

'TWIRP'

By DAVE GIBSON

INTRODUCTION:

● In developing this 4-H project, one of the basic philosophies I tried to live up to was: Provide the maximum opportunity for long duration flight through simple planes that build quickly. The phrase to understand is "long duration." To me that means a flight so long that the laws of gravity are exceeded in the novice's mind, and the experience spreads across the ego like a blush.

This feeling is not limited to novices, of course. At a recent contest in this area, I heard a gym-full of experts applaud the flight of Charlie Sotich's Volksplane peanut, when this anti-gravity feeling engulfed the crowd as Charlie's plane flew almost forever.

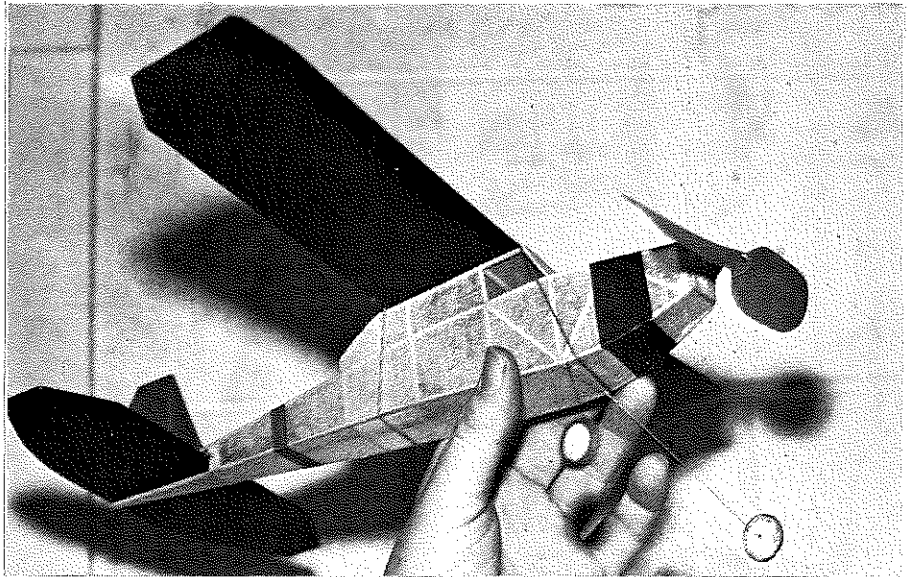
The idea is to generate this feeling in the members quickly, and to allow them to achieve it without all the search and frustration that follows the beginner who tries to get into the hobby on his own. It is the thrill and the accomplishment of flight which, I feel, are prime motivations.

The side of our hobby that frequently shows itself to the novice is the difficult kit in a mass merchandising outlet (where perhaps no model plane magazines are sold), and because the plane appeals to him and he has fantasies about its flight, he enters the hobby. Disappointment may turn him to other interests.

If, at one time or another in your life, you struggled with manhole-cover-kits of rock hard balsa that refused to fly on the rubber strip provided, you know what I mean.

I know there are people who say, "The heck with him! If you want to succeed in this hobby, you have to try and try again, on your own, like I did!" To those people I would suggest that they are rationalizing their own selfish interests. They are defending themselves so they will feel no guilt because they do not share what they know with those who want to know. Fortunately for all of us, I also know many other people who do not feel this way. But as I have worked this project out, and as it has gone on for so many months, I cannot forget that it was the 4-H and the School Department that made it all possible. It was not the hobby, its organization or clubs, nor the hobby industry that did it; and that is something we should think about, isn't it?

In planning what each plane in the project should be, the costs, the new learning experiences each should provide to the members, and so on, I decided on



a paper airplane, a North Pacific "Sleek Streak," and after that I would have to design some planes. Four planes make up our first indoor flying season. In addition, but not a required part of the project, the members have access to my many plans for building other planes. And to break up the program, we have paper airplane and "Streak" contest nights. As we move from the indoor program to outdoor flying, the traditional evening is an outdoor project of building and flying the "Flash X-18," from Frank Zaic.

Our operation was established from a cost standpoint, so that after an initial payment, small dues would pay for the project through the indoor season and the construction of the first outdoor model, as well as for glue, pins, building boards, and materials. . . also soda, cookies, and prizes on contest nights. The theory here is that the time period in which a plane is built and flown allows the accumulation of funds to pay for it and to make a dent on the next project.

As more complex and more expensive projects are undertaken, we think in terms of fund raising. That may seem impossible to some people, but the 4-H can organize for this sort of thing. Another 4-H project in this area raises about \$500.00 each year on a chicken barbecue, and there are popcorn sales at public events, cake sales, paper and can recycling projects, and so on.

The project itself can't provide the total learning experience, and to augment what is presented during the meetings, the reading of magazines is encouraged. Youngsters find the cost of model plane magazines high, but I felt they should not be denied access to them for this reason, so public libraries, school libraries, and a School Committeeman were contacted to see if they would add MB to the school and public library magazine racks. Some have added the book, and others will at their next

budget year.

People in general have been very cooperative with our program. Perhaps this is simply a characteristic of our area of the country, possibly nostalgia has something to do with it, but I'm convinced that the excellent reputation and the organizational ability of the 4-H in our county was, and continues to be, an influencing characteristic in the cooperation we have found. As a result, we make every effort to insure that everyone in our group adheres to all the rules anyone may establish.

In searching for an outdoor flying site, I had been told by many people that the local private airport was definitely out. I wrote to the owner asking if we might use the site. In a delightful letter of reply, he said, "The airport is open to the flying public. Size of aircraft is not specified" . . . so we have an outdoor site!

But on to the "TWIRP." The word refers to something silly, according to Webster's, but things which may be or look twirpy can often fool this first judgement. Our "TWIRP" flies, generates the blush on the mind, and is apparently forgiving of all the different "building techniques" youngsters can generate. Covered in everything from condenser paper, to art tissue, to Christmas tissue wrapping paper, and even Japanese tissue, the plane flies. It flies very well indeed. While outdoor flying has too many variables for accurate recording purposes, the indoor record is 70 seconds under a 22 foot ceiling. This version of the plane was built with light weight (but not indoor) wood and was covered with regular tissue.

There are one or two places in this plan where decisions have to be made. The aft cabin roof and the wing trailing edge pieces at the tip, are curved. This was done to introduce forming of balsa by soaking it, wrapping it around a curved surface, and heating it dry . . . a

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prelude to a later exercise in forming prop blades. All these pieces can be made straight. Wing ribs are shown flat bottomed or undercambered. The flat bottomed version is recommended.

Trickiest area is at the wing tips. The bottom of the wing sweeps up to the tip piece, which attaches first to the wing spar. The wing is built flat, and then cracked for dihedral.

The directions on the plan say "shim stab in place." This may be confusing and difficult for novices, so an alternative method was devised. Make a loop of elastic thread (available where sewing supplies are sold), put it over the fuselage, under the bottom of the stab, and around the end of the fuselage. Tiny shims (scraps of balsa) can then be placed between the leading edge of the stab and the underside of the longerons until proper incidence is found.

The area needing the most practice was in making ribs, but once the youngsters learned the technique, things went smoothly.

The project, I feel, is working well. Similar programs could be run in your area for the 4-H, Scouts, Cubs, Boys Club, YMCA, and so on, or for any group of kids. You'll find the kids are interested and interesting, and the learning process for members and the adult leader is pretty much an equal swap. You would be building your hobby and making a contribution to a bunch of kids... and yourself. Everybody gains something.

FUSELAGE

1. Use thumb tacks or pins to attach the plan to the building board.

2. Cover the plan with plastic food wrap so that wood will not stick to the plan.

3. Cut the top and bottom pieces of the fuselage (these are called the "longerons"). Soak in HOT water for 20 minutes. Pin these to the plan. DO NOT push pins through the wood. Angle the pins so they hold the wood down.

4. Pour a small amount of white glue into a little dish or plastic cup, and thin ever so slightly with a few drops of water.

5. Cut the "uprights." These are the pieces that attach to the 2 "longerons." Cut these pieces a little LONGER than they should be. Use an emery board or a sanding block to sand these pieces to the proper length. If any piece comes out too short, replace it.

6. Use a small watercolor paint brush to apply a tiny amount of glue to both ends of the "upright" and to the "longerons" at the spot where the "upright" is going to be placed. LET THE GLUE DRY. When it is dried, once more brush a small amount of glue on the ends of the "upright" and pin the "upright" in place. By using this method, you will get a strong fuselage that is light in

weight.

7. Make the hole for the motor peg before gluing this "upright" in place.

8. Build the rest of the fuselage side. LET IT DRY ON THE BOARD OVER NIGHT. The reason for this is to prevent warps.

9. Next day, remove the pins, but DO NOT MOVE the fuselage side. Leave it where it is on the plan.

10. Place a piece of plastic food wrap over the fuselage side you have already finished. Make sure the plastic has no wrinkles.

11. Build the second side ON TOP OF the first side, and let it dry over night.

12. Next day, remove the pins, and gently remove both sides from the board. Reglue any pieces which may have come loose.

13. Stand each side up on the plan and pin it to the top view of the plane, starting at the rear. Pin only where the bottom of the fuselage is flat. Now cut, sand, and fit one bottom "cross piece." When it is the proper size, cut a second piece the same size. Glue one piece at the bottom and the other piece above it at the top. DO NOT glue in the "cross piece" to which the landing gear is attached.

NOTE:

Sometimes the cross pieces which connect the tops of the fuselage sides are difficult to glue in place. One trick to solve this is to glue and hold the piece in place for a few minutes, and then put blocks, books, glasses of water, or whatever, on BOTH sides of the fuselage to hold the piece in place.

Make sure when you do this that you do not bend the fuselage to the side.

14. Glue the two sides together where they meet at the rear of the plane. LET DRY OVER NIGHT.

15. Next day, gently remove the fuselage from the plan. Cut and sand the remaining cross pieces and glue in place. Keep lining the fuselage up with the plan so it will be straight. Pin the fuselage to the plan JUST at the point where the bottom cross piece is located.

16. Cut "Former A," cut out center section, and glue to nose of plane.

17. Bend landing gear wire as shown. Wrap to 1/16 x 1/8 cross piece with thread, and rub some glue into the threads. When glue is dry, rub in some more glue. Now glue this piece into the fuselage.

18. Cut the wheels from a foam meat tray. Make center holes and glue in aluminum tubes as shown. When dry, place on landing gear and bend ends of wire up to hold wheels in place.

19. GENTLY sand fuselage to remove excess glue. Sand the edges of the longerons JUST A LITTLE BIT to make them rounded.

20. Cover the fuselage with tissue. The "grain" of the tissue must run along the length of the plane. To find out which

way the grain runs, hold a sheet of tissue in front of you. Make a one inch tear from the top of the sheet. Now make a one inch tear from the side of the sheet. Look at each tear carefully. One tear will be a crooked line, and the other will be a straight line. The STRAIGHT LINE shows you the direction in which the "grain" runs. Cut the tissue so the grain runs from the front of the plane to the back.

21. Cut each piece of tissue larger than the side of the plane being covered.

22. Mix half white glue and half water in a small container. With the brush, paint this mixture ONLY on the edges of the side being covered. In other words, paint only the longerons, not the uprights or the cross pieces. DO paint the uprights that hold the motor peg.

23. Lay the tissue on so that it has no wrinkles. Do not try to pull the tissue too tight.

24. When the glue is dry, cut away the excess tissue with a new, sharp double edge razor blade. (Break blade in half lengthwise with pliers so there will be two pieces, each having one cutting edge.)

25. When all four sides are covered, the tissue can be shrunk. Do this by spraying water on the plane. DO NOT SOAK! Hold plane far away from the sprayer, and give one spray to each side. Let dry. Do not spray again unless tissue is still very baggy. Too much water may cause warps.

26. Paint one coat only of the following mixture on the fuselage:

1 ounce NITRATE dope.

1 ounce Nitrate dope thinner.

20 drops Castor oil.

27. Cut cellophane for windows and windshield. Glue in place, using Tester's model plane glue.

STAB AND RUDDER

1. Follow the same building technique you used on the fuselage.

2. BE SURE you leave these parts pinned to the board over night.

3. Sand (Gently!) each part down slightly to remove excess glue and some weight. Round leading edges.

4. Cover, but DO NOT SHRINK tissue. The tissue grain should run the length of the stab and from top to bottom of the rudder.

5. Paint one coat of dope mixture on one side of stab and rudder, and pin these parts to board until dry. When dry, paint other side and pin parts back to board.

WING

Wing ribs can be flat bottomed or can have a curved bottom (called undercamber). Novice builders should use the flat bottom ribs.

1. Cut ribs. To do this, place a piece of cardboard, thin plywood, or any other fairly hard material underneath the outline drawing of the rib. Make a series of

pin holes through the outline and into the cardboard. Work around the rib.

2. Connect the pin holes in the cardboard, and cut out the rib. CUT the rib larger and then sand down to the outline.

3. Make a second cardboard rib by pushing the pin through the holes you made in making the first rib. Cut out and sand to shape.

4. Place one rib on top of the other rib so they are *exactly* lined up. Push a pin through both ribs near the front, at the middle, and half way to the back of the ribs. Remove all three pins.

5. Cut 12 pieces (10 plus 2 extras) of 1/32 balsa wood which are *slightly* larger than the cardboard ribs. Make a "sandwich" with the pieces of balsa wood between the two cardboard ribs. Push pins through the pin holes you made in the cardboard ribs in order to hold the "sandwich" together.

6. With a sanding block, *gently* sand the balsa wood until it is the same size as the hard cardboard ribs.

7. Before taking out the pins, cut or sand in the "notch" on top of the ribs. Fit a piece of 1/16 x 1/16 stringer into the notch to make sure the notch is the right size.

8. Pin the leading edge and trailing edge of the wing to the plan.

9. Glue the ribs in place, making *certain* that they are not tilted to one side or the other. Let glue dry over night.

10. Cut the "spar" which will fit into the rib notches to the proper length, and glue to each rib.

11. Cut the wing tip piece and glue it to the spar. NOTE: To make absolutely sure that the wing tip pieces are glued in straight, place pieces of paper or scrap wood under the tip pieces so they rest flat. Put a small piece of plastic wrap between the tip piece and the paper or wood used to hold it in place so the glue won't stick everything together. **LET DRY OVERNIGHT.**

12. Next day, fit in place the two pieces that go from the leading and trailing edges to the tip. When they fit well, glue in place.

13. When glue is dry, remove pins. Crack (just barely!) the leading and trailing edges where shown. Put glue in the cracks, and pin the center section of the wing to the board.

14. Prop up the wing tips so they are exactly one inch off the board. Let glue dry.

15. Cover bottom of wing and then top of wing. Grain of paper must run from one wing tip to the other. If using flat bottom ribs, do not put white glue mixture on the tops or bottoms of ribs, except for the two ribs that make up the center section. Cover bottom of wing with one piece of tissue. Cover top of wing with 3 pieces (one for center section, and one for each outer sec-

tion of wing).

16. Shrink *one* wing at a time. Make sure *no* water gets on center section or other wing. Use *one* spray on bottom of one wing and then the top. Pin *that* wing to plan and let dry. Then do other wing the same way. Pin to board and let dry. Then do center section the same way. Pin to board.

17. Paint *one* coat of nitrate dope, thinner, and castor oil on one wing. Pin to board until dry. Then do other wing and then the center section in the same way.

PROPELLER

Carving of a propeller from a block of balsa requires more skill than is needed to build the TWIRP, so we have chosen to go with the ready-made plastic type. This permits the beginning modeler to get in the air successfully without having to jump this hurdle. We highly recommend the Peck-Polymers plastic prop. It is lighter and has a more efficient blade shape than the popular "Sleek Streek" prop.

If you wish to try carving your own, a prop blank is shown on the drawing. The how-to of prop carving, if done properly, would take an article by itself, we don't have room for it here. Seek the help of a modeler experienced in prop carving. It's not so difficult once you get on to it.

NOSE PLUG

1. Cut nose plug pieces larger than shown. The "grain" of each piece should run in the opposite direction from the piece in front of it and behind it.

2. Cut the pieces for the part that fits into the square hole in "Former A." Cut these pieces slightly *larger* than the square hole. Glue them together with the grain of each piece crosswise to the one next to it. Let the glue dry thoroughly. When dry, sand each side edge a little at a time until the part just fits snugly in the square hole.

3. Place this part PART WAY into the square hole. Put a heavy coat of glue on the forward surface of the part and glue the nose block to it. **BE CAREFUL NOT TO PUSH THE PART ALL THE WAY INTO THE SQUARE HOLE!!**

4. When the glue is dry, remove from square hole and make certain no wet glue is on edges.

5. Now put part all the way into the square hole, and sand nose block square with fuselage.

6. Make hole through nose block for the aluminum tubing. Hole should be pointing slightly down and *just a hair* to the right as viewed from back of plane.

7. Widen hole on the back side (the part that goes into the fuselage).

8. Fit aluminum tubing into the nose block. Glue at back where you widened hole, by putting glue into widened area.

9. Bend music wire prop hook. From the back of the nose block, run the

music wire through the aluminum tubing, through the washers, and through the propeller. Make bend in wire to hold everything together.

FINAL ASSEMBLY

1. Glue rudder in place. Make sure it is straight up and down and is glued on the fuselage straight from front to back.

2. Put the stab in the slot provided. Wedge the stab leading edge in place by putting small pieces of balsa over and under the leading edge where it passes through the fuselage. Later on, glue the stab in place once you have found the proper location by test flying and adjusting.

3. Place (DO NOT GLUE) the motor peg in the fuselage.

4. Place (DO NOT GLUE) the nose block and prop in the fuselage.

5. The wing is held in place with a light elastic band, or make a loop of elastic thread.

FLYING

1. Cut a short loop of 3/32 or 1/8 rubber. Wash it, tie the knot, run it in to the fuselage through the square hole so the knot is at the back, and slide the motor peg through the loop. Wind in a few turns and test fly.

2. If plane stalls, slide wing back on fuselage. If it continues to stall, raise the leading edge of the stab slightly by changing the balsa pieces that hold it in place.

If plane continues to stall, add small pieces of card stock between nose block and body of plane, on *one side*, so that plane flies in tighter circle.

Further corrections for stall can be made by adding "down thrust." Place pieces of card stock between nose plug and top of fuselage so that propeller points down more.

If all else fails, add clay to the nose.

3. If plane dives, move wing forward. If it continues to dive, lower the leading edge of the stab. If this does not do it, sand away some of the nose block or add a tiny bit of "up thrust" by placing a piece of card stock between the nose block and the bottom of the fuselage.

4. If plane spirals in to the left, add more "right thrust" (card stock between nose block and *left* side of fuselage).

Further corrections can be made by steaming the left wing over a kettle of boiling water and *gently* bending the left wing's trailing edge down *slightly*. Remove from steam and hold in your hands until set.

5. If plane spirals in to the right, try adjustments opposite to those above.

6. When plane is climbing in circles and flying well, replace motor with 14 to 18 inch loop. Clean, knot, and lubricate. Then stretch-wind using a mechanical winder. **HAVE PATIENCE AND GO SLOWLY.**