Buhl Bull Pup

by Vern Zundel

Wind in the rigging recalls earlier birds. This old classic stirred thinking in it's day. A Fox .40 in a Semi-Scale R/C.

Some years ago I had acquired a collection of Berkeley kits (now out of business) and was intrigued with a kit called the "Buhl Bull Pup." It was 1½" to the foot and I thought it would be very interesting to see how this aircraft design would work out in a larger R/C size. With pen in hand I started with a few mathematical equations and before I had realized how far I had gone, I was constructing it in 2½" scale. I am somewhat lacking in the history on this airplane, but I did find out that it was one of the classic planes of the golden age, built around the 1930's. It had a very unique sheet metal fuselage and tail surfaces. Most of these planes were finished in natural aluminum wherever metal skin was used and the fabric wings were sprayed aluminum to match. I chose the color scheme because I remember seeing one of these planes published in Sport Flying some years ago. It was of identical color, using a dark blue fuselage, and cub yellow for the wings, stabilizer, and elevator. It would also be a very attractive plane in chrome MonoKote.

As you can see by the photos, it's not a hard or complicated plane to make. I started by building the wings complete, including the root rib, and then cutting out the section to install the window assembly. If you first build the entire wing, you can be assured of a true wing before cutting into the root rib for this construction area.

You may have noticed that I have added some improvements in the wing since some of the photos were taken, as I found it was necessary after the first tests to insure a more rigid wing panel. Some builders might wish to eliminate the wing window, but I suggest it be used as it was one of the outstanding features of this airplane.

The vertical stabilizer and rudder are made up of ¼" balsa stock and proved to be very reliable in a self-supporting rudder assembly. It's very simple and easy to construct as was the horizontal stabilizer.

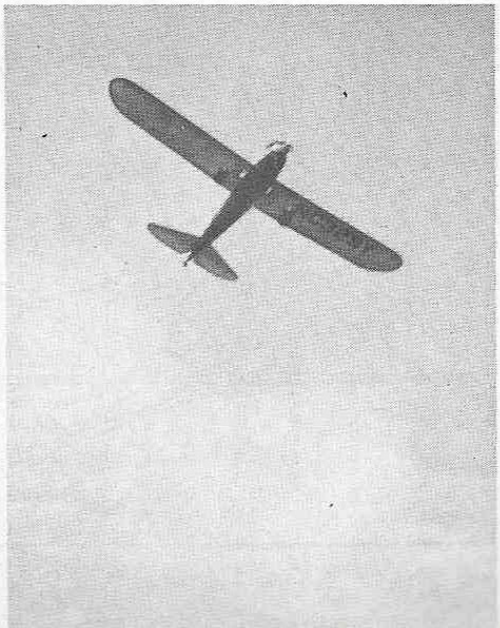
The horizontal stab is made up of ¼" balsa stock and at first it appears to be a weight factor with its large span. The reason I chose this method was for a more rigid and self supporting stabilizer, and it proved very effective. You may wish to build up the vertical stabilizer and the horizontal stabilizer, but I cannot assure you how rigid it will be. I agree that my method does increase the tail weight, but this is a minor problem to overcome rather than having a fluttering tail assembly.

To start construction of the fuselage, cut out all formers (making sure the right side and left side match properly), and the upper and lower crutch. Start by placing all the formers on the left side, then when dry install the right side. Be careful not to warp the center crutch as you install the 2¼"x¼" side longerons. Take care in the assembly at this point as this is where you could build in a fuselage warp.

Start covering with soft grained 3/32" balsa. Begin at the bottom crutch line and be sure you use sheet balsa that has a true straight edge. Place two 3/32" sheets together with the seam centered on the bottom crutch.

It is important to check the alignment as you progress in the building. Install the ¼" plywood wing support before sheeting and sand to proper shape as shown on the drawings. Be sure to epoxy it securely as this is the only means of preventing the wing from crushing in the fuselage sides. Use a good grade of cement such as Tite Bond. When the cement is dry, with the aid of a cloth soaked in warm water, thoroughly work the sheeting so it will bend without cracking (easier said than done). Be sure to do this all the way to the crutch or it will break at the crutch, (don't soak it at this point or the Tite-Bond will come loose). Wet it just enough to bend it. Remember to check the alignment of the

Photos by the Author



center crutch, as this is the only means of checking your alignment. You will be in good shape if you choose your sheeting wisely at the beginning of the assembly. When you finally pull the sheeting down to the ¼"x¼" longerons, you can be sure you will have a true fuselage, a skin stressed structure.

It's almost impossible to sheet the lower nose area, so I decided to block in the lower half up to the second bulkhead #3 (you remove the lower half of former #2 at the longeron line). The filler block is made up of ½" sheet balsa laminated after the installation of the first (right and left of the crutch) 1" filler blocks. For you fiberglass boys, this probably could be made as a fiberglass shell and you could save yourself some sanding. Drill and install the dowels for the foward landing gear struts. After you have completed the installation of the laminated nose block, rough cut it to shape. This is a continuous contour from the bulkhead #3 to the motor mounting plate, and needless to say it is almost an impregnable nose. This was done at the time of building in order to accomplish two points, less damage to the airframe on rough landings (and a more secure landing gear arrangement), and secondly, the need for more weight in the front to eliminate some lead ballast to acquire the proper C.G.

Before covering the top, install your hardware such as the lower flying wire attachment dowels for the landing gear and the upper landing gear brace with the 5/32" dia. wire attached. Also the gas tank and the blind nuts for your engine mount. Check for your type of installation and allow yourself enough open area for this before closing up the top. Do make sure your Golden Rods are installed (or pushrods if you prefer), before completing the covering of the top. The sheeting on the top follows the same method as the bottom. Install the tail block and rough shape. Once again . . . check for straightness of the fuselage and be sure the wing blocks are attached properly (use epoxy in this area and be sure its a good glue joint. It must be installed properly as this is the only means of achieving proper wing settings later).

To set the tail surfaces, I temporarily "T" pinned the horizontal stabilizer to the fuselage and confirmed the alignment (reference points are the two longerons at the cockpit opening). This will positively set the horizontal alignment. Now hand work the upper tail cone to the fuselage contour using a piece of scrap ¼" balsa to simulate the rudder location. (This is removed later). When confident you have the proper alignment of both horizontal stabilizer and the tail cone is properly glued. Remove the horizontal stabilizer and the vertical skin. Now seal and cover the tail cone with whatever means you choose. Reinstall both horizontal and vertical stabilizer and reset. Checking the alignment again, starting with the horizontal. To check the vertical, use a triangle at the hinge line. Be sure its proper in all respects. The headrest and seat back are made from scrap balsa blocks.

The fairing under the headrest is 1/16" sheet. The rivets are silk pin heads cut off ¼" long. They are held in place by inserting glue in the holes, then inserting the pin. The pitot assembly or the snorkel as I call it is made up two lengths of 1/16" O.D. brass tubing soldered together, side by side with two hollow rivets soldered at the top for inlets. These tubes are held in place by means of brass straps ¼" wide by .010 thickness, wrapped and formed around the snorkel and soldered together.

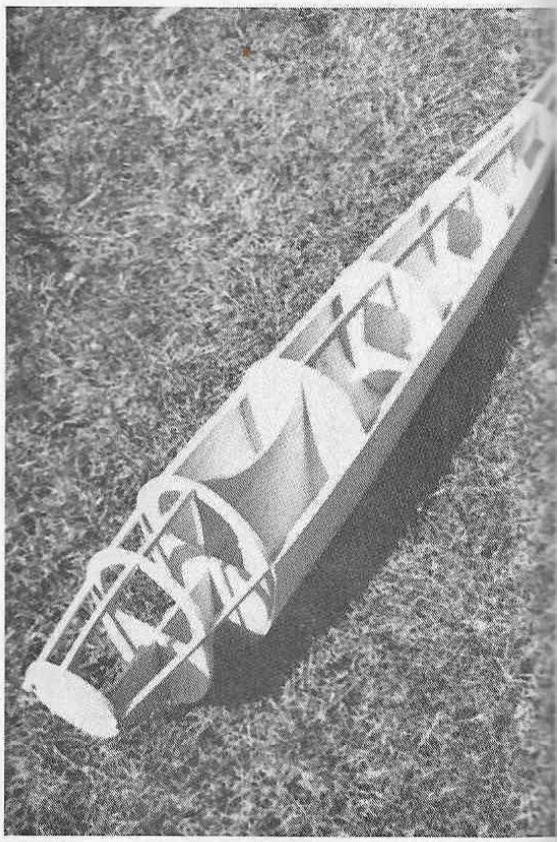
Decide on the type of engine, mount and the mounting arrangement before setting up the ¼" ply mounting plate. I used a Tatone mount with a circular ¼" shim plate sanded to the proper angle behind it. This in case I had to make any changes later in the angle and thrust lines, which turned out to be 3 degrees down and 2 degrees to the right. We did however install 4 ounces of lead in the nose to balance out the plane as our Fox .40 was lighter than we had anticipated. See the illustration for cable installation in the wing dowel. Start at the bottom, loop over the top and back down.

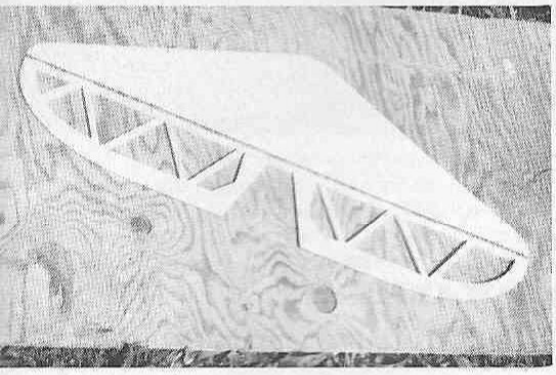
Now install the lower wing cable into the Kwik Link. First slip a piece of brass tubing over both cables, then the Kwik Link onto the 90 degree bellcrank. Insert the two ends of the cables from the wing into the end of the Kwik Link so they will go all the way through. Use a pair of needlenose pliers to pull tight and a 250 watt soldering gun to solder the cables into the Kwik Link. Apply plenty of solder and make sure they are attached very well. You should have the two ends hanging out of the center when finished. Clip these off with a pair of cutters. The cable I used was obtainable from "Joy Products" and soldered very easily. Their address is 1303 First St., Menominee, Michigan. I believe it cost $2.00 and I have some left over. I cannot be sure that some types of controline cable available elsewhere can be soldered readily, as I have run into this in the past.

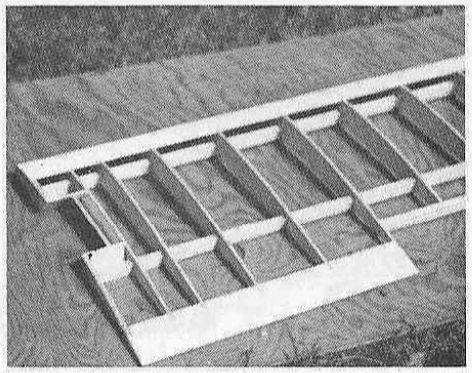
To install the 1/16" dia. music wire, bend the hook and insert into the bottom. Seat it as far as it will go, then carefully bend it towards the fuselage attachment.

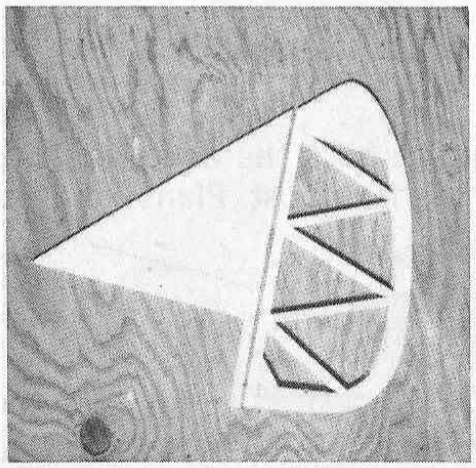
To attach the lower wing cables (flying wires) you will first have to understand that this is a high stress area and requires careful assembly and installation. The 90 degree nylon bellcrank is epoxied into the fuselage by running gobs around and over and through the holes in the bellcrank so it has no possible way of moving or pulling out the side or bottom. This is as important as the wing attachments. You need only one hole exposed outside the fuselage and enough room to hook up a metal Kwik Link. While epoxiing the bellcrank you will need to seal any possible openings around the exposed area with scotch tape so it will not leak out. This installation was made after the fuselage was covered and completed. It took me nearly a month of trial and error to figure out the best way to assure the wings wouldn't come off and still be detachable. If this is done right it will never come apart, regardless of how much wing loading you have. You will however have the advantage of installing them as you sheet the lower half, as you can get to this area better than I had to through the cockpit. Remember to use caution here as this is one of the most important installations. This also applies to the wing cable and ½" dia. dowel attachment areas. It will surprise you how tough and rigid this really is. You can see the pushrod was hard to install on the servo as it is very far forward in the wing. I suggest that you install Golden-Rod and see the proposed exit on the top view of the plan for ease of hook up.

The radio installation is dependent upon









Photos more or less clockwise around: Strained expression in the top photo indicates it's big handful in the wind. 76" in span, a pleasure to fly. Next shot reveals some wing bones. Notice aileron indentation and ribs notched into edge. Fin and rudder frames out easily, adequate area and enough swing to control it in slow flight. Shot below captures it square on its fat old wheels with all the realism you could wish for. Ship is unusual in line, interesting in detail. The Buhl Bull Pup adds up to a good Semi-Scale choice in that it cruises in a peaceful manner. ¾ rear shot at lower left displays the cockpit arrangement, rigging set-up. Notice windows in the wing. A pilot's view was limited of earth below, so transparent areas of the wing skin were built in to allow the pilot to see better. Fuselage framework follows the usual techniques and assembles with relative ease. Do select the sheet wood carefully, soak and bend it around.

your type of radio. I used a Bonner 4RS system with Controlaire servos, but remember to keep everything as far forward as possible. The dashboard in the original is held in place by two wood screws so you can get to the aileron servo.

The wheels give more than enough cushion when landing. In fact try not to bounce the plane in, as it has a tendency to rebound to ten to twelve feet altitude as we found out. Fly it in, don't just drop it!

As soon as the plane was completed I called a good friend, Gene Jones of the M. A.C. club and asked him if he would be available to check out the flying ability of this new aircraft. Checking with the weather people we found that we had to postpone this for a couple of days. One beautiful Tuesday morning we found ourselves at the end of the runway, knees knocking, and a lump in our throats. We preflighted the plane to make sure we had everything secure and that all was go, checked the radio and made sure all surfaces were functioning well. We started up the engine and taxied into position. Gene fed it throttle and we were on our way down the runway, the tail rose and she was off with no apparent trouble. Very good ground handling and very responsive.

On half throttle, the aileron is a bit slow in coming around. Gene had to use both aileron and rudder, so when installing your R/C gear, remember to get as much throw as possible. Later Bob Underwood flew it and said he thought it had enough for a proper scale turn, but for a faster rate of response you may have to bump a little rudder and aileron. The entire airplane weighed out at 5¾ pounds and for the size, it's very light, so watch out for those windy days. Gene had no trouble in handling this aircraft as he circled the field at half throttle (wind was at about 7mph). The slow flight made the plane a little mushy, but with a good test pilot it's no problem. On the second flight, Gene used full throttle and the *"Bull Pup"* came alive, performing with the best of them. The ship flew right off the drafting board.

Trim correction was only needed on the ailerons. It's a graceful antique and handles quite well for a slow semi-scale. With additional time spent on detail and research, it could be a true scale design with adequate handling qualities.

At this point I would like to say that this is by no means a pattern plane or pylon racer and was designed strictly for scale flying as these wings are made in two sections. Fly it safely.