

IN THIS SERIES.

Study plans, perspective sketches and instructions carefully and thoroughly before attempting model construction. Time and patience are required to make this exact scale model. Always bear this in mind. The following few additional tools and materials, other than those supplied, are necessary to build this airplane model: A razor blade (preferably one with a heavy rounded back); a small drawing board upon which to work and cement parts; about fifty small thin pins; a pair of pliers for bending shaft; some small pieces of sandpaper; and a piece of waxed paper 12x38 inches.

STEP 1 • REINFORCED PRINTED SHEETS
Printed balsa rib sheets are supplied. But, when stronger models are required, plain sheets of white writing paper can be pasted to backs of rib sheets. Apply library paste to paper and attach to back of each rib sheet. Paper reinforcements eliminate possibility of cracking balsa along the grain. While drying, place pasted parts between two flat surfaces and apply weights to them (some old magazines or books) to prevent warping. Do not remove paper reinforcements from various pieces after they have been cut from rib sheet.

STEP 2 • SANDPAPERING
Material: Wood Block and Sandpaper (not furnished)
For sandpapering obtain a small block of wood and fold sandpaper tightly around it. Rub sandpaper covered block with an outward motion. LIGHTLY and SQUARELY on all balsa strips. Avoid rounding edges of square longitudinal pieces.

STEP 3 • SPARS, ETC.
Material: Sanded Balsa Strips
From the sanded strips select the correct sizes as required on the plan for leading edge, spar and trailing edge. Do this before any notches are cut in ribs so that fit will be very close or tight. A good close or tight fit requires less cement. Consequently, less weight will be added to the finished model.

STEP 4 • WING—RIBS—WING TIPS
Material: Printed Balsa Rib Sheets
With a razor blade cut out illustrated ribs and wing tips from rib sheets as they are needed in the process of building the wings. This will prevent pieces from being lost. Begin assembly by working over the wings in the top view. It is advisable to place a piece of waxed paper over plan to prevent wood parts from adhering to and tearing or soiling plan when they are removed.
While working over plan hold down balsa parts with small thin pins.
The wings are assembled as one unit, namely, right and left panels. Place spars and trailing edges in position and insert ribs beginning with A, B, C, etc. After all ribs are in place, fit leading edges in position and complete wings by inserting wing tips and diagonal braces. Cement all joints carefully and when they are thoroughly dry remove wings from plan.

STEP 5 • ELEVATORS AND STABILIZER
Material: Balsa 1/4" sq. 3/32"x3/16" and Printed Rib Sheets
The tail is assembled in two units, namely, stabilizer and elevator. Sandpaper all strips as explained in Step 2, before cutting to required lengths. Use waxed paper and pine in assembly. Cut cross members and cross braces to required sizes and cut curved tips from rib sheet. First, place cross members and then front and rear edges in position. Pin down firmly. Apply small amount of cement to cross braces and curved pieces before inserting and pinning down into position. When all pieces are in their proper places, apply cement to dry thoroughly before removing from plan. A piece of soft mat is supplied. This is to be used for control hinges. Cut off hinges to required sizes and slit balsa cross members at positions indicated and insert hinges. Apply cement only to outer edges of hinges.

STEP 6 • FIN AND RUDDER
Material: Balsa 1/4" sq. 3/32"x3/16" and Printed Rib Sheets
Cut required parts from rib sheet. Assemble rudder in two units, namely, first the fin and then the rudder. Work over side view. Rudder is assembled in the same manner as stabilizer. Allow cement to dry thoroughly before removing from plan. Control hinges can now be inserted.

STEP 7 • BODY-SIDES
Material: 1/4" sq. Balsa
Cover side view of plan with waxed paper. First pin down longons. Next put in upright members. Start at front and work toward rear. Cut uprights to size and apply cement to ends before dropping into their correct positions. Now put in diagonal braces. When thoroughly dry, remove body side from plan. As two such sides are required, replace waxed paper over plan and make another similar body side.

STEP 8 • BODY-FORMERS
Material: Printed Rib Sheets
The second body construction step is the assembly of the two sides into the completed frame. Work over top view. Cut body formers from rib sheets. Stand both body sides upside down on plan and into position. Place bottom body formers into position and cement into place, one station at a time. Start at rear and work toward front. Crack or bend longitudinals where necessary. When cement is thoroughly dry, remove from plan. The top body formers and then side formers can now be cemented into position. Check trueness of body by holding frame so that it can be viewed from front to rear along center line. Check corners to be sure they are at right angles and perfectly aligned. When cutting out stringer notches make them a trifle smaller than the printed outlines to assure a tight fit for the stringers.

STEP 9 • BODY-STRINGERS
Material: Balsa 1/4"x3/8" and 3/32" sq.
The same kind of materials are used for both longons and stringers. Smooth

with sandpaper, cut to required lengths and cement into positions indicated BY NOTCHES IN FORMERS as stringers are purposely not shown on plan. They run lengthwise along outside of body to help round out body and support covering.

STEP 10 • TEMPLATES
Printed on Plan
All stiff paper templates are shown in full size on plan. With carbon paper trace these templates onto stiff paper. Cut out traced forms to exact size, bend to required shape and cement into position during the process of assembly. Apply cement to proper edges and hold or pin into position until cement is thoroughly dry.

STEP 11 • MOTOR COWL
Furnished
The motor cowl is ready-formed. Sandpaper edge until smooth. Mark off exact position of cross section No. 1 on back of block. Cement motor cowl to front of ship. Do not attach template "A" until model is covered with tissue.

STEP 12 • PROPELLER
Furnished
A machine cut propeller is supplied. However, it is not completely finished. Sandpaper corners and edges round. Propeller must be balanced. Do this by piercing propeller center with a very thin pin which in turn is stuck to the edge of a board, thus permitting propeller to revolve FREELY. When propeller is properly balanced it will remain stationary on its shaft, in any position. Sandpaper heavier blade until balance is attained.

STEP 13 • BEARING, ETC.
Material: Furnished
The bearing, shaft and washers are all furnished ready to use. Note that the shaft is placed first through the bearing then through the washers and next through the propeller. Bend shaft over into a "U" pull back into hub of propeller and cement securely. Be sure shaft is aligned properly with blades so they will revolve truly. As tension of rubber motor will hold nose in position DO NOT cement it to motor cowl. This will permit propeller unit to be readily removable from front of ship. Now insert rear motor crosspiece into position shown in side view.

STEP 14 • LANDING GEAR AND TAIL WHEEL
Material: 1/4" Birch Dowel and Printed Rib Sheets
The main strut of landing gear is made from a 1/4" birch dowel. Cut to correct length. Method of inserting wheel struts is shown in side view on front of plan. The wheel is now made from two separate pieces. Cut them from the rib

sheet. Cement these pieces together and "crossgrain." This is done to attain extra strength and to avoid warping. After cement is thoroughly dry, round outer edges to a tire shape. Now attach tail wheel struts. The landing gear and tail wheel are not attached until the final assembly.

STEP 15 • COVERING, ETC.
All individual complete parts are to be covered all around or on all sides. First sandpaper all rough edges and make all corners slightly rounded. Fit the tissue paper first, a section at a time, then apply cement and finally attach tissue and allow it to dry. Cover all parts completely and apply as much tissue in one section as possible without undue wrinkling. Cover body sections, where stringers are used in narrow longitudinal strips applied between each stringer over entire length of body. This prevents undue wrinkling and produces a much smoother appearance when tissue is tightened by shrinking, as explained. With a very fine atomizer or insect gun, spray entire covering of framework very lightly with water. Allow parts to dry. The tissue shrinks as it dries. This gives the parts a smooth tightly stretched covering. When parts are completely covered and dry they are ready for final assembly.

STEP 16 • WINDSHIELD AND ENCLOSED COCKPIT
Material: Transparent Stock
Make windshield and cabin windows from transparent stock supplied. Cut and fit material until proper size and shape are attained. Insert pilot and instrument panel into place before cementing windshield into position. Apply cement to outer edges of pieces and place into positions. Use pins in assembly until cement is thoroughly dry.

STEP 17 • ASSEMBLING
When all individual parts are completed they are ready for final assembly. Cement elevator and rudder into positions shown and allow cemented joints to dry thoroughly. After these parts are completely dry attach landing gear and tail wheel. Line up the landing gear to correspond with drawing. Now cement tail wheel into position. The model is now ready for decorations.

STEP 18 • DECORATIONS
Material: Printed on Decoration Strip and Emblem Sheet
Cut various decorations from back of plan and Emblem Sheet. Apply a thin layer of cement to backs and place in positions. Cut "U. S. Navy" from strip and cement to bottom of motor.

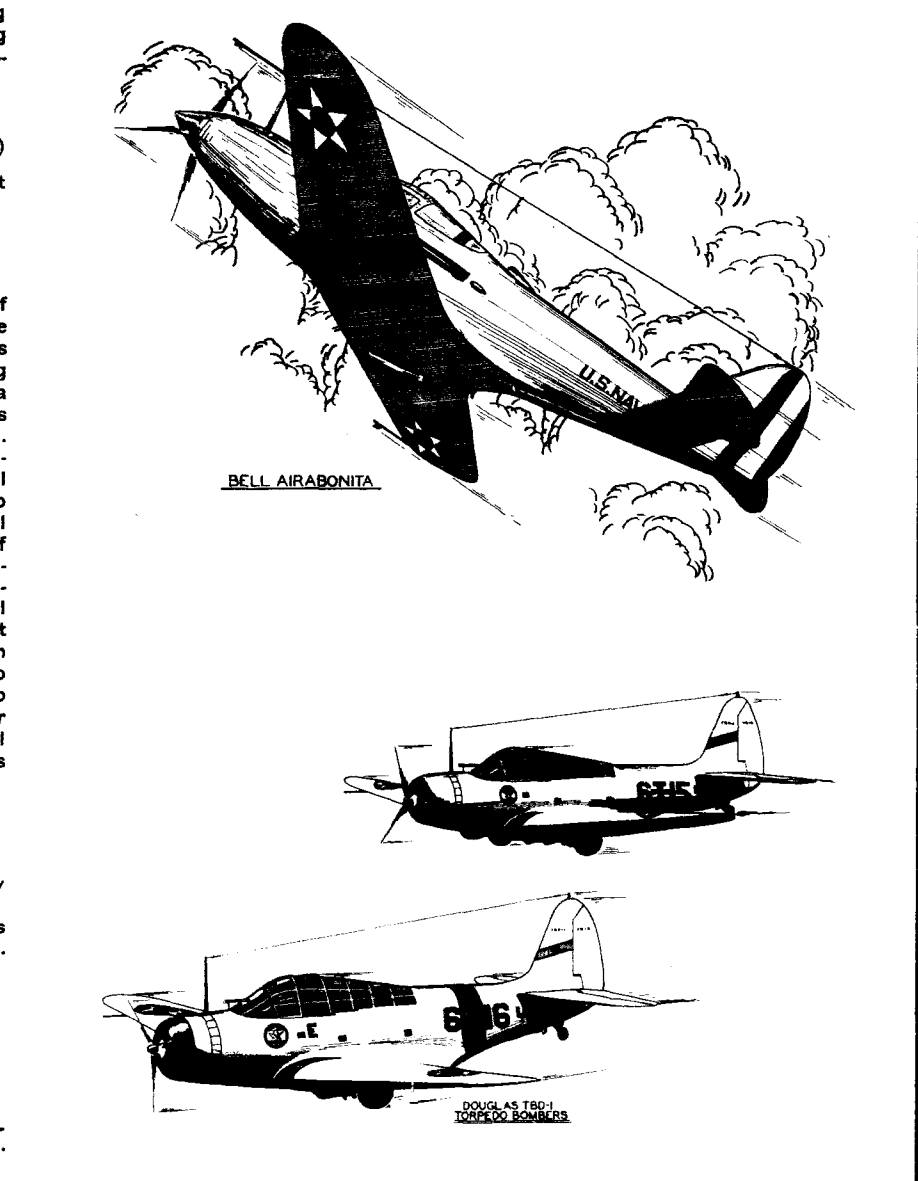
STEP 19 • RUBBER MOTOR
Material: 1/4"x1/8" (2 Bands)
Two large rubber bands are supplied. Tie them together to form a two strand rubber motor about 18" long. Sketch shows how bands are joined. Attach rubber motor between propeller shaft and rear crosspiece. Rubber motor can be

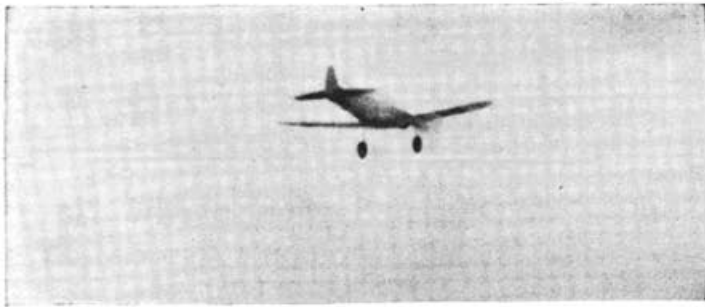
easily inserted by threading or pulling into position with a piece of string dropped through body if held in a vertical position. At front of ship nose plug is removable, but at rear a small opening in the covering should be provided for inserting the rubber motor.

STEP 20 • SCALE PROPELLER
Material: Balsa (not furnished)
Views of the scale propeller are shown on front of plan for those who do not wish to use the machine cut propeller supplied.

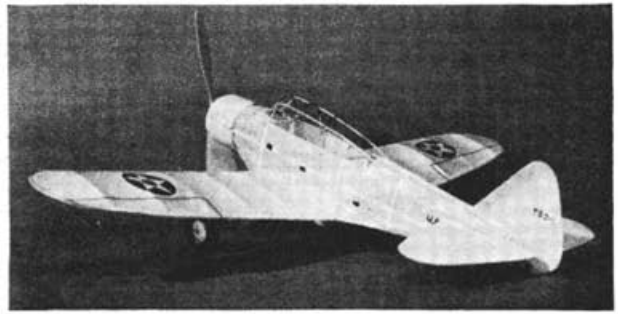
STEP 21 • FLYING
When model has been completely assembled it must be checked for center of gravity balance before a trial flight is attempted. Place the forefingers at the midpoint of the wing tips and lift model to see whether it balances. If tail has a tendency to drop it denotes tail heaviness which may be overcome by adding a little weight to nose of ship. If nose has a tendency to point downward, add a little weight to tail. Use this procedure until proper balance is attained. Tacks or pins can be inserted into front or rear of model to produce proper balance. When plane remains horizontal, while suspended on finger tips, it can be considered balanced. A few short trial glides should be made AFTER the model has been properly balanced (not before). When gliding, if ship has tendency to climb and if it does not make a gradual glide downward, it indicates that tail is still a little too heavy. This must be offset by additional weight at front of model. To be certain that ship is correctly balanced, hold it unwound, in position for launching and if the glide after leaving the hand is steady and consistent and goes forward 10 or 12 feet, ship can be considered as making a normal glide. Model is now ready for its trial flight. When gliding the ship do not launch it upward. Launch it with the nose pointed slightly downward which permits gravity to take effect. Before trying a powered flight it is advisable to test motor by winding propeller with right forefinger. Permit rubber motor to unwind completely two or three times. At this time check trueness of propeller rotation. While turning propeller and thus winding rubber motor, hold model firmly by its nose block. The proper number of turns for the rubber motor is attained when its coils or twists are fairly small and tight.

STEP 22 •
Although your model is finished your plan can be looked over for small, possibly forgotten details.
For convenience of model builder all ribs, formers, etc., are duplicated on this plan for use in final checking, repairing and for the building of additional models. Plan can now be filed away for future reference.





The completed model in full flight shows great steadiness



Intriguing details give a realistic appearance

BUILDING THE DOUGLAS TORPEDO BOMBER

By HERBERT K. WEISS

ONE of the latest of the navy's sleek torpedo planes is the Douglas TBD-1. Flying under a double classification, the TBD-1 carries either bombs or a torpedo at an estimated top speed of 235 m.p.h. Since the ship will be used aboard carriers, space is an important factor, and the wings of the TBD-1 fold up and in on themselves from a chord about midway to the tip. The experimental version of the torpedo-bomber had a straight cockpit housing, but the accepted version has had the housing humped, probably to accommodate the directional loop of a radio antenna. The engine is a Twin Wasp of 850 horsepower.

Because of the comparatively small size of the model, there are certain points which must be stressed in construction. They are as follows:

Sand the fuzz off all balsa used in the model before using it; the frame will be lighter, cleaner and stronger. Use plenty of cement; the small additional weight is negligible against the gain in ruggedness and freedom from warping. Keep the tail of the model light; every weight you put on the nose for balance will mean just that much more weight that the ship has to carry, and it's a small ship! And remember, a little mistake on a small ship is equivalent to a pretty big one on a large model.

Wings and Tail

Make the wing first, as it's used as a jig for the fuselage. The frame can be assembled on the plan, if the left wing panel is traced on another sheet of paper and pinned down in its proper place. The wing is built in one piece. Put waxed paper over the plan, pin the leading and trailing edge in place, and add the ribs and wing tip. Use plenty of cement. The bamboo for the wing tip can be bent over a flame, or, as it is very thin, it will bend easily without heating and can be tied in place with silk thread

A Realistic Model of a New U. S. Navy Plane— Fine Performance Is Combined With Simple Construction

while the cement is drying.

When the frame is dry remove it from the waxed paper and with a razor blade cut loose surplus cement and any waxed paper which may have adhered. Crack the spars just outside rib 1 and give the wing $3/4$ " dihedral at each tip. Re-cement the spars, and when the cement is dry shape the leading and trailing edge to airfoil shape with a razor and sandpaper.

Trace the tail surfaces on $1/32$ " sheet balsa and cut them out. The stabilizer is made in one piece. Sand the pieces smooth. Cement the $1/32$ x $1/16$ " stiffeners on top of each side of the stabilizer.

Fuselage

Cut two halves of each bulkhead from $1/16$ " sheet. As the fuselage must stand handling do *not* substitute $1/32$ " sheet. Cement the halves together, using small lengths of $1/32$ " square bamboo across the grain to stiffen the assembled bulkhead crossways at the joint. Cement bulkheads C and D to the wing center section in the position shown on the plan. Now cement the $1/8$ x $1/16$ " main side stringers to these bulkheads, and add the remaining bulkheads to the $1/8$ x $1/16$ " stringers, being careful to keep the bulkheads lined up correctly. Complete the fuselage frame by adding the $1/32$ " square bamboo stringers, formers B and D, and the $1/16$ " square balsa top and bottom stringers. The tail post is $1/16$ x $1/8$ " balsa.

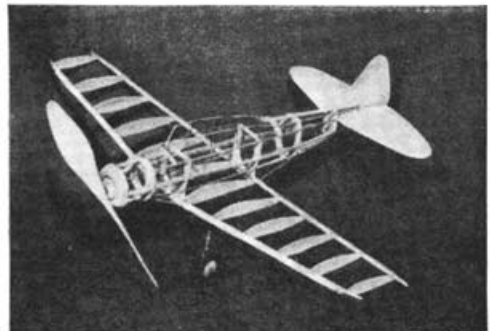
Cowl sections are round, so that the diameter of the cowl formers can be taken from the plan, and the sections drawn on sheet balsa with a dime compass. Cover the cowl

with $1/32$ " sheet balsa, and sand the whole cowl after assembly until it is smooth. A small hard-wood nose plug is used (Continued on page 51)

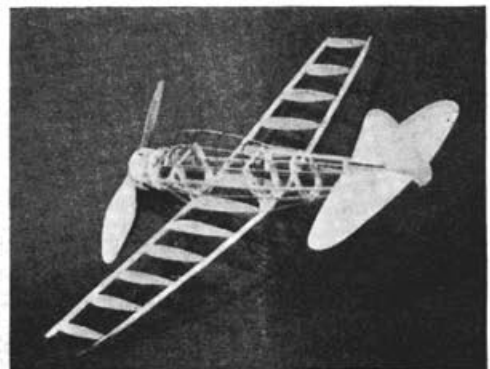
Some model builders think that a small plane will not fly well. This little ship will explode such an opinion. It has been flown repeatedly for more than 25 seconds indoors and outdoors; one of the few small models with a big performance.



It has a comparatively large "prop"



The framework is well designed



It is simple and easy to build

Building the Douglas Torpedo Bomber

(Continued from page 21)

and can be obtained at any model counter.

The plan shows the correct number of cockpit formers. Some may be omitted for simplicity. Make the formers from 1/32" square bamboo.

Assembly and Covering

Sand the fuselage and wing carefully so that there will be no projections to spoil the covering. Cover the model carefully with white tissue, using small strips on the curved parts of the fuselage. The landing gear is attached to the wing before covering, and the tissue is cut to fit. All wire parts are .028 wire.

Spray the model lightly with water, and when it is dry, sand off the fuzz which will appear at the leading and trailing edges of the wing and at sharp corners on the fuselage. Give the model one coat of clear dope which has been mixed with thinner in about a half to half ratio. Dope the cowl and other parts, but *do not dope the tail surfaces*. Sand any roughness which may appear, and then cement the tail surfaces in place. To insert the stabilizer, slit the tail post with a razor, push the stabilizer into position and cement it, then re-cement the tail post.

Add as much detail as may be desired. The model has a standard navy insignia, including stars on top and bottom of each wing tip.

Propeller

Carve the propeller from hard balsa, using a block 4-3/4" x 7/8" x 1/2", or use any medium pitch prop of that size that you may have. *Do not use a high pitch prop*, for the torque will make the model difficult to control laterally.

Flying

The model should balance just about right if hardwood wheels are used. Test it by gliding it. If it stalls, check the tail attachment, and if there is any perceptible negative incidence cut the stabilizer loose and readjust it to zero incidence. If the model still stalls, sand the tail surfaces. Add weight to the nose only as a last resort. If the model dives warp

the elevators up slightly or use lighter wheels.

If the model spiral dives under power, warp the trailing edge of the inside wing down slightly.

Use two strands of 1/8" flat rubber, lubricated, with about a half inch of slack. For long flights after the model is adjusted, use a winder.
