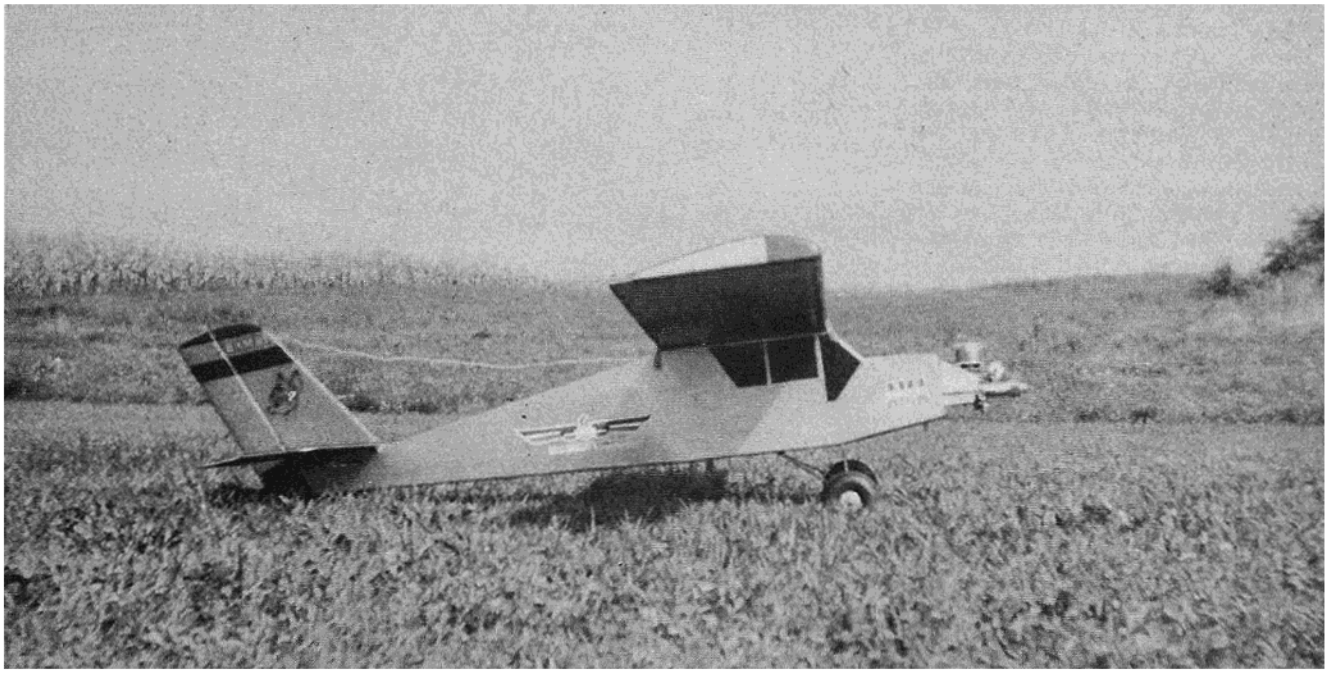


BAMBI

A RUGGED, ROUGH FIELD, .19 TO .30 POWERED THREE CHANNEL TRAINER THAT HAS BEEN USED TO TEACH BEGINNERS SINCE 1971.

BY HARRY MONTGOMERY

It was early spring of 1971, and R/C flying time was here after a cold and snowy Pennsylvania winter. I was entering my second term as President of the Penn-Ohio Radio Kontrol Society (P.O.R.K.'S). As President, I should have been a proficient stick jockey, but such was not the case. The basement family room was filled with a multitude of scale ships which their owner hadn't the nerve to fly, plus an old and battered "Royal Coachman", which had borne the brunt of my flying attempts the previous season. In short, I needed a rugged trainer, easily and quickly built.

Many suggestions were given by the club members as to the type and manufacturer of such a trainer kit, but none really suited me. At club meetings, I had bragged that I could design and build a trainer from a simple three view sketch on a letter size sheet of paper and the total cost, less equipment, would not exceed five or six dollars. In a club well represented with sixty dollar ARF's this met with some comments based on my sanity - - - or lack of it! The die was cast and the sketch was made in the form you see presented with this article. Detailed full size drawings are available for those who don't wish to transfer outlines to the wood by scaling dimensions from a small three view as I did. Five years later, many individuals have learned to fly on the Bambi, and it is still a good, rugged trainer, ideally suited for rough fields.

Plywood has always been my favorite building material. The model which was affectionately named "Bambi" was built mainly of 1/8" soft poplar plywood which can be ordered from any lumber yard in 4' x 8' sheets for a cost of approximately $6.50. One sheet will build seven or eight of these models with wood to spare. Weight wise, it is comparable to the harder grades of balsa but it is many times stronger. Cutting was done with a small magnetic type jig saw. If ordered from Sig, it is called "Lite-Ply."

Construction

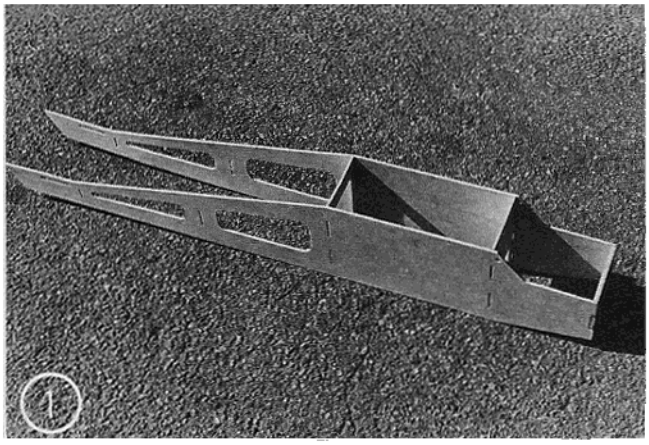
Since this is a trainer type aircraft, I will outline the basic building steps for the novice and the experts will have to bear with me.

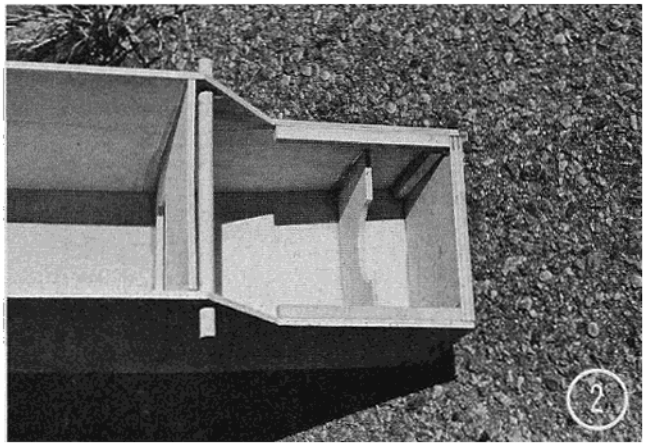
Fuselage:

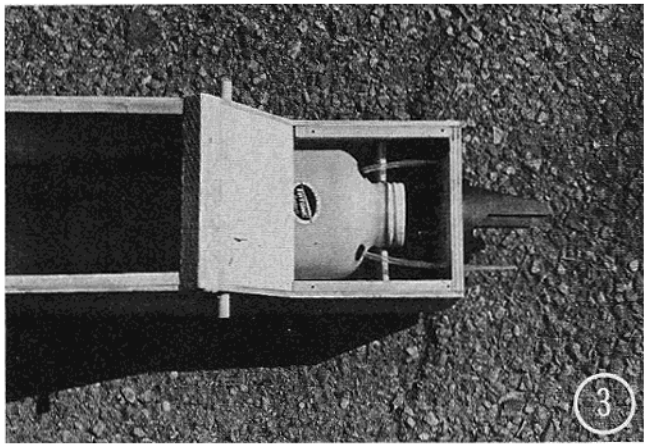
Transfer the outlines of all indicated parts to the ply sheet with carbon paper. In the case of the fuselage sides, trace one side only and rough saw outside of the actual outline. Pin this to a second blank and saw to the traced outline, thus assuring two identical sides. Saw the former slots before separating the panels. The slots and the formers with the matching keys assure a perfectly aligned fuselage. Sand all parts to outline before assembly. The firewall former "A" is cut from 1/4" plywood. Would you believe a scrap of walnut paneling left over from improvements in the home?

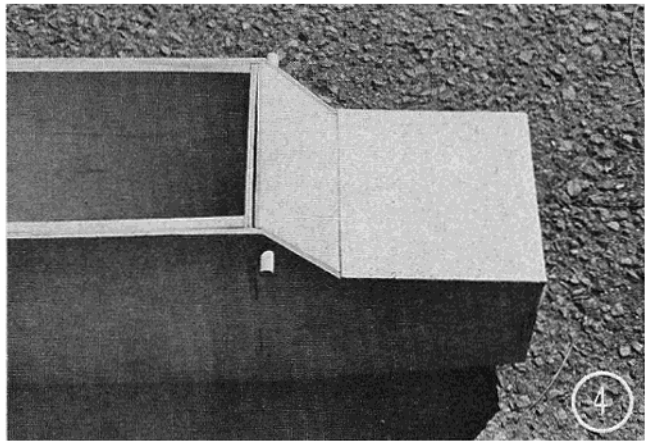
With sides and formers ready for assembly, lay one side flat on the workbench and, using five minute epoxy, cement firewall "A" and formers "B" and "C". A small drafting triangle will check for a true upright condition of the formers. Alignment will be guaranteed if the slots in the sides and the key lugs on the formers and firewall were accurately cut.

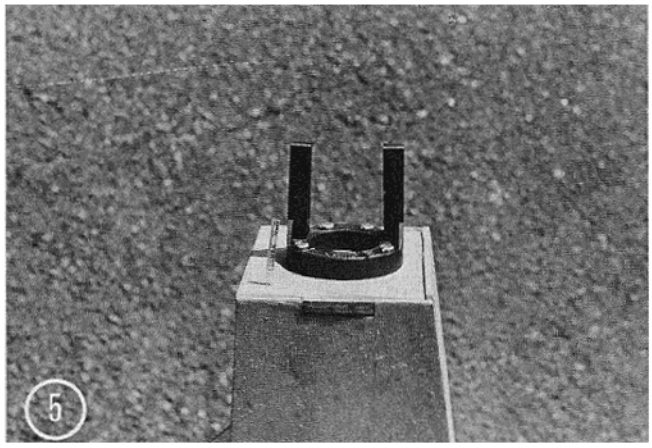
When this assembly has set, place the

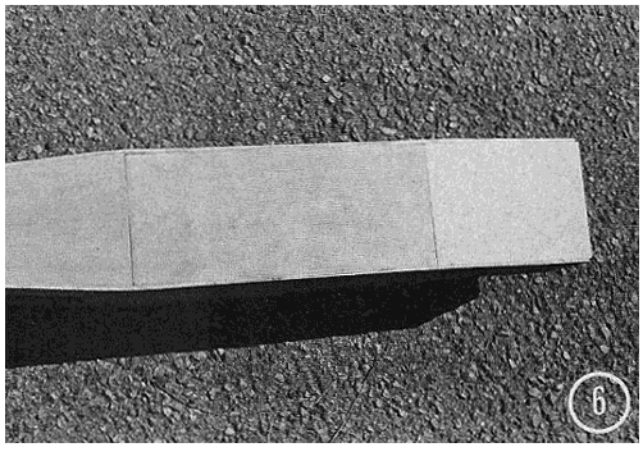


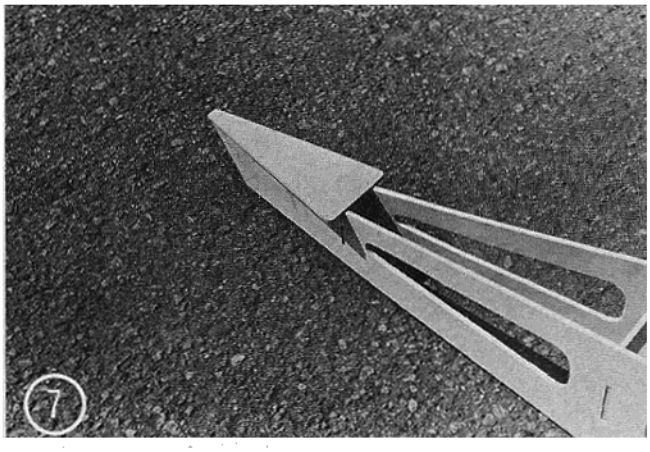




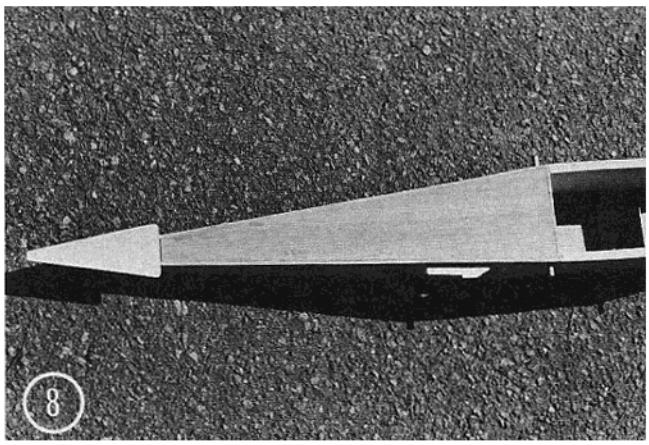


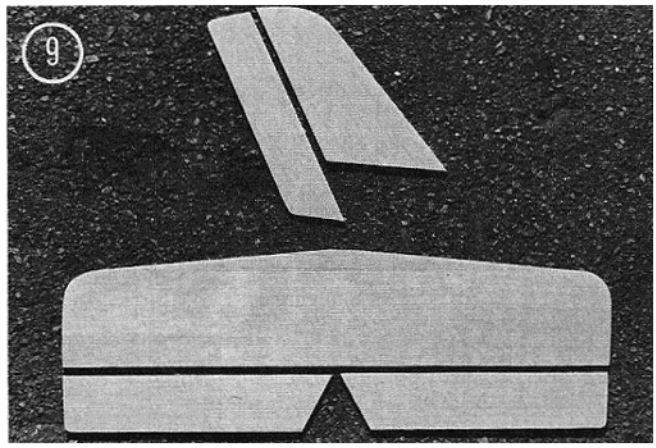


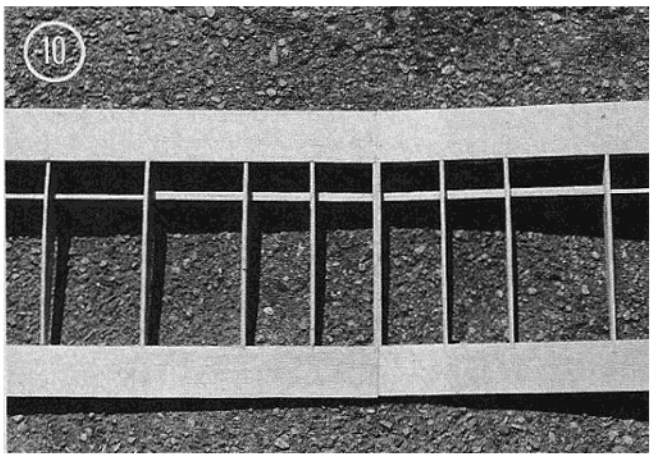


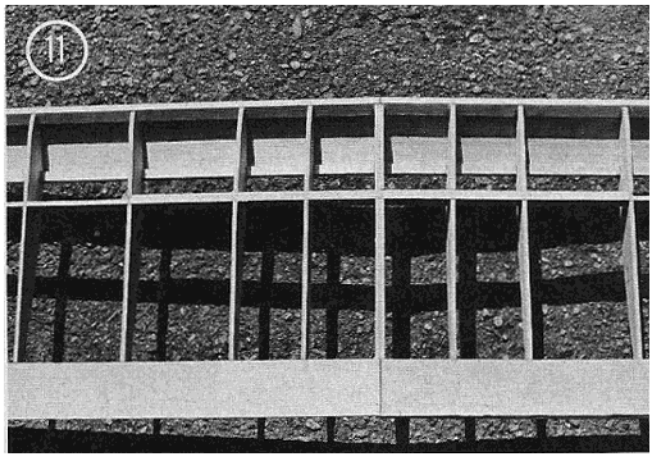


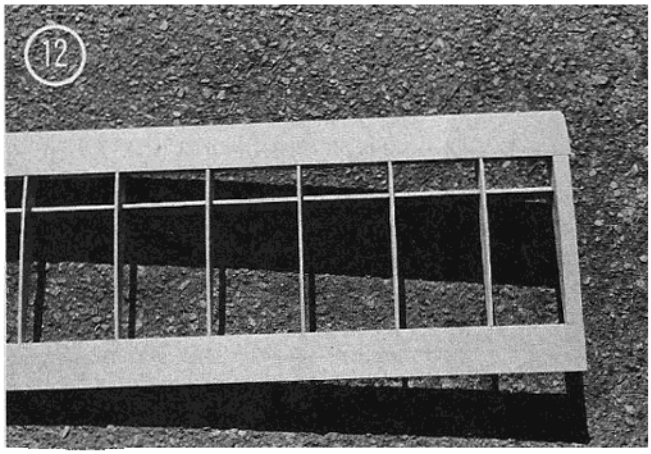
(1) The basic lightweight plywood fuselage sides joined together with the firewall and two main bulkheads. Note lightening holes in aft fuselage sides. Interlocking formers insure easy, true alignment. (2) View of tank and battery compartment. Tank half-former is cut to fit your particular tank contour. (3) Tatone stick-a-tube tank used in this particular installation. Pilot holes drilled for hatch hold-down screws. (4) Hatch mounted in place. (5) Kraft-Hayes motor mount in place on firewall. (6) Bottom sheeting completed. Note that it is inset between fuselage sides, again insuring alignment. (7) Stab mount glued in place prior to sheeting top of fuselage.

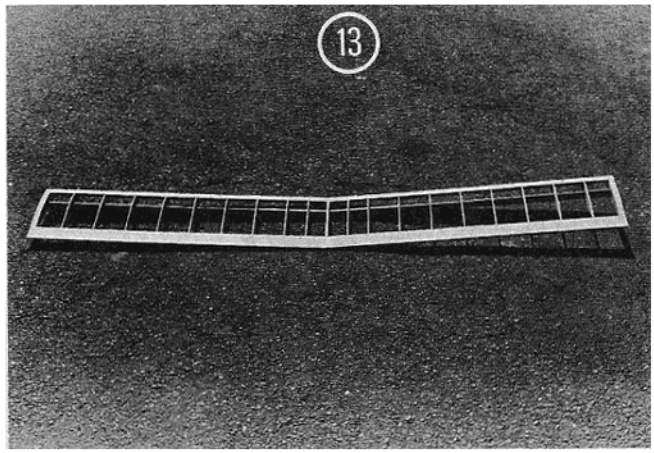


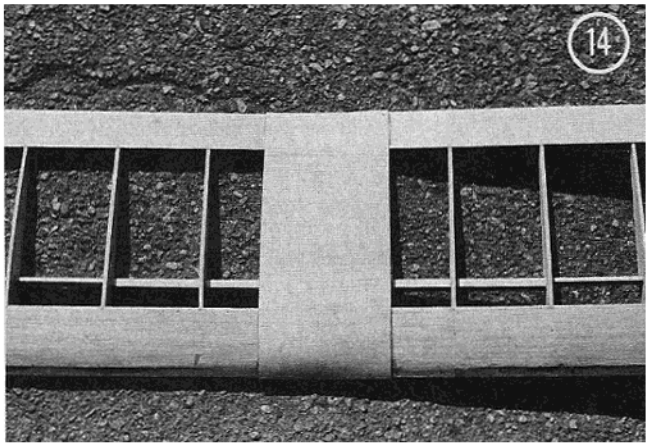












(8) The top fuselage sheeting in inset between the sides after the stab rest is glued in place. (9) The sheet balsa tail pieces are now cut to shape. (10) View of the wing center section – a simple to build, flat bottom airfoil. (11) Bottom view of the wing center section. Note basic simplicity of structure. (12) Wing tip view. Note thick tip rib. (13) Completed wing, both panels joined together, but minus center section sheeting. (14) Wing center section sheeting covers leading and trailing edge sheeting and simulates a cabin top when the wing is mounted on the fuselage.

other side flat on the bench and epoxy to the other sides of the formers. After the epoxy has cured, we now pull the sides together at the rear, align, pin and cement. Eyeball the assembly to make sure no misalignment is present. Formers "D" and "E" are now cemented and snapped into place in their correct positions. These, too, will be held and aligned by the slots in the fuselage sides. Cut and epoxy the ply stabilizer support plate in place. Be sure level alignment is identical to the top of the fuselage between formers "B" and "C". Add 1/4" square pine vertical strips behind the firewall. Cement 1/4" dowels in place in the previously drilled holes in the fuselage sides, cut to the length shown.

The fuselage bottom from firewall "A" to former "C" is cut from two pieces of 1/8" plywood. Fit between the sides and epoxy. The remainder of the bottom of the tail is 1/8" balsa sheet cemented with Wilhold Aliphatic or Titebond. The top of the fuselage from former "C" to "E" is also 1/8" balsa cemented between the sides. The front hatch cover for fuel tank and battery access is cut to fit from 1/8" ply with 1/4" square strips cemented to the fuselage sides. Small wood screws through the hatch cover into the strips secure the hatch and gives a much neater appearance than the dowel and rubber band method.

Cut and install the front tank support former. This outline will vary depending on the tank used. The outlet line should be slightly below the needle valve level. The original "Bambi" has a standard six ounce rectangular plastic tank and the former is cut to support the neck of the tank and prevent its forward movement in case of a crash. The foam wrapped battery pack under the tank, supports it in a level attitude. Remember to enclose your battery in a "Baggie" or plastic wrap to prevent fuel seepage in case of tank rupture.

Back to the fuselage construction. Bend the forward and rear landing gear parts to the outline shown from 1/8" diameter piano wire. Bind with fine copper wire at the lower ends but do not solder yet. Cut the landing gear clamp straps to size from tin can stock, form around the wire, and drill each clamp for a bolt. Invert the fuselage and place the landing gear in the location shown. Slide the clamps to the desired position and mark and drill holes through the plywood bottom for the mounting bolts. Note that, in the bottom area covered by the landing gear wire, inner ply doubler pieces are added for extra support. The mounting bolts pass through both layers of ply. A Hallco B-105-5 commercial dural gear can be substituted if desired. Now add the 1/8" x 1/4" top cabin area wing support strips. Tilt these strips to the angle defined by the "V" at the top of the formers "B" and "C". These parts, as well as the front windshield cover, are cut from 1/8" plywood.

Add the servo mounting bars to suit your equipment. My "Bambi" uses a Kraft Gold Medal series radio with three KPS-10 servos mounted side by side in the Kraft plastic tray. The tray may be supported by two 3/8" square hardwood pieces mounted across the fuselage and epoxied in place or with a plywood plate. Drill the fuselage sides for wood screws to more firmly anchor these pieces in case of a crash.

To simplify engine mounting, a Tatone or Kraft type mount may be used but, to cut costs, a scrap piece of 1/16" thick aluminum was sawed to shape as shown. Make two, and bend one right hand and one left hand, using a vice and a hammer. Drill for firewall mounting and for the engine mounting bolts. Bend the aluminum accurately to assure both sides are aligned identically to each other. No offset thrust is built in, either down or right. After mounting, add 1/2" square sub-mounts under the aluminum to dampen vibration and prevent stress cracks. Epoxy the sub-mounts to the aluminum and to the firewall. Using the pre-drilled holes in the aluminum mounts, drill down through the wood sub-mounts. Coat the firewall, sub-mounts and the internal area of the fuel tank and battery cavity between "A" and "B", with epoxy.

BAMBI
H.T. Montgomery

TYPE AIRCRAFT
Sport & Club Trainer
WINGSPAN
56 Inches
WING CHORD
9 Inches
TOTAL WING AREA
504 Square Inches
WING LOCATION
Top of Fuselage
AIRFOIL
Clark Y
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1⅝ Inches
O.A. FUSELAGE LENGTH
37" From Firewall
RADIO COMPARTMENT AREA
(L) 12" X (W) 3" X (H) 3"
STABILIZER SPAN
22 Inches
STABILIZER CHORD (incl. elevator)
6¾ Inches Average
STABILIZER AREA
148.5 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7⅛ Inches
VERTICAL FIN WIDTH (incl. rudder)
5½ Inches Average
REC. ENGINE SIZE
.19-.30 Cubic Inch
FUEL TANK SIZE
6 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rudder, Elevator, & Throttle
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Poplar, (Sig Lite Ply)
Wing ..... Balsa & Ply
Empennage ..... Balsa
Weight Ready-To-Fly ..... 56-66 Ounces
Wing Loading ..... 16-18.85 Oz./Sq. Ft.

The fuselage is covered with acetate sheath dress lining material which may be purchased at any fabric or yardage store. This silk-like material comes in 45" widths and sells for about sixty cents a yard. "Bambi" was completely covered with this fabric and it must be used to be appreciated. It is much more durable than silk, easily filled with dope, and shrinks with one coat like a drum. Three coats will fill the weave and it produces a scale-like appearance. The increase in weight on a finished airplane over silk is very slight and the cost of covering even a large model is less than a dollar. CAUTION! Be sure you purchase ACETATE sheath. It is also sold in a heavier cotton based version which is not suitable. MonoKote or Solarfilm may be used, if desired.

After covering the fuselage, mount the landing gear. Align the struts to assure correct wheel tracking, and solder the ends of the wrapped wire. The wheels are held with soldered washers. A slight wheel toe-in is desirable to improve tracking.

Tail Surfaces:

The basic construction is 1/8" hard balsa covered with 1/16" balsa sheet. No difficulty should be experienced here. Join the surfaces with cloth tape hinges which I have found to be more reliable than the plastic type, but here again "You pays your money and you takes your choice."

Wing:

A simpler structure with equal strength would be hard to build. It is a constant chord, 56" span, with a Clark "Y" airfoil. The area is 504 square inches. Saw cut the center section ribs spanning the length of the dihedral doubler from 1/8" ply. The rest of the ribs are 3/32" balsa. The leading edge is 3/8" square spruce, or pine, and the trailing edge is two 1½" wide strips of 3/32" balsa. The full length spar, cut in two halves is cut from 1/8" ply. The dihedral doubler is also 1/8" ply and is notched to accept the ribs. The tips are sawn from 1/2" balsa stock to the outline of the rib and shaped as shown. The leading edge cap sheeting is 3/32", two inches wide. The ribs are notched for the ply spars and doublers, the trailing and leading edges, and the 1/4" square top spar which supports the rear of the leading edge sheeting.

Build the wing on an absolutely flat surface. Cover the plan with plastic wrap and pin down the lower half of the trailing edge. Pin the half spar (ply) in position and epoxy the ply dihedral doubler to it. The outer end of this part will be tilted up at the end and will form the correct angle for the other wing panel. Add the ribs, leading edge, 1/4" spar, cap sheeting and upper trailing edge half. The tip block completes one half of the wing. When the glue is dry, tilt and block the panel at the correct angle determined by the doubler, and build the other

From RCModeler Aug. 1976

. . . . panel. Add the 1/16" sheet center cover which simulates a cabin top when the wing is in place on the fuselage.

Assembly:

Epoxy the fin to the center of the stabilizer, vertically aligned with a square or triangle. Epoxy this assembly to the top of the stab support plate, again checking for squareness and alignment. Fillet the leading edge to the fuselage with plastic wood. Brush or spray your finish on all parts. Two coats of clear and two coats of color were used on the original. "Bambi" was doped gold overall with red trim on the wing leading edge and on the fin and rudder. Windows, ala "Curtiss Robin" on the wing and fuselage are from black MonoKote trim sheet.

The original was powered by an Enya .29 TV but a good .19 will provide plenty of power. The engine throttle rod is piano wire passing through drilled holes in the firewall and former "B". The elevator and rudder rods are 1/4" dowel with piano wire bound to the front to connect to the servos with Kwik Links at the rear.

Flying

Balance "Bambi" at about 30% of the chord with the fuel tank empty. Before flying, pack that radio equipment in all the foam cushioning you can shove in, and be sure to range check your equipment.

Adjust the control surfaces for neutral with your transmitter trim settings also in neutral.

Take-offs, because it is a tail dragger, require back stick to make "Bambi" track straight until sufficient ground speed is built up. Slight rudder correction may be necessary but, strangely enough, it usually requires a touch of left rather than right.

The climb-out with the Enya .29 is usually steep and altitude is grabbed quickly. Down elevator trim is necessary to prevent climb under full throttle, with the C.G. shown.

The ship, when trimmed properly, is a hands-off flyer and will return to level flight from any attitude upon releasing the sticks. Loops are as tight as a "ukie" model. Because of its inherent stability, the ship does not spin easily and must be fully stalled to enter a spin attitude.

The glide is fantastic! With a dead engine at 300' altitude, she will stay in the air two to three minutes, depending on the pilot. At the time of writing this article, "Bambi" has taken a third place in our annual club contest. This, in spite of its owner's shaky hands.

Go ahead - - - build a "Bambi." Would you believe ten of them for the price of one prefab pattern ship? ❑