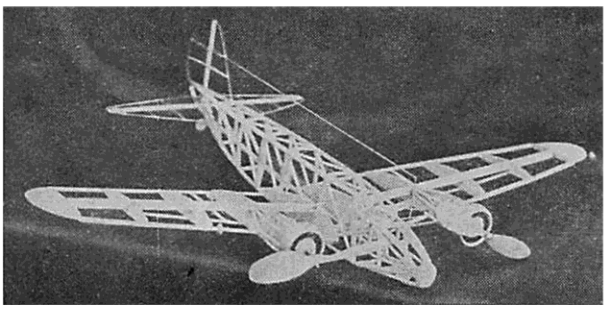
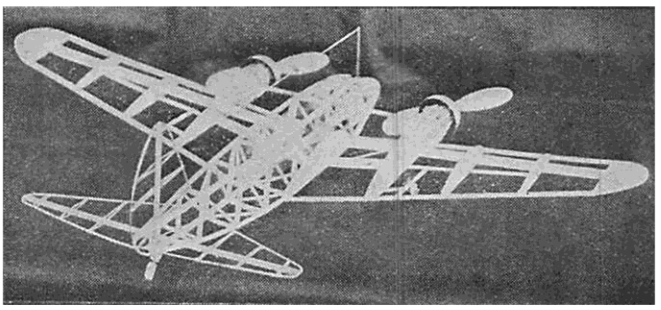


The completed framework ready for the covering



The connecting rod propeller drive may be seen at the front

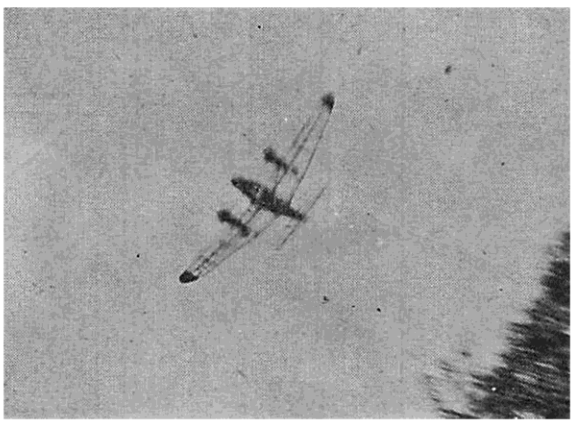
# How You Can Build a Flying Scale Boeing—247

## A Unique Propeller Drive Makes This Modern Transport Model a Fine Flier and Interesting to Build

By WM. H. DURAND

YOU will find that Boeing's new, high speed twin motor transport, technically known as the 247, makes an unusually interesting model to build. This fast, modern ship with its three-mile-a-minute top speed and its low landing speed of 59 miles per hour is making history on America's air lines and is proving the superior speed, reliability and economy of the medium size transport plane.

The problem of applying power to the two outboard propellers in a flying model of the twin motor variety is solved in a unique manner in this design which uses no unsightly motor sticks, expensive air or gas engines, nor the inefficient pulley transmission. The Boeing 247 model to be described here uses the crankshaft and connecting rod type of transmission which is very simple and cannot possibly slip. This transmission system is shown in detail on drawing number 5 which accompanies this article. Besides being easy to construct, the new system makes winding and launching easy and does not spoil the appearance of the model since the moving connecting rod is a mere blur when the plane is in flight. There is very little vibration, only a slight buzz being audible when the transmission is in operation.



The model banking in full flight

The model is very true to scale except that tail surface areas and dihedral have been increased in order to insure good flying qualities. Although this is not an extremely difficult model to build, it is not recommended for beginners.

### Fuselage

It is convenient to begin the model by constructing the fuselage. Refer to drawings 1 and 2. Lay out the two fuselage sides *flat* in the usual manner, but disregard all diagonal braces except the heavier members that may be placed at a slant. Notice that the longerons are 1/8" square balsa while most of the uprights are 3/32" square balsa. It is a very easy matter to form the curved longeron in the nose of the fuselage; just press small dents into the balsa on the inner side of the curve with your thumb-nail. Space these dents about 1/16 of an inch apart. This makes the wood very pliable, and it may easily be bent into the desired curve. This method is much quicker and easier than soaking or heating the balsa. After the entire fuselage has been assembled, these bent parts should be doped in order to restore their original strength.

When both sides of the fuselage have been completed, lift them off the board on which you are working and proceed to give each of the uprights a curve similar to that shown in the cross section view in drawing No. 1. Use the same method as was used in forming the curve on the fuselage nose longeron; that is, by forming the wood between the fingers with the aid of your thumb-nail. This gives the fuselage sides a rounded effect like that produced by cementing small bulkheads to the sides of a rectangular fuselage, only the new method is much less tedious as well as lighter. Just a word of caution—don't give both sides the same curve; make one right side and one left side.

Your next job is to join the sides with the top and bottom cross braces which are formed into a slight curve before cementing in place. You will notice on the plan that the upper cross members are shorter than the lower ones.

Now you are ready to line up the structure and secure it by the addition of the 1/16" square diagonals shown in the plan. At this stage you may also place the 1/16" square stringers around the nose. Bulkhead "A" is not

*(Continued on page 38)*

## How You Can Build a Flying Scale Boeing-247

*(Continued from page 27)*

notched as the stringers run over it instead of through the customary notches. Sand the longerons down to a quarter round section, then add the pilots' cabin and nose block.

### Wings

As usual, the first job here is to cut out the ribs. These are made from 1/16" sheet balsa. It is advisable to sand a *slight* lower camber into the left wing ribs to assist in overcoming propeller torque. Cement the ribs in position on the upper wing spars, allowing for dihedral in the root ribs. Next install the nacelle base (see Fig. 3 & 4) and the leading and trailing edges, as well as the sheet balsa wing tips. Cement the wings in position on the fuselage as indicated in drawings 1 and 2 and join the two halves of the wing and the fuselage by means of the ¼" x ⅛" lower root spar. Place the remaining miscellaneous braces as shown in the plans.

### Nacelles

First cut out bulkheads B, C, D, E and the dummy motor, G, all of which are made from 1/16" sheet balsa. These are shown in Fig. 4. Mount bulkheads B and C on the nacelle base and proceed to finish the dummy motor by wrapping thread around each cylinder to represent cooling fins; then cement in place the small bamboo push rods which, besides adding to the appearance of the model, keep the cylinders from breaking off with the grain of the wood. Assemble dummy motor and nose block as shown in the plan. The steel thrust bearing is next cemented to the nacelle base in the position indicated in the drawings. It may be necessary to flatten out a standard type thrust bearing and bend it to the desired shape. Cement a ¼" washer to the nacelle nose block and install the crankshaft. With this done you are ready to assemble the remaining bulkheads and place the stringers around them. Remember that there is an uncovered gap in each nacelle through which the connecting rod runs.

### Landing Gear

After careful consideration it was decided that a permanently retracted landing gear would be practical and very appropriate for the Boeing twin motor transport model since this is one of the most distinguished features of the real plane.

If you are still steadfast in your belief that the model needs the conventional landing gear, you may gather sufficient information from photographs of the real ship to enable you to construct this type.

### Tail Surfaces

These are built up of 3/32" square balsa spars with thin bamboo ribs and outlines. This type of construction was decided upon because it was found to be light and exceedingly warp proof. Cover the tail structures before assembling them on the fuselage. Don't cement them in place too securely at first as they may have to be cut loose and their setting changed during test flights.

### Transmission Installation

The success of your model depends largely upon the care with which this part of the work is done. Follow instructions and plans carefully. Construct the center bearing, P, of ¼ x ⅛ hard balsa, punching or drilling a hole through its center and cementing ¼" copper washer to each side to be used as bearings for the motor shaft. If you so desire, you may insert and cement a 1/16" brass eyelet or bushing in the washer hole as this makes a much smoother running unit.

To make the connecting rod, use the material specified and cut it so that it is at least ¼" longer than the distance between the two propeller shafts. Then with the cranks on both prop shafts at absolute lower dead center, slip a 1/16" brass eyelet or bushing on each crank pin. Put a small drop of cement on the top of each of the two bushings. Another bushing should be cemented to the under-side of the connecting rod at the exact center and a small drop of cement should also be placed near each end of the rod. Now slide the rod through the fuselage and into each nacelle and set it down so that it will be cemented to each of two bushings on the propeller shafts. It is important that both shafts are at absolute lower dead center during this operation! Assemble the motor crankshaft in the center bearing as shown in Fig. 5. The position of the center bearing, P, as shown in Fig. 1 is only approximately correct, the exact location being determined as follows:

With the motor shaft assembled in the center bearing, the crank pin is slipped forward into the center bushing on the connecting rod. Meanwhile, the connecting rod should be level, both prop shafts being at lower dead center. With the center motor shaft in an absolute lower dead center position, cement the bearing block, P, to the fuselage members, using filler blocks where necessary.

Wait until you are sure the cement has set. Then remove the rod with bushings *on* by bending the center forward far enough so that the center bushing can slip off the front of the center crank pin. It is then an easy matter to disconnect the rod from the outer shafts. Remove the rod and give each bushing a generous coating of cement, binding it with silk thread if necessary. When you are satisfied that the bushings are cemented to the connecting rod permanently, snap the rod into posision again and give the system a few turns with the hand to be sure that none of the moving parts bind or otherwise fail to work properly. Realign if necessary.

### Propeller Installation

The propellers are carved from blanks like that shown in Fig. 5. Give the blades plenty of area and slight camber. The simplified free wheeling system which works by air pressure alone without the use of springs or rubber tension is used in connection with the propellers. This is shown in detail in Fig. 4, the side view of the nacelle showing the propeller in free wheeling and the top view of the nacelle, showing the prop engaged. The person flying the model engages the props before launching. *(Continued on page 40)*

## How You Can Build A Flying Scale Boeing 247

*(Continued from page 38)*

### Finishing Touches

With the entire model assembled and the transmission operating correctly, you are ready to cover. Contrary to popular opinion the color of the real Boeing is not aluminum but gray, which is the natural color of anodically treated duralumin with no pigment finish. White or a light green are probably the closest colors you can get in the form of colored tissue. Colored dope is too heavy for the purpose. A single strip of celluloid on each side of the cabin is covered with tissue except for the open spaces left for windows. Leave small sections under the front and rear rubber hook uncovered to permit winding and replacement of rubber. Balsa, aluminum, celluloid, or paper cowlings may be used around the dummy motors. If you are using aluminum anti-drag rings, it is advisable to cement a narrow strip of ordinary paper around the motor and then cement the metal cowling to the paper. If you feel that you cannot afford a ready made cowling, you may use a two-ply paper drag ring similar to those furnished with many of the present "two bit" kits. Better yet, bend a strip of celluloid around the motor and paint it to match the fuselage. Propellers are finished in aluminum and the motors are, of course, black. Numbers may be cut from black tissue and doped down to the wing. You may refer to photographs of the large plane for further decorating. This makes a beautiful model to hang in your room and the free wheeling propellers will spin in a light breeze.

### Flight Tests

If you have followed the plans, your model should not be difficult to balance. The model when hand launched should make a long, flat glide. If it turns sharply and dives, examine the wings to see that they have sufficient dihedral. The trouble might also be in the rudder setting. If the model seems nose heavy, give the stabilizer a greater angle of negative incidence, or give it a smaller angle if the model seems tail heavy and tends to stall. When you have it gliding satisfactorily you are ready to test it with power. Have a friend hold the model and connecting rod stationary while you wind the motor from the rear by means of a winder and S hook attachment. Give it about 30 turns with a 4 to 1 winder and launch the model level.

## The Navy Admiral In Detail

*(Continued from page 36)*

Now paint the fuselage and tail at one time. Then paint the wing while it is still unassembled. Connect the ailerons to the wing and fasten the control cables to them. Now paint the struts and the outboard floats. Connect the wing, struts and floats to the hull when dry. Now place the insignia on the wings and on the other parts of the ship.

### The Propellers

Any metal can be used for the propellers, (brass, steel, etc.). To make the hub, turn a piece of metal stock to the size of the largest outside diam. Next drill a hole through the end, the entire length of the hub. Then turn out flanges, one on each end to accommodate the clamps. Polish the hub with fine emery cloth and cut it down to proper length.

The blades are next. Make a template the shape of half of the blade and turn the stock down to the shape of the template every so often, applying the template to get the correct curve of the blade. When you finish them all, cut them off to the proper length and grind or file each one to the shape of an airfoil. Polish them off smoothly and chrome-plate them. Now drill a hole through the hub to accommodate the shaft and solder the shaft to it. Now plate the hub, insert the finished blades and the prop is complete.

### The Color Scheme

Entire ship is of natural aluminum finish with red, white and blue color bars on the rudders. Stars are on the wing, one on each end. U.S.N. is painted on the hull underneath the tail.