wing ribs are glued in place on the 1/32 balsa sheeting with Hot Stuff. Then the sheeting is bent over the more-curved forward part of the ribs and glued.



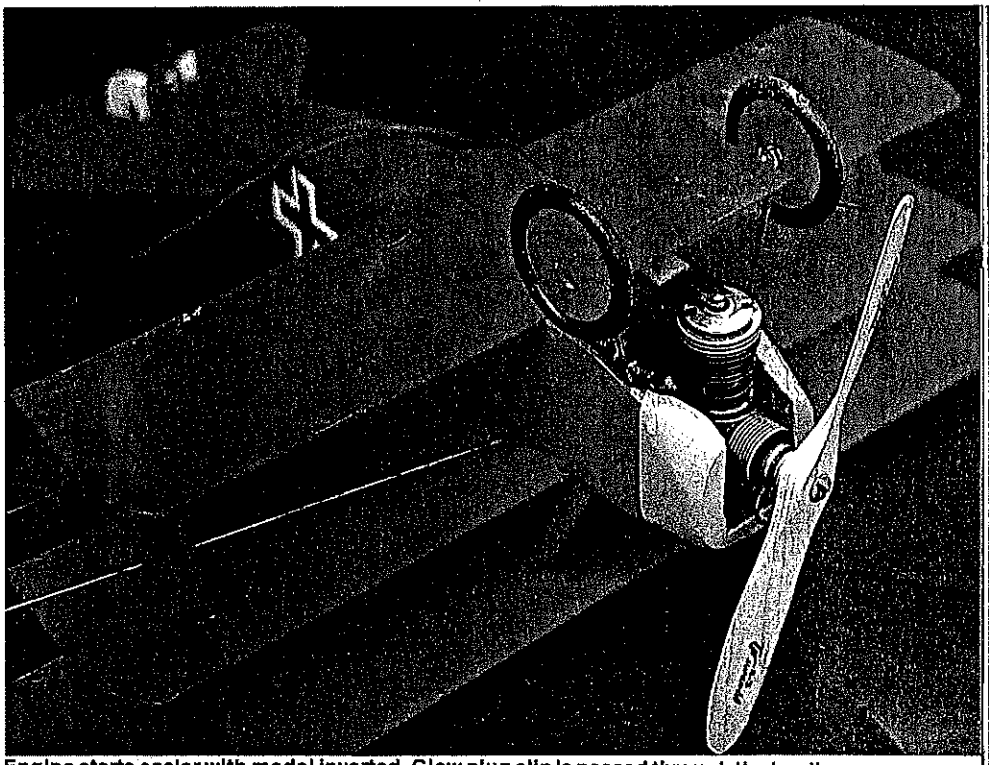
The preferred view for Allied pilots in WW I. Note rudder offset for line tension. Photo makes the top wing appear closer to the middle one than it really is. They are almost equidistant.

will be glued. Glue the rear half of each rib to the sheet, making sure the end of the ribs are even with the trailing edge of the sheeting.

When all the ribs are in place, the top sheeting is bent around the sharper curve of the front half of the ribs. After building my wing the hard way, I discovered an easier method. First, moisten the first 1 in. of the leading edge of the sheeting on the outside of the curve. Bend the sheet so it is about halfway to where you want it to end up and apply CyA to hold what you've done so far. Repeat the procedure for the back half of the sheeting. An easy way to bend the sheet equally across the span is to start with the wing laying upside down, flat on the workbench. You then lift the trailing edge, keeping the leading edge on the workbench moving with a rocking-chair motion.



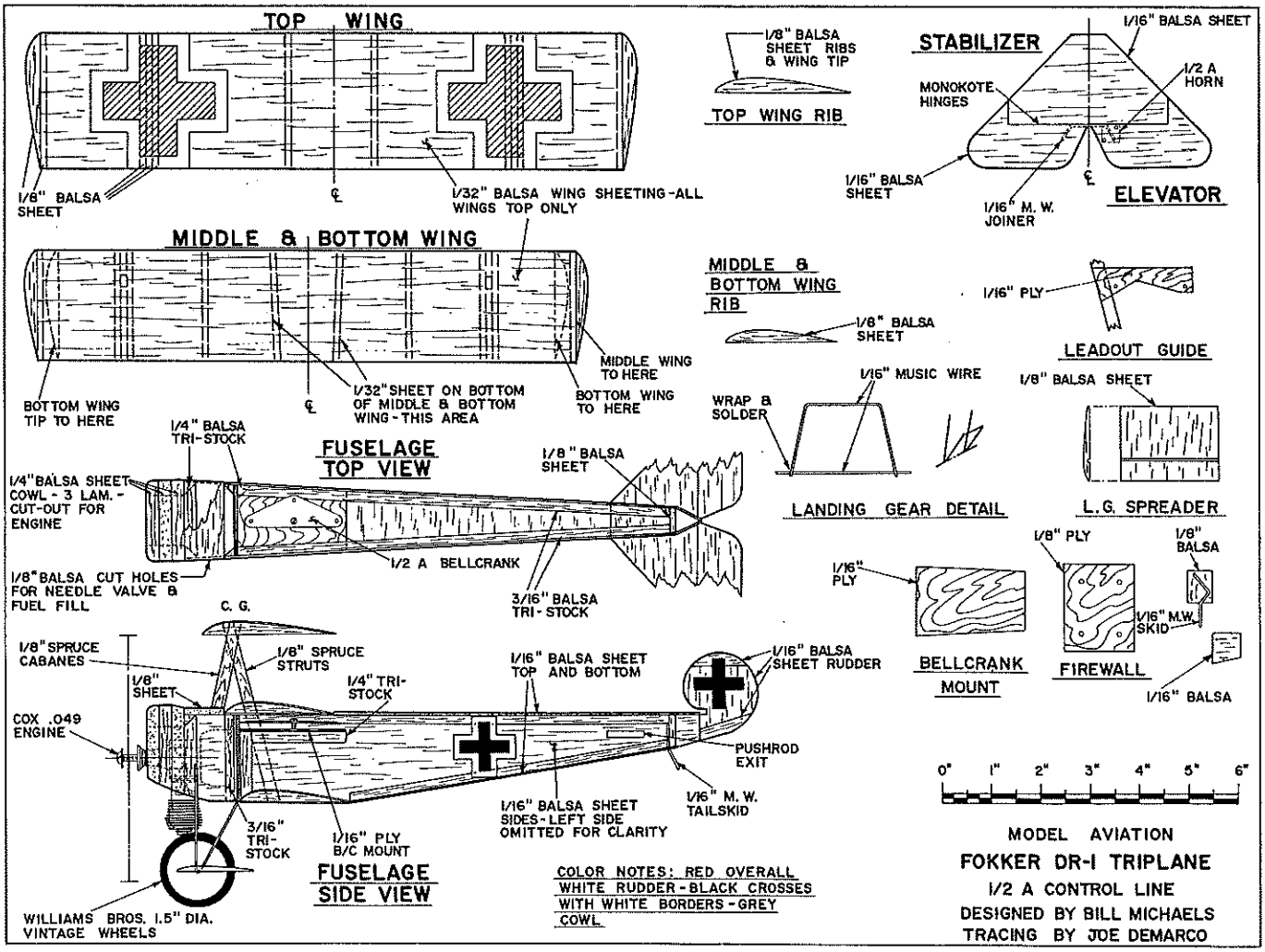
A completed wing ready to be covered. Wing tips are just extra ribs glued in place and sanded to shape. Covering the three wings with MonoKote will produce sturdy units (heat the MonoKote evenly to avoid warps).



Engine starts easier with model inverted. Glow plug clip is passed through the landing gear to keep it (and fingers) clear of prop. Start engine, flip upright, and fine-tune needle valve.

When the sheeting is glued to the ribs the wing will have its airfoil shape. The wing tips are made by attaching a rib and sanding it to match the airfoil. Cut holes in the sheeting of the middle and bottom wings for the wing struts. Sand 1/32 off the bottom of the two center ribs and attach the bottom sheeting so it is flush with the bottom of the wing.

Continued on page 168



Full-Size Plans Available . . . See Page 172

Glue the leading and trailing edge strips with thinly-spread epoxy. Hold the strips in place with tape while the epoxy sets.

Sand the leading and trailing edges to the correct shape. There must be a smooth transition from the foam core to the trailing edge, as the balsa skin will overlap it. To aid in sanding the balsa without sanding the foam, tape a piece of lightweight cardboard (such as a notebook divider) over the foam with it butted against the balsa, then block-sand as in Photo 12. Probably you will have to replace the cardboard several times before you are finished. When the balsa is smooth and even with the cardboard, remove the cardboard and carefully sand until the balsa is smooth with the foam.

If the balsa skin is to overlap the leading edge, then the balsa leading edge should be sanded in a similar fashion. An alternate method is to glue on and sand the leading edge balsa after the balsa skin has been glued on.

Preparatory to skinning the wing, block-sand the foam core lightly. You only want to smooth any ridges. Don't go overboard, as the foam is thin and fragile. Vacuum the sanded foam core with care.

The skin will be 1/16 sheet contest balsa. Edge-glue enough sheets together to get the width necessary to cover one side.

Mix enough 45-min. epoxy to cover two skins. Apply the epoxy to the skin, then use a playing card to spread it and remove any excess. When it is just right, the balsa skin will only be damp with epoxy. Lightly coat the trailing edge, leading edge overlap, and plywood spar edge; excess epoxy will only add weight and not provide strength.

The skins are applied with the cavity cores in place for added rigidity. Starting at the leading edge, roll the skin over the core (you would do the same if using contact cement instead of epoxy). Do the same for the skin on the other side. Place this subassembly back into the outer core saddles. When sandwiched together, add weights to the top of the outer core saddles to compress everything while the epoxy is curing.

Make the bellcrank assembly with the lead-outs. Bush the lead-outs with 1/16 brass tubing through the bellcrank. Slip the lead-out through a 1½-in. length of tubing. Slide the tubing through the bellcrank, and bend the tubing in a smooth radius. Make lead-out cable connections as per the AMA rule book (see Photo 13).

Assemble the bellcrank. The pushrod must be secured to the bellcrank in a way to not interfere with movement. Notch the inboard wing for the bellcrank support and pushrod exit. The pushrod should be installed without any bends between the flap horn and bellcrank; this might require a larger exit notch than normal. Epoxy the bellcrank assembly in the inboard wing. Make sure the operation is smooth before going any further.

Both wing halves are now ready to epoxy together while in the outer core saddles to provide support and alignment. At both inboard edges, trim away the excess balsa skin. The foam cores should be square and not sanded. Remove the cavity cores.

Lightly coat the foam cores and balsa skin inboard edges with 45-min. epoxy. Position these two edges together in the core saddles. The trailing edges must be straight and in alignment (Photo 14). Allow the epoxy to set.

Cut two 1/8 x 1 x 1-in. plywood bellcrank supports. Drill through their centers, and epoxy them to the wing skin. This will give the bellcrank area enough strength for those 40-lb. pull tests.

The wing butt joint must be reinforced with 1½-in. strips of fiberglass. Lay down the fiberglass, and brush epoxy through it. Remove excess epoxy with a playing card to keep weight down.

The wing in the condition as described should now be weighed. To be used for a competitive Precision Aerobatics aircraft, it should not be more than 8 oz. If the wing is too heavy, think of uses other than competitions. The most likely reason for a too-heavy wing is use of 1/16 balsa other than the lightweight contest variety.

Building a foam-core wing for CL Precision Aerobatics is not beyond the capabilities of the average modeler. The completed wing will use about $10 worth of materials and take about 10 manhours of time. Making the templates takes about half the time, so making additional wings of the same design can be done in about five hours.

A foam-core wing, in general, is easier, faster, and always straighter than a built-up wing. (Installing wing tips and flaps is not part of this article.)

My thanks to Bob Vogel, good friend and photographic hobbyist, for the pictures with this article.

Fokker/Michaels

Continued from page 83

Each wing is covered in the same manner. Use one piece of MonoKote, starting by attaching it to the top of the trailing edge and wrapping it around the rear of the wing, across the bottom, and attaching it to the leading edge. The material is then attached to the top surface. If you are handy with MonoKote, you can cover the wing tips along with the rest of the wing. If you prefer, cover the tips first, then do the rest of the wing in one piece. Glue three pennies, for tip weight, into the right tip of the bottom wing.

The tail surfaces are made of 1/16-in. sheet balsa and are easy to assemble. The rudder is made from three pieces of wood with the grain running in the directions shown on the plans. Building the rudder this way makes it stronger than if it were made from one piece. The elevators are joined with a piece of 1/16-in. music wire, and are attached to the stab with a strip of MonoKote ironed across the top of the gap to serve as a hinge. Be sure the gap between the two pieces is wide enough to allow the elevator to deflect downwards as well as upwards.

Fuselage. Drill small holes in the firewall where the engine mounting screws go. Prepare the 1/16-in. balsa fuselage sides by gluing the 3/16-in. tri stock along the rear edges of the fuselage. (Make sure to build a left and a right side.) Glue the 1/4-in. tri bellcrank mount supports and rear firewall braces in place. Glue the firewall, bellcrank mount, and rear 1/8-in. balsa bulkhead to the fuselage sides. Make sure that everything is square at this point, or you'll end up with a warped fuselage. When dry, add the 3/16-in. tri braces to the front of the firewall.

Bend the tail skid from 1/16-in. music wire and epoxy it to the front side of the rear bulkhead. Plank the fuselage bottom aft of the wing with 1/16-in. balsa with the grain going across the fuselage. Bend the pushrod to shape and install it and the bellcrank. Glue the stab in position and check to make sure there is no binding or slop anywhere in the control system. If all is well, plank the top of the fuselage aft of the wing. (The lead-outs are installed before the middle wing is glued on.) Attach the two 1/16-in. pieces that make up the rear of the fuselage under the stab.

Now is a good time to modify the engine you will be using. The engine needs to have the cylinder turned 180°, so that it points downward. Do this by removing the four screws on the back of the fuel tank; rotate the tank 180° and replace the screws.

The cowl is made from three pieces of 1/4-in. balsa sandwiched together and then cut out to clear the engine. I chose the Cox .049 Black Widow for my model, and the cowl is designed to clear the prop and spring starter. If you are using a shorter engine such as the Babe Bee .049, shorten the cowl by leaving off the outermost piece of 1/4-in. balsa.

Glue the 1/4-in. triangular cowl supports along the front of the fuselage sides. Glue the 1/8-in. balsa fuselage top in place on the front of the fuselage. When dry, sand the

corners round, smoothing it into the fuselage, and cut away the material to make enough room for the engine and a screwdriver to tighten the screws. Cut holes in the fuselage top for the needle valve and fuel filler.

Cover the fuselage with MonoKote, and paint the inside of the engine compartment with fuel-proof dope. Attach the lead-outs to the bellcrank, and glue the bottom and middle wings in place. Make sure that they are parallel to each other. (Be sure to cut away the covering to provide a good wood-to-wood joint.)

Install the spruce wing struts and the lead-out guide. Cut holes in the bottom of the top wing for the struts and the cabanes. Glue the top wing to the wing struts, making sure it is parallel to the middle wing. When the wing is set, add the cabane struts.

Bend the 1/16-in. music wire to the shape shown on the plans. Put the wheels on the axle and bend the ends so they won't fall off. Attach the axle to the landing gear by setting it in place and wrapping the joint with fine wire. You can reinforce the wire joint by soldering, but I didn't find it necessary on my model.

Glue the landing gear to the model. The rear crossbar is epoxied to the bottom of the firewall, and the front legs are epoxied to the ¼-in. triangular cowl supports inside the engine compartment. Attach the axle wing to the axle with epoxy. (A dab of epoxy between the axle wing and the fine-wire landing gear leg/axle joint will keep the axle wing from rotating.)

Finishing. By now there isn't much left to do. Glue the rudder in place with a ¼-in. offset to the right. Make the markings from black and white (trim or regular) MonoKote. I added a single machine gun made from scrap balsa, but left off the second one so I could reach the needle valve. Install the engine, adding one washer to offset it to the outside of the circle. Finally, check the balance point.

Flying. Fly the model on 30- to 35-ft. lines. I found it easier to start the engine with the plane inverted and then flip it over to fine-tune the needle valve. Remember to keep fingers away from the prop. Pass the wires from the starting battery through the landing gear so they are less likely to get caught in the prop. Adjust the needle valve from behind the top wing, not in front of it.

The DR-1 will leap into the air after a short takeoff run. It flies well, and is fairly maneuverable, but is not a good glider—so be ready when the engine quits.

TR 260 Berliner

Continued from page 94

lybdenum steel in the U.S.), covered with unidirectional fiberglass. The wings are built up from hemlock pine and covered with 2½mm, 45° mahogany plywood. The ribs are spaced 12 in. apart. The airfoil is a modified NACA 21000 series, with the