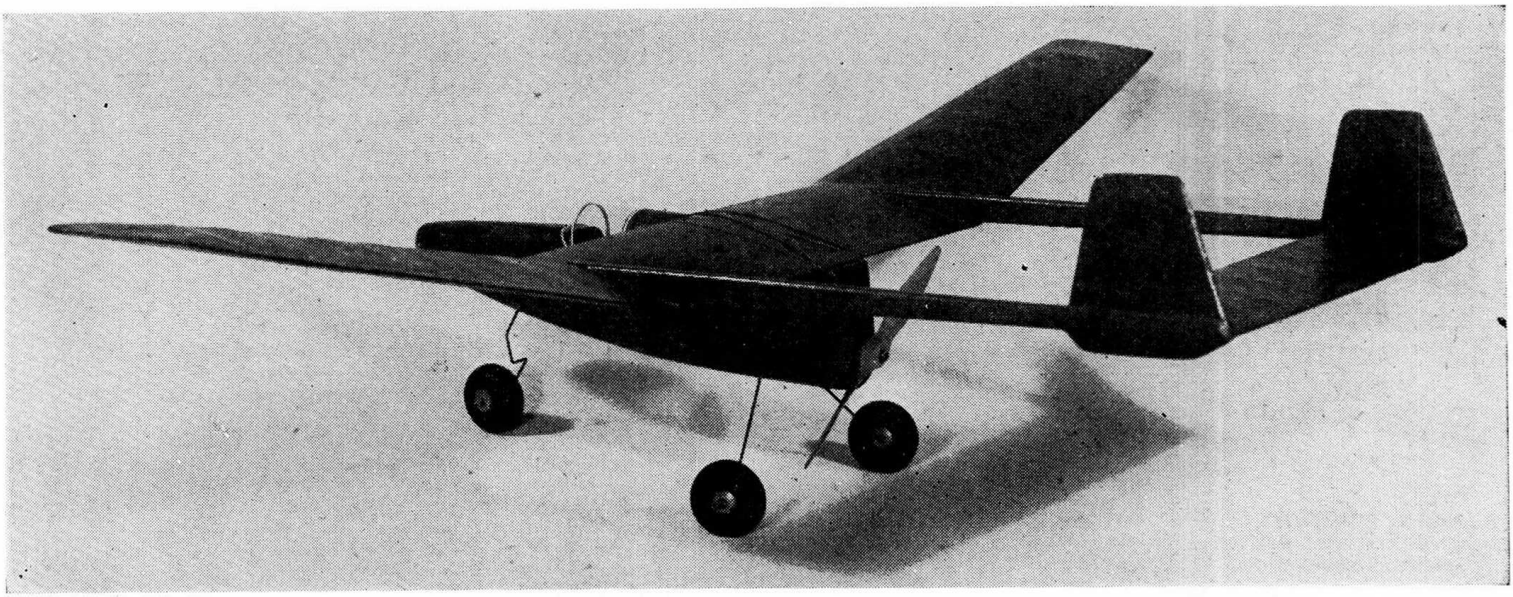
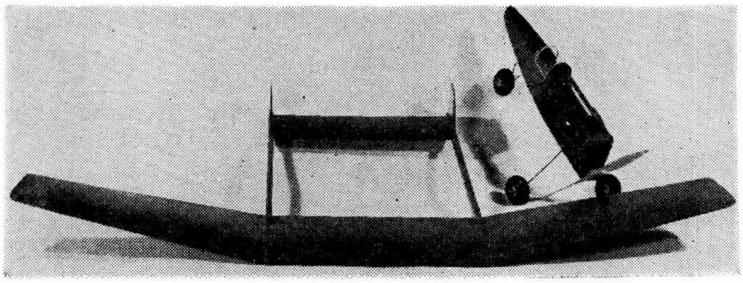


Motor and propeller are well out of harm's way in this design!

PUSH ROD



Fuselage is turned backward relative to wings in above view

by PAUL PALANEK

Push Rod was primarily designed as a sport and all-around flying model, with no intent on contest fame, unless the Clark Y airfoil the model now carries is replaced with an airfoil of more suitable contest qualities. The basic design has been used by the author for a number of years, but construction of *Push Rod* was abruptly curtailed at the request of the government. Upon returning to civilian life, what had been built of the model was found in a heap of balsa and dust. Starting from scratch was more than necessary.

Push Rod sports ample wing area (400 sq. in. of it), with a span of 55". She may be powered with engines of .19 to .29 cu. in. displacement; the model shown in the photos sports an *O.K. Bantam*. The pusher design is easy on props, while the wide spacing of booms allows ample elbow room for starting the engine. The tricycle gear saves wear and tear on the booms as well as on props and adds a measure of class to the model. The ship has an unusually flat glide and is really an eye-catcher on the flying field. But enough about *Push Rod* history—let's buckle down to building her.

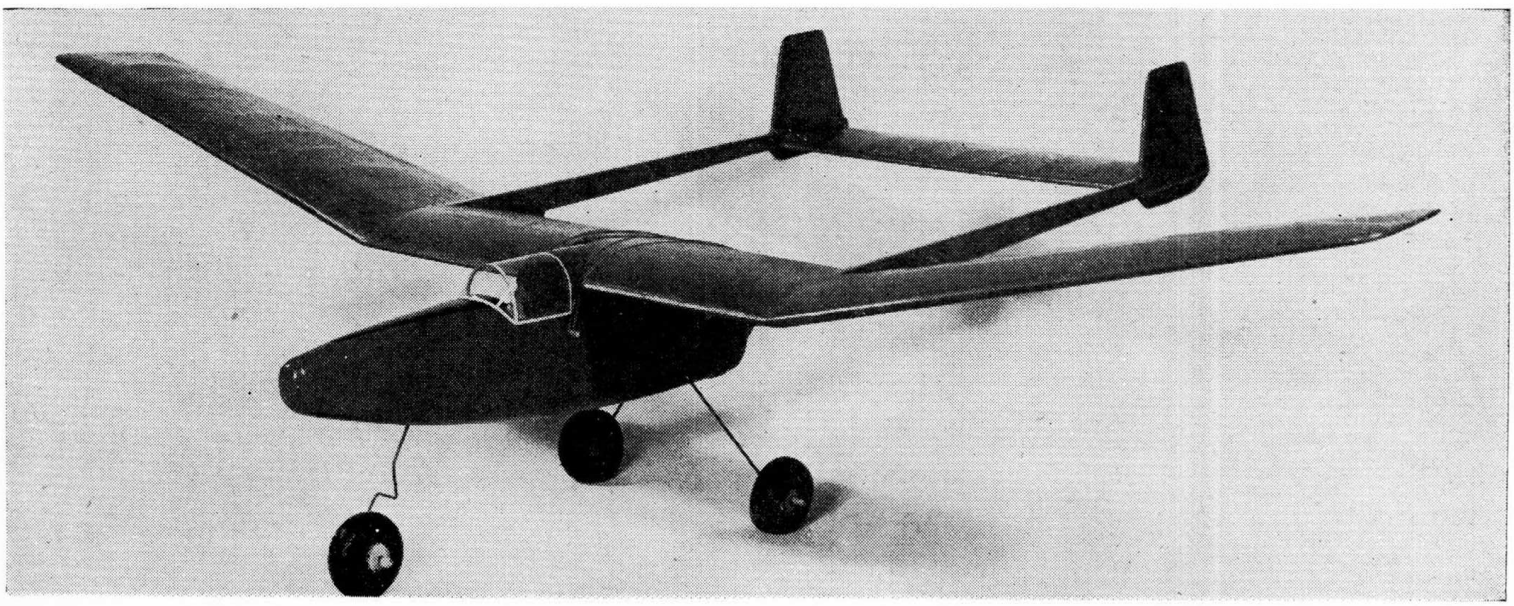
Each modeler has his own system of starting construction, but the author strongly suggests following the procedure outlined here. Study the plans carefully, paying particular attention to the landing gear installation and the method employed in fastening booms to wing center section. The entire ship is built of medium-hard quality balsa.

Completely familiarize yourself with the drawing, and after having enlarged the necessary portions to full size, start construction of the booms. The sides are 1/8" sheet balsa, with 1/4" sq. spacers tapered to 3/32" at the tail end. Cement well to form a box-type section. The booms should be left longer than needed, and trimmed prior to assembly. The 1/4" boom spacers start 4" from the tail end to allow a 3/32" opening for the rudders.

The rudders are made in two sections, butt cemented, of 3/32" x 2" sheet balsa cut to a height shown on the drawing; when completely dried, trim to the shape shown and cement in place, taking care to assure vertical alignment. While the boom and rudder assembly is left to dry, let us turn to the wing.

The wing spar is made next. Assemble the spars with 3/16" sq. stock on a flat surface, cutting one strip for the upper spar and one for the lower; butt cement the outer panel spars to the center section, building in the proper dihedral angle. Cut four reinforcement plates from 1/8" sheet and cement over the butt joints in the spar. Leave the outer panel spars dangling.

While this assembly is drying, cut the eleven center section ribs of 1/16" sheet; the taper panels have eight each, also cut



***Push Rod* is designed as a sport model with which you can have a lot of fun**

Push Rod

from 1/16" sheet. With the spar dried and properly sanded, cement the center section ribs in place. The ribs are inserted horizontally then twisted to the vertical position between the upper and lower as well as the rear spars. Cement in place the leading edge of 1/4" sq. balsa, and the trailing edge of 3/16" x 1/2". When completely dry, remove from plans and proceed with outer panels as you did with the center section. Secure the spars to the drawing, propping up the center section to relieve strain on spar butt joints, then cement ribs in place. The wingtips are made of 1/4" sheet, cut as shown and cemented in place.

With the wing drying, we turn once again to the now well-dried booms and rudder assembly. Sand both rudders to airfoil sections, finish with fine sandpaper and give two coats of clear dope. Starting from where they leave the trailing edge of the wing, rough sand the booms to shape; final sanding will be done after the wing center section is sheet covered. Our next step is to assemble the booms to the wing. Secure center section to work bench, notch trailing edge and booms as shown, then cement both between ribs W-1 and W-1, spacing the tail 2" high as measured from the flat lower camber of the wing.

With this assembly drying, you can start on the lifting stabilizer which carries a narrow Clark Y airfoil. Seven ribs are cut from 1/16" sheet; the two outer ribs are 1/8". Insert the 1/8" sq. spar, space the ribs as shown and cement to the notched trailing edge of 1/8" x 1/2" strip stock. The leading edge is cut from 1/4" sq. material. When dried, remove from plans, sand well, and cover with *Silkspan*. Spray the covering with water; when dry, apply two coats of clear dope.

While the wing and boom assembly is still secured to the bench, cement the finished stabilizer between the booms with a

zero incidence setting. This operation is of importance and should be executed with extreme caution. With the wing still fast to the bench, sheet cover the areas shown, using 1/16" stock. When completely dried, sheet the underside. Add 1/32" x 1/8" cap strips, then sand wing and boom. At this point we add the fuselage-to-wing fairing which is cut from a block of balsa measuring 1" x 2-1/4" x 3". Cover wing with *Silkspan* and apply two coats of clear dope, booms included.

The last and final step in construction is the fuselage. You will note on the drawing that the author shows a *Bantam* mounting a plastic fuel tank. If a Methanol base fuel is used, the plastic fuel tank must be replaced with a metal one. Now for the fuselage. Select two pieces of 1/4" x 3" sheet of uniform bending qualities; these will form the fuselage crutch. Cut to shape shown and cement the motor mounts of 3/8" sq. hardwood along the lower rear portion of the crutch. Apply two to three coats of cement and allow ample drying time. The firewall is cut from 1/8" plywood, as shown in drawing cross section. The landing gear is bent from 1/16" wire and held to the firewall with heavy thread and cement. Cement the firewall and gear assembly in place, then attach the two center spacers of 3/16" x 1/2". This will give you the basic box shape of the fuselage. At this point, install the 1/8" sheet nose former as shown in top and side views. The nose wheel gear is bent of 1/16" wire and fastened to a piece of plywood measuring 1-9/16" x 2-1/8". Do not cement this assembly in place yet, and bend only the mounting end *not* the wheel end.

Select the three large fuselage blocks of even grain and proceed as follows: the lower rear block measuring 1-1/4" x 2-1/4" x 9" is fitted first. Notch this block so it will nest between the gear, and allow it to overhang the rear of the fuselage a small amount. Tack lightly in place with cement. The lower forward block measures 1-1/2" x 2-1/4" x 10" and is tacked in place with cement in the same manner as the rear block. The upper deck block measures 3/4" x 2-1/4" x 6-1/2"; cement this one lightly in place also. Now proceed with the carving and sanding, referring to the cross section shown on the drawing. Use rough sandpaper for the heavy work, then finish up with 00 sandpaper. When this operation is completed, apply two coats of clear dope, sanding after each coat. Now remove the three blocks and gouge out to a 1/4" wall thickness throughout. Cement the lower rear block in place first; next install the nose wheel assembly and apply several heavy coats of cement, as strength is a must with this installation. The nose wheel receives heavy landing shocks and must be built to last. When dried, cement two reinforcing braces of 1/4" sq. on fuselage as shown in the side view of drawing. With the nose wheel gear still straight, drill a 1/8" hole in the lower portion of the hollowed block where the gear comes through, cement this block to fuselage (don't spare the cement). Secure the top block and allow the assembly to dry.

Cut out formers A and B from 1/8" sheet and 3/16" sheet respectively, and cement in place. Cut the canopy former of 1/8" diameter reed and mount as shown, forcing the ends of the reed into the fuselage sides. Finish bending the nose wheel gear as shown in drawing. Cement nose block in place but do not hollow it.

The two air scoops are carved from blocks measuring 1" x 2-1/4" x 3". Before these scoops are cemented in place, cut out the air inlet holes in the fuselage just to the rear of the firewall. To complete the fuselage, drill a 1/4" hole through the sides and insert a 1/4" dowel for wing rubber.

The cowl is carved from a 3/4" x 2-1/4" x 4-1/2" balsa block, hollowed out, and is held in place with two dress snaps cemented securely. A final sanding is given the entire fuselage, followed by two coats of clear dope; this applies to cowl as well. The windshield and canopy enclosure is formed from .015 celluloid. Mark the cutouts for the exhaust and fuel-filling holes; when you have checked to be sure of your markings, cut the holes out. With this completed, *Push Rod* is ready for its final finishing.

The model is now ready to be doped to the colors desired by the model builder. The plane illustrated is doped blue with red booms and rudders, with a red stripe down the fuselage. The top portion forward of the windshield is painted anti-glare black for scale effect.

Eight feet of 1/8" flat rubber hold the wing in place, and a 10" diameter, 10" pitch *Supr-Scru* pusher prop propels the model. The ship alights on three 2-1/2" diameter *Trexler* balloon wheels. After a few glides with, and without power, the modeler should start in to thoroughly familiarize himself with *Push Rod* before taking hasty steps, which invariably result in a heap of scrap balsa. Good flying fellows!!!