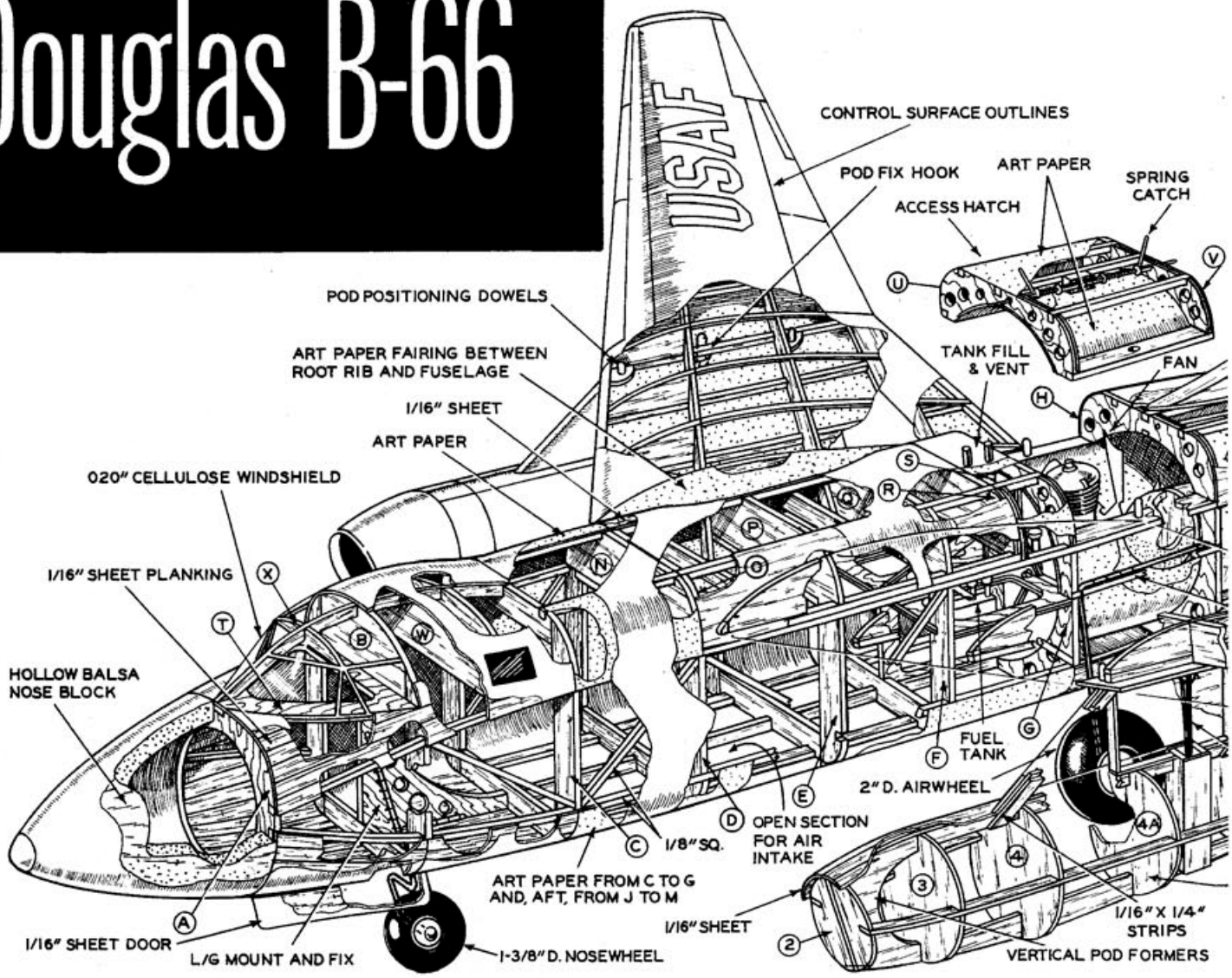
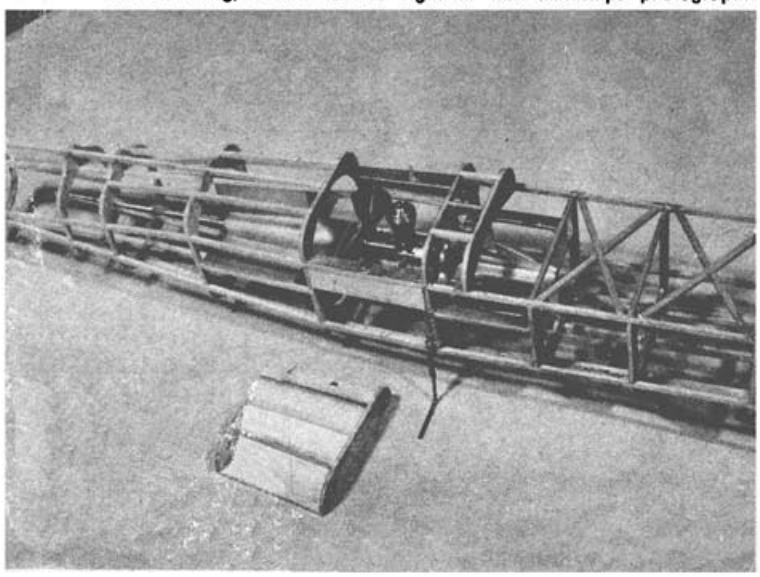
A DUCTED FAN
Douglas B-66

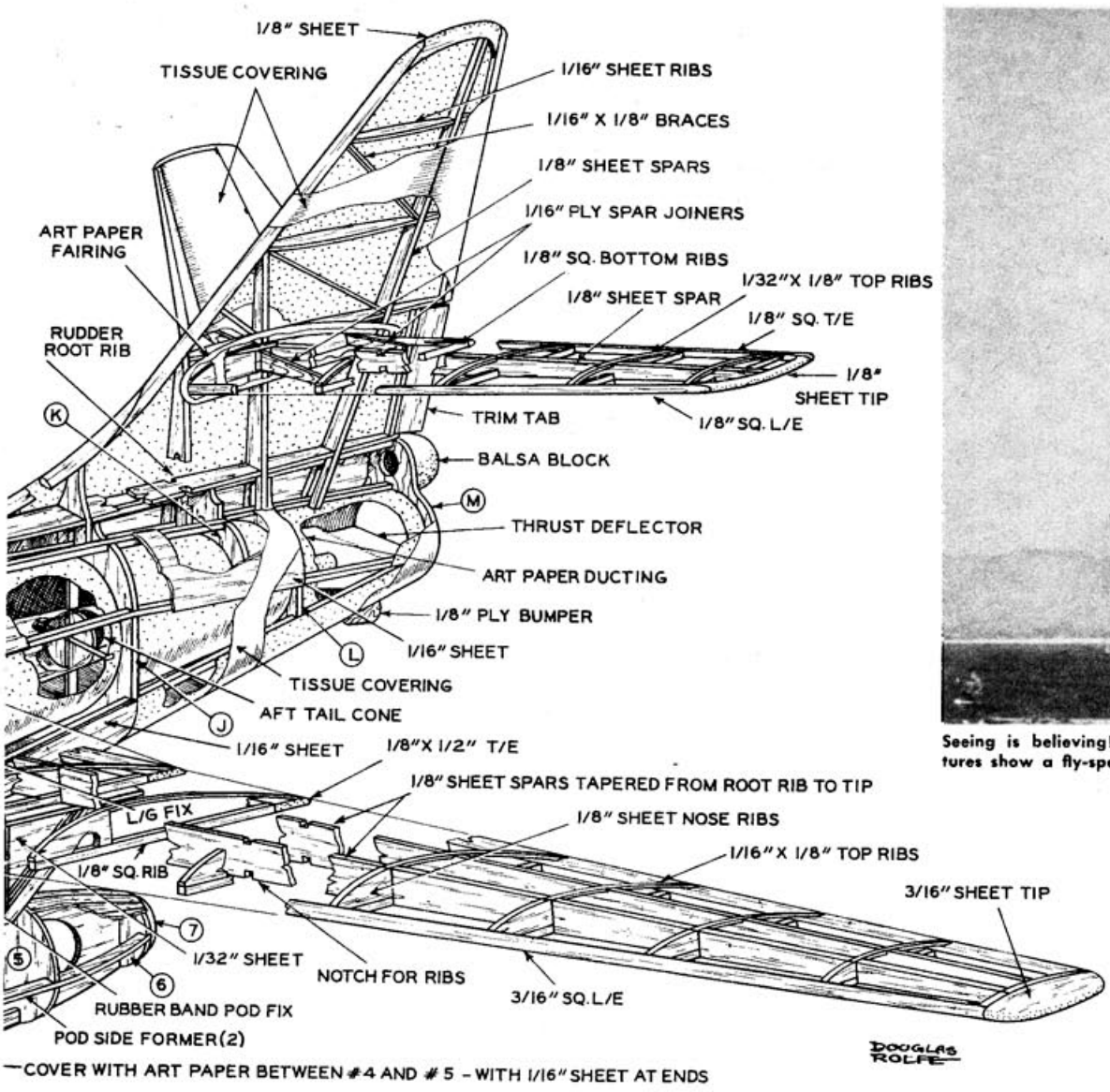
by WILLIAM H. PAXTON, JR.



The tail cone, guide vanes, the ducted fan, Thermal Hopper engine, it's mounting, shown left to right in this amidships photograph.



Roy Cox, left, and young Bob Hill listen attentively to designer's explanation of how it is possible to fly a B-66 on wee powerplant.



—COVER WITH ART PAPER BETWEEN #4 AND #5 – WITH 1/16" SHEET AT ENDS

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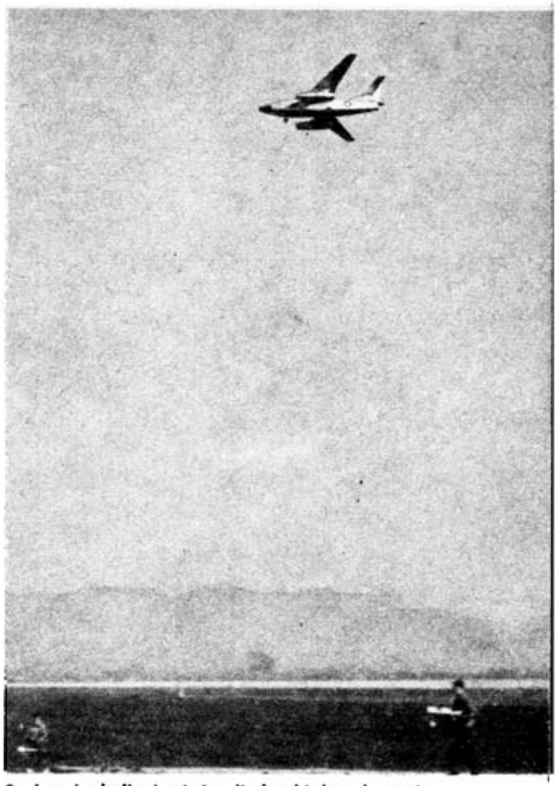
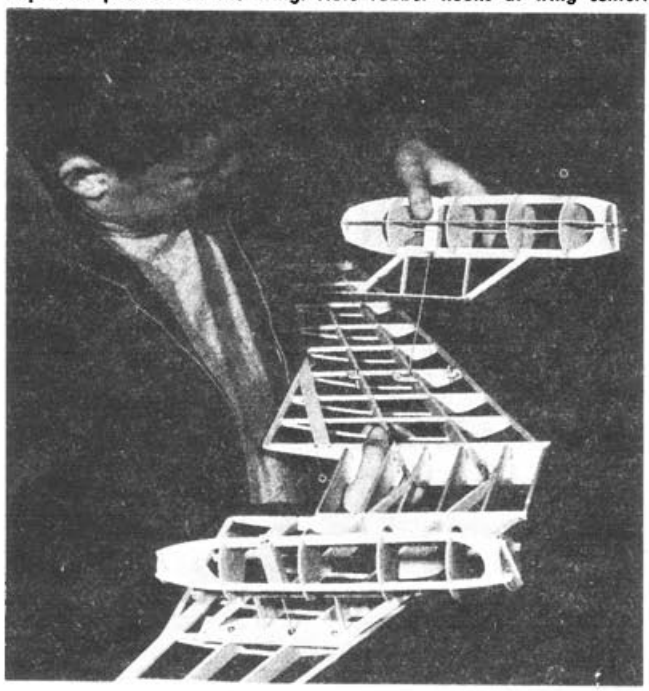


Seeing is believing! It climbs higher but pictures show a fly-speck. How real can you get?

Craft assembles like the real one. Here, dummy, starboard nacelle slips into position on the wing. Note rubber hooks at wing center.



An adventure in building and flying, for experienced modelers. It flies on .049, proving the age of miracles has not yet passed.

► One of the most versatile light bomber-type airplanes ever developed, the new U.S. Air Force B-66 is a twin-jet, swept wing aircraft in the 600-700 mile-an-hour class. Two RB-66s, the photo-reconnaisance version, flew from Tucson, Arizona to Eglin Field, Florida at an average ground speed of 700 mph. Powered by two Allison J-71 engines and operated by a crew of three, the B-66 is capable of carrying the "H" bomb at altitudes up to 45,000 feet deep into enemy territory for all-weather, around-the-clock bombing.

Having noticed that my ducted-fan Cougar would operate with no loss in performance with air supplied through an opening in the bottom of the fuselage, it was calculated that a model of the B-66 should operate satisfactorily by hiding the engine within the fuselage and supplying air to it through the bomb-bay opening. An adequate air exit for the duct could be obtained by simply leaving off the rear gun turret. By having the engine in the fuselage,

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A Ducted Fan Douglas B-66

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dummy engine pods could also be made extremely light and directional stability problems inherent in twin-engine models would be eliminated.

Before we get into consrtuction details, however, I would like to stress the necessity for keeping the weight down and the use of a relatively hot engine capable of turning the fan in the neighborhood of 16 to 20,000 rpm. Target weights to shoot for, which were the actual weights of the components of the airplane pictured are:

WEIGHT OF STRUCTURAL COMPONENTS BEFORE COVERING WITH TISSUE

Wing	1.59 oz.
Body with rudder	5.78
Stabilizer	.25
Two nacelles	1.02
Total less engine, fan & fuel tank	8.64 oz.

AIRPLANE COMPLETE READY TO FLY

Body	7.45 oz.
Wing	2.38
Two Nacelles	1.51
Engine and fan	1.83
Total weight	13.17 oz.

As can be seen, this is extremely light for an airplane of this size and can be achieved only by careful selection of soft, straight-grained balsa and lightweight basswood plywood.

CONSTRUCTION DETAILS

1. Cut out all bulkheads, ribs, and engine mount supports, carefully identifying each and marking centerlines and attaching structure points.
2. Solder 3-48 nuts to a strip of tin for engine attachment and cement to plywood engine mount with Ambroid cement.
3. Sub-assemble engine mount supports Y and Z to bulkheads F and G. Tie and cement engine mount with Ambroid. Assemble fuel tank and tie in place. Tie full and vent lines in place.
4. Lay out ⅛ sq. main side longerons on the plans and mark bulkhead positions. Cement to engine mount support structure assembly.
5. Add remaining bulkheads, longerons, and cross braces.
6. Bend nose-wheel wire so that wheel will be on the centerline of the airplane and tie and cement to plywood support. Cement assembly in place.
7. Build up hatch assembly within the opening and add ⅛ in. sheet balsa members between bulkheads as noted in cross section view of main landing gear installation. Install ⅛ dia. alinement pins and latching mechanism.
8. Wire and solder together the main landing gear and tie and cement in place.
9. Assemble the tail cone in two sections and fit to the fuselage. Before installing, apply two coats of nitrate dope, two coats of Silver Aerogloss, followed by a coat of Comet Hot Fuel Proof dope. Apply the same doping process to the engine mount structure.
10. Apply this same process to a sheet of Art Paper about 15 x 18 in. (This is the type paper school kids use to make colored designs, etc.) Use this to form a duct within the aft portion of the fuselage from Bulkhead G to M.
11. The thrust deflector is made from soft .020 aluminum and is installed along with the aft section of the tail cone.
12. Add windshield members and assemble the removable section of the wing within the fuselage to assure proper alinement.
13. Plank double contoured sections of the fuselage with 1/16 in. sheet strips. Sand down to about 1/32 in. thickness. Single contoured sections are covered with Art Paper. Carve the nose from a medium hard balsa block and hollow out.
14. Cut wing spars from ⅛ in. balsa sheet and taper from root rib to 3/16 in. camber at the tip rib. Notch for intermediate ribs. Cut root rib from ⅛ in. balsa. Cement ⅛ in. sheet rectangles to the forward section of the ribs and cut to contour by sighting along the wing.
15. Assemble the wing halves to the mid section by notching and tapering the spars to produce the 2 degrees incidence and 1 inch dihedral. Add wire hooks for attaching to fuselage and add dowels and hooks for attaching the jet nacelles. Scrap pieces of balsa are added at hooks and dowels wherever they protrude through the paper to keep the paper from wrinkling when doped.

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16. Fair in the wing to fuselage intersection with Art Paper.
17. The rudder may be built up as a separate assembly before installing on the fuselage. Cover with light weight Silkspan tissue and apply two coats clear nitrate dope. Cut out opening for contour of stabilizer.
18. Assemble stabilizer in two sections and add dihedral as noted. Cover and dope same as rudder. Install and add Art Paper fairing.
19. Assemble jet nacelles and plank fore and aft sections with 1/16 in. balsa strips. Sand down to about 1/32 in. thickness and cover center section with Art Paper.
20. Solder 3/32 in. inside diameter washers to landing gear wires to hold wheels in place.
21. Areas on the fuselage and wing not planked or covered with Art Paper are covered with light weight Silkspan tissue and given two coats of clear nitrate dope. Areas on the wing, fuselage and nacelles that are planked or covered with Art Paper are given a coat of sanding sealer followed by two coats of clear nitrate dope. Sand between coats. The complete airplane is then sprayed with silver Aerogloss dope.
22. Cut lettering from black trim film and star insignias from red, white and blue trim film. The bumble-bee is painted on with plastic model enamels. Body of bee is yellow, bomb is red, outline of bee is black as are legs and fins on bomb. Wings and eye of the bee are white. Lettering on bomb is white.
23. Paint the anti-glare area and lower radome on the airplane nose dull black and the aft round radome and rectangle on the rudder yellow. Outline control surfaces with a lettering pen and black dope.
24. The windshield and windows are covered with .020 cellulose acetate following which brush on a coat of Comet Hot Fuel Proof dope over the entire airplane.
25. Cut the six bladed fan from soft .040 aluminum, filing airfoil sections and adding camber as shown. Bend blades to produce about 30 degrees pitch at the tips. Be sure to bend the blades to produce the reverse thrust required.
26. Construct a special screwdriver from a piece of music wire about 18 inches long for use in installing the Cox Thermal Hopper engine. Install the self-starter spring and the fan and you are now ready to go, but please read the rest.

Test Gliding and Flying

1. First check the balance point on the airplane to determine the C G location. It must not be aft of the position shown to avoid future difficulties under power. The model glides and flies fairly fast so pick some tall grass for initial glides.
2. After the glide has been properly adjusted and before any power runs are attempted, a word of caution is necessary. This engine will turn this size fan from 16,000 to 22,000 rpm which is a lot of centrifugal force acting on the blades. So be darn careful before each flight to check to see that there are no cracks developing at the root of the blades. It's also advisable to keep spectators and yourself out of the line of the fan while the hatch is off.
3. Make your first flight attempts as ROG's with the thrust deflector gent slightly down. If the model shows no tendency to get airborne, bend up the deflector slightly and try again. A take-off run of 100 to 200 feet will be required so don't get over anxious. Happy landings.

Fans manufactured by R. J. Hetherington, 4434 Eagle Rock Blvd., Los Angeles, Calif.