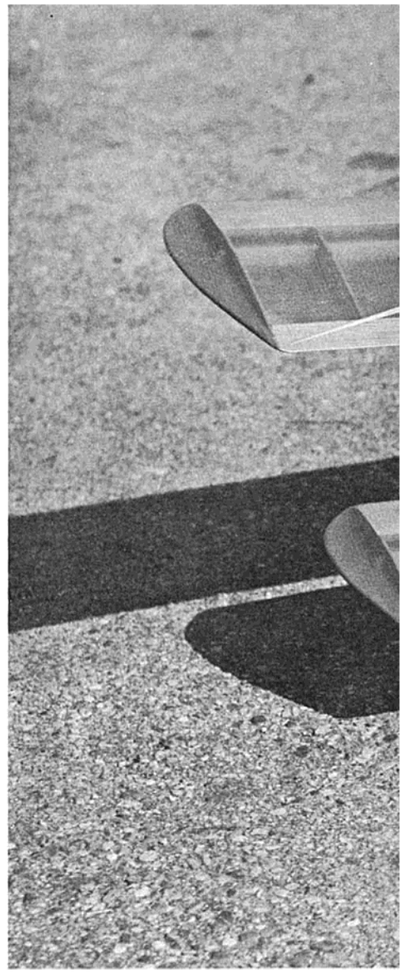
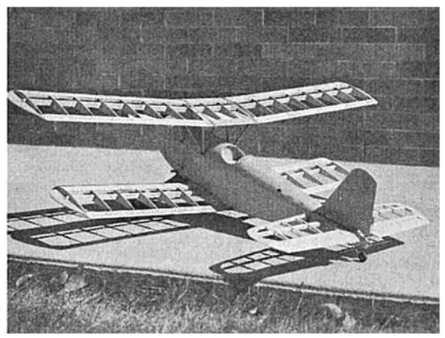
PFIFF

THE MAGIC BIPE

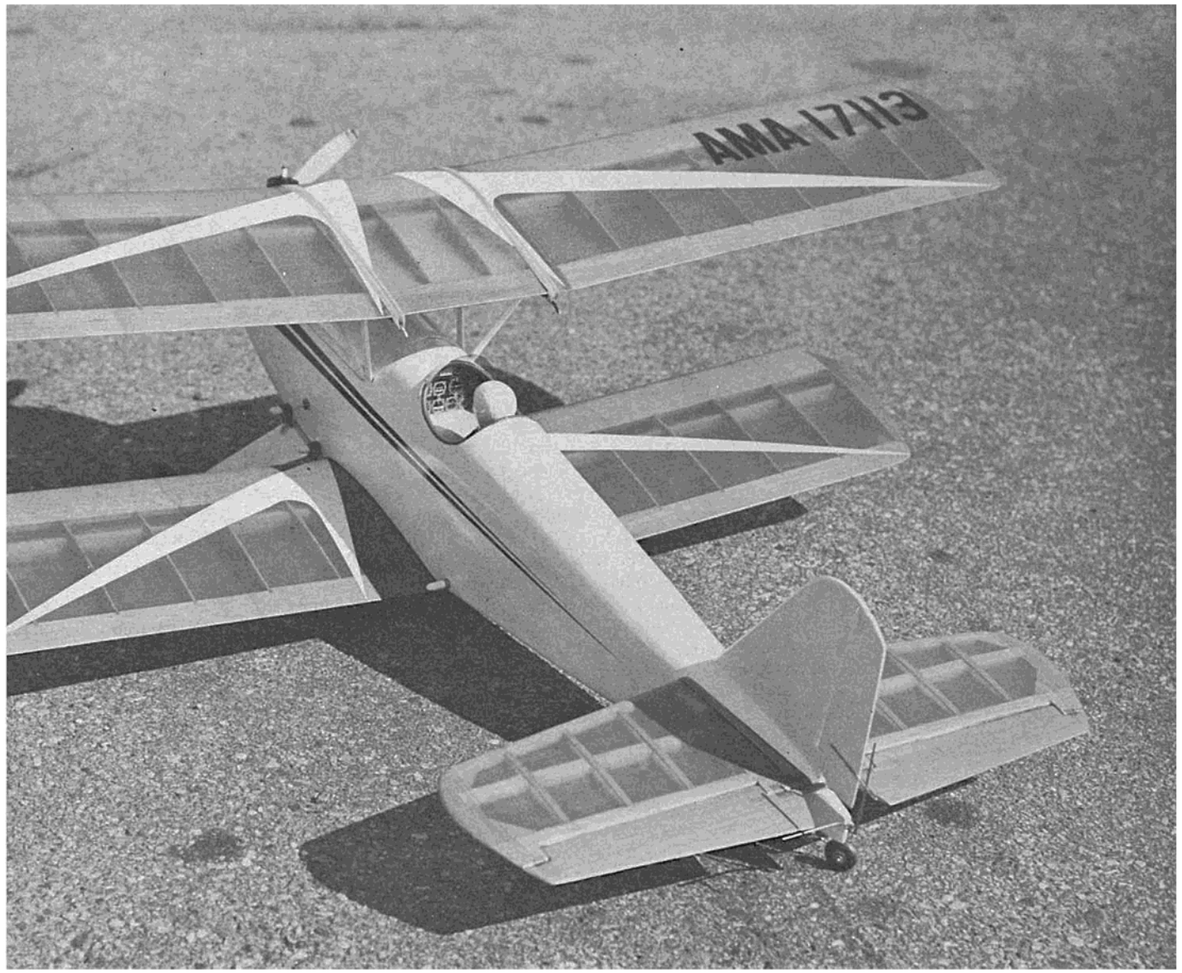
SINGLE CHANNEL, REEDS, OR PROPORTIONAL; PFIFF IS PURE MAGIC IN THE AIR.

by JOHN GARDE





The magic of the biplane of yesteryear is captured in the Pfiff.



IN August of 1963, my family and I saw our first air show in Stormville, New York. There, before our eyes, we thrilled to Stearman's modified Great Lakes's Trainers and Rod Jocylen's little stunt biplane performing sensational stunts and maneuvers over a dirt strip airfield. I had been toying with the idea of building a winged "hot rod" like all the other "Big Daddys," down at the local flying strip, but, man was my mind ever changed. Now nothing but a "Bipe" would do!

Previously, I had built a popular ½ A Bipe. This little Jewel was a lot of fun but did not perform too well in windy weather (5-10MPH). Perhaps I expected too much.

With enthusiasm and determination the plans for my dream were begun. This model would be stable in windy or gusty weather. She would respond to rudder going down wind, either dead stick or low motor, she would groove in a turn without dropping her nose, be rugged enough to survive rough landings, including the three point kind (two wing tips and a rudder), she would have eye appeal and would not stall suddenly in gusts. Last but not least, she would be simple enough to build and fly so that the average Joe could achieve maximum relaxation and enjoyment from her.

Keeping in mind the goals that I had set, I started in October of 1963 with pencil, slide rule, paper and a large pile of erasers. You see, I had never designed a model airplane before, nor was I trained in mechanical drawing. I did not finish the plans until late in January of 1964. Construction began in February and the first flight was the ninth or tenth of October. One year from conception to completion.

Its maiden flight was "right off the board" and it required only one trim change to achieve acceptable flight. Later, a friend built one using these plans except for a total weight of four pounds and a Torpedo 19. It flies just as well as mine. Still another is currently being built for R.E.M. proportional with no major changes other than motor size.

Pfiff is 32 inches long, has a top span of 44 inches, bottom span of 39 inches, and equals chords of 7⅜ inches. It is equipped with a Torpedo 15 with homemade throttle, nicads, F & M superhet, dual Varicomps and a modified OS motor control escapement for three speeds. It would be excellent for the new trio of Royal servos or six channel. The front half of the fuselage is fibreglassed. The original colors are white and red. The weight is 3½ pounds, with a wing area of 596.5 square inches. The wing loading is approximately 13 ounces per square foot, unless my math is incorrect. Now, if "Pfiff" appeals to you as it does to some of my flying buddies, let's get started.

If you are a beginner in RC and have not graduated from the Mombo, Esquire, or Live Wire Trainer type models, this is not yet the plane for you. With short coupled tails biplanes are more sensitive than the trainer type.

FUSELAGE CONSTRUCTION:

After studying the plans you will no-

On medium speed, and with reeds or proportional, Pfiff will do the Class II pattern with ease. We have done hammerheads, wingovers, loops, Immelmans, and sloppy tail slides even with escapement!

tice that the sides are one piece, cut from 4" x 36" Sig 3/32" soft. Cut-in the air foil for the lower wing carefully maintaining that 0° incidence, also note the stab is 0°. After gluing the 1/8 square and 3/16 square longerons, plus the 1/8 medium balsa doublers to the inside of the sides, glue the sides together at the tail, using a small 1/8 tapered block, allow to dry well. Incidentally, use only white glue, it gives the most strength and you will need it on hard landings. You can use contact glue for the doublers, but **not** the cabane plywood.

You should have all the formers ready by the time the sides are finished. Start with F2 and work back A, B, C, D, but take it easy! This plane has to be lined-up perfectly. This saves all the questions later when you are ready to fly. While the formers are setting up, get the 1/8 plywood out and knock out the doublers for the cabane anchor points and support.

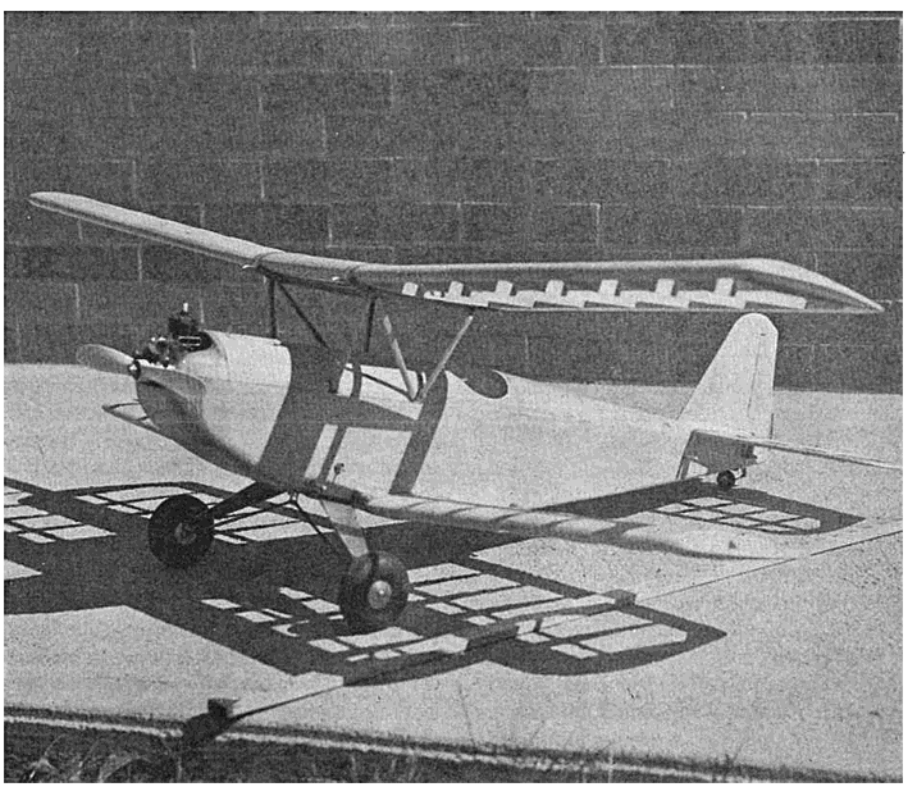
CABANE:

If you are more excited about the Bipe than you were before, good, but settle down Dad, everyone tells me the cabane on any Bipe is rough going and you have to make it now. Ready? Let's haul.

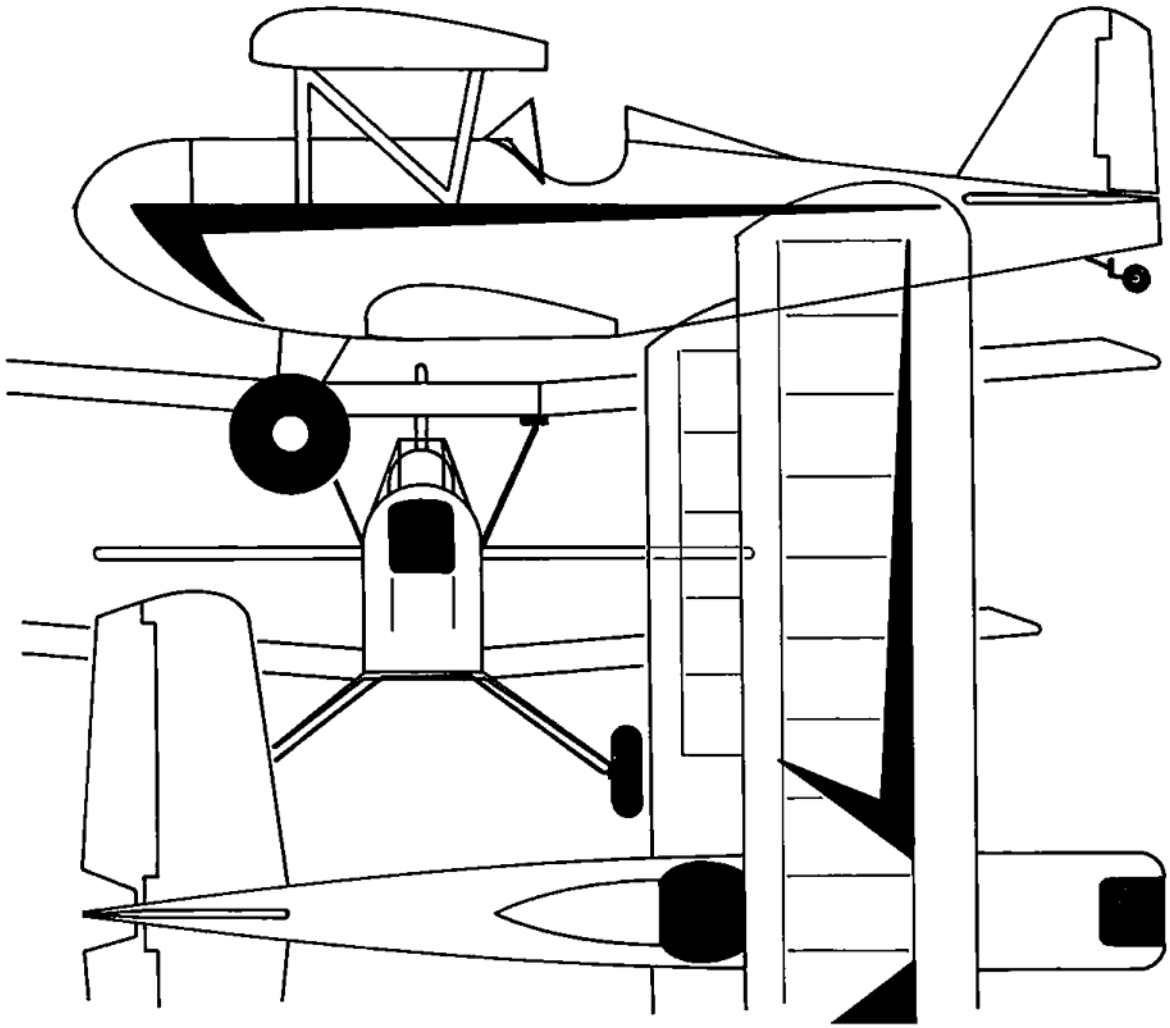
Bend the 90 mil cabane struts exactly as the plans show. There are two, friend. Throw the bad one away and make another, the wire is cheap! Make them alike, matched pair, twins, dig? Now draw, trace or whatever you wish, the outline of the cabane struts on the plywood doublers, and carve the grooves to accept the struts you just completed. NOTE: Grooves are on the outside of the doublers, i.e., between doubler and fuselage side. Also note that maintaining the angle of the rear cabane strut as shown on the plan, you will be building in a 3° incidence, which proved to be fine for both 3½ and 4 pound Bipes of this kind. Now cut the square and round holes in doublers, as shown on the plans, wire and epoxy the struts in place. Epoxy in the **groove portion** only, leaving the holes open for later filling. Place the strut and doubler assembly on a level table. Using a level, move the struts up or down to level the cabane before the epoxy cures. Level sideways, not front to back. They should not be too far off if you cut the grooves in the doublers very close beforehand.

Now you are ready to put this assembly into the assembled sides. Smear white glue on the outside of the cabane

(Continued on Page 22)



If you don't care for all that fancy stuff, Pfiff is a pleasure to watch just flying around at 25 mph — not 70 mph. There is a bit of nostalgia in the air when she is flying up there . . .



ENGINE

Use a .15, .19, or .23 engine. A .15 may be used with light weight equipment and where all-up weight does not exceed 3¼ pounds. For 3½ to 4 pounds flying weight, use a .19 or .23.

DIMENSIONS

Top Wingspan: 43¾" Chord: 7½"
Lower Wing Span: 36¾" Chord: 7½"
Total Wing Area: 560 Square Inches
Fuselage Length: 33"
Max. Fuselage Width: 3½"
Engine Offset: 5 degrees right
6 degrees down
Incidence: 3 degrees positive, top wing
0 degrees, bottom wing
0 degrees, stabilizer

FLIGHT CHARACTERISTICS

Stable, responsive, capable of all Class II maneuvers, depending upon engine size and equipment used. Surfaces, as shown, are balanced for use with escapements or simple proportional.

RC EQUIPMENT

First prototype used cascaded Varicomp escapements for rudder and elevator and SN escapement on throttle. Later versions used six channel reed equipment and proportional. Adequate room for newer "full house" propo gear.

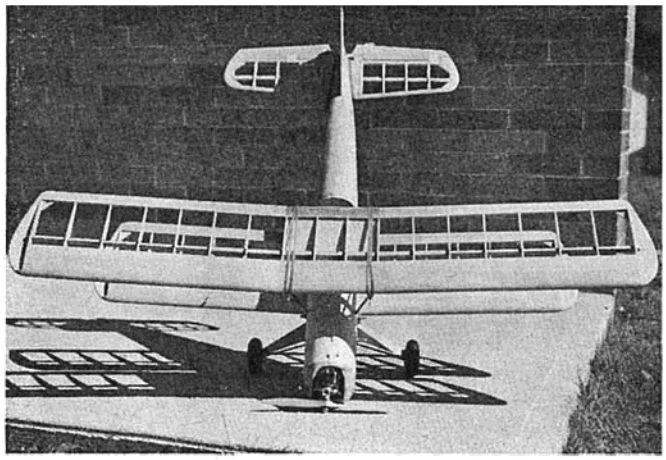
MATERIAL LIST

(balsa unless otherwise specified)

Wings:
(4) 3/8" x ½" x 36"
(4) 3/16" x ½" x 36"
(4) 5/16" x 1¼" x 36" T.E. stock
(8) 1/16" x 3" x 36"
(1) 3/16" x 2" x 36"
(1) 6" x 12" x 1/16" plywood
(2) 3/32" x 3" x 36"

Tail Group:
(1) 3/16" x 4" x 36"
(2) 1/16" x 1/8" x 36"
(2) 3/8" x ¼" x 36"
(2) 1/16" x 3/16" x 36"
(1) ¼" x 1" x 36"

Fuselage:
(1) 6" x 12" x 1/8" plywood
(1) 6" x 12" x 1/16" plywood
(1) ¼" x ¼" x 36"
(2) 3/16" x 3/16" x 36"
(2) 1/8" x 1/8" x 36"
(1) 1/8" x 4" x 36"
(2) 1/16" x 3" x 36"
(1) ½" x 4" x 6"
(1) ¼" x 3" x 36"
(2) 3/32" x 4" x 36"
(1) ¼" x 36" dowel
(1) pair 3½" DuBro wheels
(1) radial motor mount to suit engine
(2) 3/32" x 36" music wire
(1) dural landing gear
miscellaneous hardware



Basic structure, sans covering. Strong and light weight.

Completed Pfiff turns in outstanding sport performance on virtually any equipment combo.

doublers. Have plenty of clamps or inverted clothes pins ready. Now slide the assembly into the fuselage, engaging and flush with the back of F2. Clamp doublers to sides, lining up the straight edge of the doublers with the straight edge of the fuselage. Hurray! It's in. Let it dry well. Make F1 while you are relaxing.

Mark off the fuselage for that 5° right thrust (F1 mounting position) and glue in, also, glue in ¼ square gussets at bottom and sides.

Now is the time to put the cross grained bottom of the fuselage on, note the plywood for landing gear, and also put the turtle deck and cockpit on. Leave the bottom rear uncovered at this time. On the plan I have noted that to form the turtle deck, cockpit and hatch, I use ammonia. That is regular household ammonia. It is better than water or steam. Cut the 1/16 sheet to the approximate size you will need for the turtle deck and soak in the ammonia. The ammonia will cause the wood fibres to actually slide. When the wood has dried upon the form it is to be glued to, you can release the clamps or rubber bands and the wood will retain its shape. It will not spring to a larger radius. So don't look stunned, it really works, try it.

Considerable thought should now be given to how you will install your RC system. Install it while the bottom rear is still open and the cabane is unfinished.

FINISHING THE CABANE:

Preform the wing pad wire struts. It is not difficult if you use a small vise, hammer and pliers that have good gripping ability. Secure the wire in the vise, then, while pulling the wire with pliers, tap it in the direction desired. Gradually work in the curves from one end to the other and match the wire to the plans often.

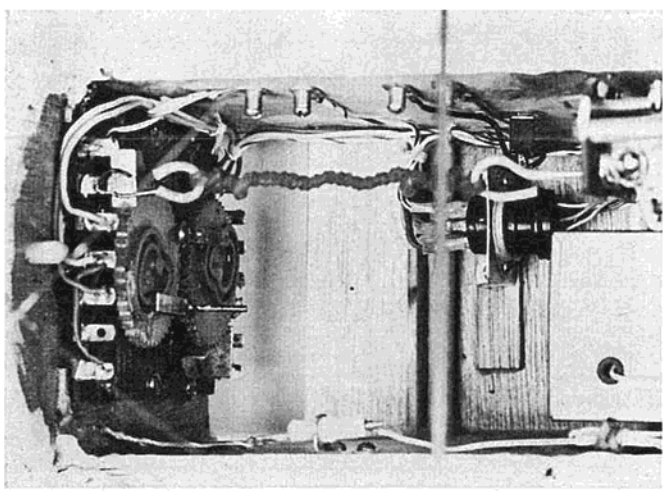
The formed wires have two advantages. (1) They, with the plywood, provide an accurate cradle for the wing, (2) the bend prevents the plywood pad from sliding back and forth if the epoxy bond loosens.

Secure the pad struts to the cabane struts on the fuselage with #22 AWG copper wire and solder. Secure them to the underside of the cabane struts. Maintain right angles the best you can. If you have had trouble soldering piano wire in the past, try using stainless steel flux by Kester Solder Co. Continue by bracing the top of the cabane diagonally wtih .010 - .015 piano wire. Draw it tight to obtain the right angles mentioned before.

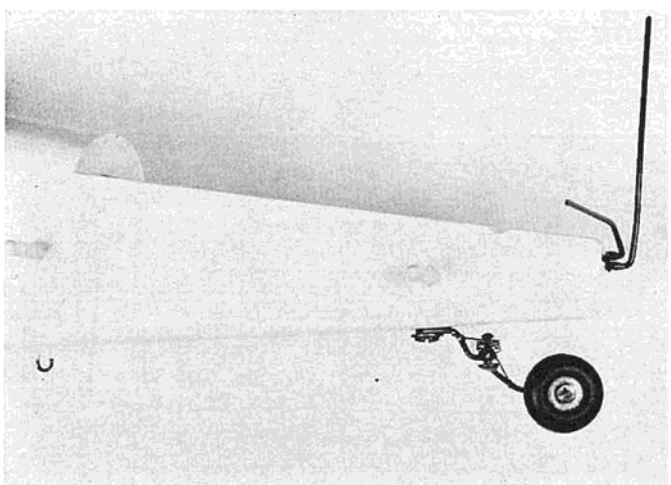
Bend up the side diagonal braces. Bind with wire to the cabane and solder. The fuselage can be protected with an aluminum wrap. The plywood pads are next. Cut two 1/8" x 1/2" x 7 1/8" plywood. The 1/8 pad is actually in three pieces. The first one is from the L.E. to the front of the first cross strut, the second is between the two cross struts and the third is from the rear of the rear cross strut to the T.E. Total length is 7 3/8" including the space or gap for the cross cabane struts. Put several cuts half way through the plywood with a razor blade, 90° to the formed wire pads so you will be able to fit the front and middle pads to the formed wire pad. Space about 1/8" between cuts at the bottom of the pads. Now drill

(Continued on Page 77)

First prototype in 1964 used cascaded Varicomp's — did rolls, Immelman's, tail slides.



Detail shot of suspension type tail wheel.



PFIFF

(Continued from Page 22)

small holes in the plywood pads for thread or #22 copper wire. Hysol's Epoxy patch will make it one unit. Keep the pads level by putting a straight edge across them from R to L until the epoxy starts to cure. When the epoxy has cured completely add 1/16 plywood to the top of the 1/8 pads, to cover the gaps. Round off the leading and trailing edges and sand the tops to get a more perfect fit for the upper wing. The cabane is finished except for the 3/8" x 1/8" Balsa struts. Sand grooves to fit the wire. Also sand the radii and glue to wires with Dart glue or Ambroid. Then silk later.

Now you can fill the holes in the plywood doubler with epoxy, making sure that the epoxy flows down, in and around the cabane struts. They will never come out now.

HATCH CONSTRUCTION:

You may have your own way of making a hatch, but this one isn't too difficult. Using the 3 tops of F1, with 1/4 square holes, cut out of the top and sides, make the hatch frame. Place the front hatch former back a little to allow for the "L" bracket and screw hold down. Adapt the middle former to your R.C. equipment. The rear hatch former is 1/8" forward so as to make up to the F1 top, F2 combination. Glue F1 top former to F2 with 1/16 clearance all the way around. This will provide a step which the hatch will fit. Put peg in F2, a hole in the rear hatch former will pick up this peg when you slide the hatch in. Then rubber bands or hooks will not be needed to hold the hatch down. Cover the hatch like the turtle deck.

Adapt the second unmarked former in the fuselage to your tank and battery requirements.

Use 1/4 hard sheet or blocks to build up the nose, altered of course, for your particular engine. The nose blocks should be 1/16 higher than the round top of F1 so as to be flush with the hatch when it is in place.

When you have the R.C. equipment in, including the pushrods or torque rods, sheet cover the rest of the bottom cross grain. It seems that if you put in all the dowels and the tail wheel you are over the bump.

STABILIZER:

The stab is a breeze. Lay out the entire frame for the stab all at once, tips, center section, leading edge, trailing edge and then glue. While the glue is drying, mark off the stations for all the cap strip ribs. This is also a good time to cut out the rudder, fin and elevator halves. Might as well glue the elevator together because the tail is almost finished. Oh yes, have you also glued in the 1/16 x 1/8 strip? They go in the center on the inside of the leading and trailing edges. While they are drying, get the 1/16 x 3/16 strip stock and cut the strip ribs to size, right on the stab. Hold one end of rib down at T.E., bend over spar to L.E., cut with a razor blade and make two each time.

Now take the stab off the plans, have 16 spring type clothes pins ready, a little dab will do ya, glue, i.e., on the rib stations, top and bottom. Install the strips, top and bottom, two at a time, hold with one clothes pin for L.E. and one for T.E., then just keep going. Now it is finished. Mine took about 1½ hours from start to finish.

Carve the balsa blocks used for the fin supports. They are sufficiently strong to support the fin in the roughest landings. Glue the fin and blocks to the stab. Sand leading and trailing edges of the stab, fin, elevator and rudder as shown, then the tail is ready to be covered.

WING CONSTRUCTION:

There are no unusual features in the wings. I used the NACA 2412 because it provided enough thickness to keep the Bipe slow, yet have plenty of lift. It has acceptable stall characteristics, because we are able to get a tail slide (not perfect) on escapements. I wasn't able to purchase a preshaped L.E. to match this section at 7⅜ chord, thus the shaved 3/8 x ½ L.E. stock. I know these wings are rugged because I cartwheeled this model several times on landings and they held together just fine. There are 33 ribs and 22 of them are identical. The other 11 vary slightly due to the sheeting differences between upper and lower wing center sections and difference in spar thickness, where the plywood dihedral braces appear. Make aluminum rib templates, to aid you when cutting the ribs.

Now with all the wood cut and L.E. shaved, remember, Bipes don't like warps so don't build any in. First glue all the dihedral braces to the spars, leading and trailing edges, being sure that they all line up with the 4½° angle on the plans.

Construct the center section first. Pin the T.E. down flat and with the ribs on the spar not glued yet, insert them into the T.E. With some 7/16 stock, prop up the L.E., now glue the ribs in. Be sure the spar is parallel to the L.E. and T.E., then glue it also. Next, the 1/8 and 3/16 spar, then when that is dried, pin and glue the sheeting on it and wait until it all is well dried. Half an hour will be sufficient if you use white glue. Apply glue to the shaved leading edge and the tops of the four ribs (center section), then clamp the sheeting to the leading edge. When this has set, you will have a very sturdy center section which will hold the wing panels true.

Except for sliding the ribs in place on the remaining wing panels, the construction of the right and left panels is essentially the same as the outline for the center section. Just pin down the trailing edge of the panel you are going to finish, prop up the leading edge, then follow the same procedure as above. Use an aluminum template to aid you when you carve and sand the leading edges.

I mentioned before that Bipes do not like warps, so I will endeavor to point out briefly how warps occur and how to build a truer wing. I have read many construction articles by many modelers, but I cannot remember anyone offering any solutions for eliminating warps. Maybe they all assume everyone else is an expert. Not so, just look at the guy who is having trimming problems with his very simple model, he seems to be in a majority around my neck of the woods.

Warps are caused by internal or external stress in the wing. By internal, I mean the wood itself, those spars that had small warps to begin with. The twisted leading or trailing edges that you forced to be straight pinning or clamping when you are building a panel. The spar you bent up, down, or sideways to go through the misplaced hole

(Continued on Page 80)

(Continued from Page 79)

in the rib. The ribs that were just a trifle too long and you forced them into place. It is these little things that add up to big warps and possibly a wiped-out model. I won't make any points on this one, but cellulose glue joints produce tremendous strains. They vary greatly with the amount of glue. White glue does not have this characteristic, it just joins the wood together.

The external stresses are in the silk and silron that you pulled tighter than a snare drum head on one side of the wing and hardly tight enough on the other. Sometimes, you put on varying amounts of dope and it shrinks unevenly. Incidentally, Butyrate Dope takes about six months to cure, and it gets tighter during that time.

Now for a few hints on making better wings. Notching ribs into the leading and trailing edges will help when you have twisted stock. Leave the small twist as it is, assemble the wing, and later carve or sand the structure true. It is much better to have the ribs slightly loose than tight, so fit them in with a little clearance on at least one end. If you have a spar that twists slightly at the end and which also bends down, don't force the spar to untwist or bend up when you slide the ribs on, rather, make the holes larger or lower or whatever it will take to get the ribs in place without stressing the spar. Make small cleats from ⅛ or 3/16 square stock. Glue them in to make up for the glue area that you cut away to let the spar pass through. Sheeting the top ¼ to ⅓ chord back from the leading edge also helps in resisting warps. It is worth while to let wing panels set up at least a day or night before removing them from the plans.

It will help in covering to do it in good lighting so you can see the silk grain. When applying the wet silk, gently straighten the grain so it runs along the span and chord, not diagonally. While it is still wet, gently pull out all the wrinkles, looking along the edge, you will see them clearly. It is not necessary to pull it so tight that the structure bows.

Apply 50-50 dope to the outside edges through the water, but do not dope the ribs. Silk the whole structure at one time, it helps to prevent those terrible warps. Let the wet silk dry all night. You will sleep better anyway knowing that the wings will look straight in the morning.

I have omitted discussion of the landing gear and tail wheel because you will have your own ideas about these. You will note the particulars of my gear on the plans.

I suggest that you fibre glass the fuselage. It sure strengthens the front end. I fibre-glassed the hatch also for the same reason. Use light fibre glass cloth on hatch and sides, heavy coarse cloth on the nose and bottom, back to the lower wing leading edge.

In finishing Pfiff, I use two coats of sanding sealer on everything, sand between coats, then cover everything with silk. Seal the wings with dope cut 50-50 and apply with a moderately full brush, slowly, not overlapping too much. If you get a run, turn the wing upside down quickly and brush it out. This method usually seals 99% the first go-around.

Clear dope the wings and use a minimum of color dope on them. Sand between coats and use a heavy coat of sanding sealer for the third coat.

I do not like to see wood on this type of Model, so I color doped the fuselage, then clear doped over the color. Always sand between coats to obtain a well finished model.

FLYING:

The first Bipe flew right off the board in October of 1964, with the following setup: 3° down thrust, 3° right thrust, upper wing at 3° positive incidence, lower wing 0°, and Stab 0°, level elevator and straight rudder. The C.G. was at the spar of the upper wing, with the nose slightly down. I recommend that you leave everything as is, even if yours goes to 4 pounds, except the thrust. It was necessary to have more right thrust and we stopped at approximately 5° or slightly more to obtain straight flight under power. Our 3½ pound Pfiff will penetrate a 15 MPH wind. Whether dead stick or low speed, it turns on command going down wind for your approach.

I must admit that I have never flown S.C. with a pushbutton, I have always used a stick box. I think power landings or low level passes on low or medium speed are by far the most impressive, especially when you can see the little pilot in there. If you have been flying for over six months, you can do the AMA pattern on medium speed very easily. Pfiff grooves either direction, in what appears to be a proportional turn. We have done hammer heads, wing over, loops, Immelman, sloppy tail slides, rolls and power landings. I tried an outside loop, and Pfiff will tuck under easily, but I chickened out. You will need to be in medium speed for ouside loops and inverted flying. Pfiff will square off a loop also if you are fast enough.

If you don't care for all that fancy stuff, Pfiff is a pleasure to watch just flying around, not travelling at 70 MPH, but at 25 MPH. There is a bit of nostalgia in the air when she is flying up there. I like Bipes. I sure hope you do, or will.