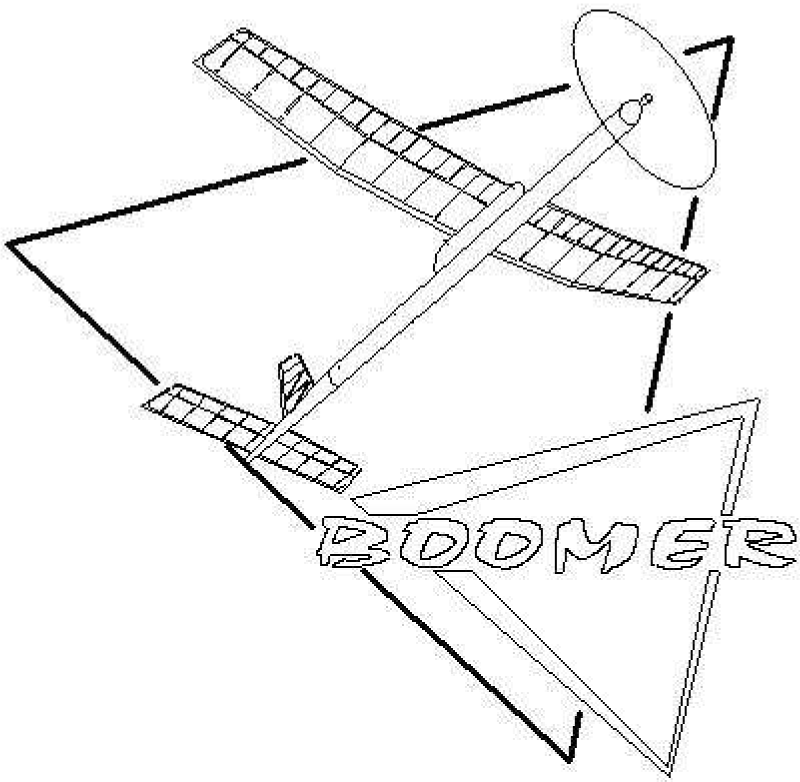

Mark II
Construction Manual

Kit No. CBMD-001

CB Model Designs

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Thank you for purchasing a Boomer kit. We hope you will find building and flying the Boomer one of the pleasurable things in life and achieve many hours of enjoyment from it.

Every effort has gone into making the Boomer one of the lightest high performance P-30 models available. Each kit has been fabricated from select wood for a light airframe that can meet the minimum 40 gram airframe weight for this event. The resulting model is suitably strong for the intended purpose of soaring in light lift. It is an excellent transition model for free flight competition and just plain fun sport flying .

Adhesive and general assembly process recommendations
Cyanoacrylate adhesive (CA in this instruction) is should be used with discretion and caution. Assembly of the basic structures is best achieved with white glue or cellulose cement (Duco, Testors, Ambroid, etc.). Use of these types of adhesive offer the best chance for any minor adjustment during assembly, and minimizes the chance of adhering the structure to the plan or building board by thin glue wicking through pin holes in the wax paper covering the plan. This in turn reduces the chance of part damage when removing a structure assembly from the plan when complete. All parts should be pre-assembled dry before any bonding occurs to check for proper location and fit. Proceed carefully and take your time with the assembly process. A Boomer can easily be constructed and made ready to fly in one week of evening work sessions.

Wing Assembly

Review the laser part number sheet before starting to understand the part arrangements and numbers. Mark any items that look like they would be confusing to sort due to similar size and shape. Separate all the wing parts from the laser cut sheets. Note that three of the W-1 ribs include a spar notch near the trailing edge. These ribs are installed at the wing center and to either side to support the short spar installed there that resists covering damage from the wing installation bands. Keep these items separate to avoid installing them in the wrong part of the wing during the build.

Start wing construction by covering the construction drawing with wax or parchment paper to prevent parts from sticking during assembly. The use of balsa strips 1/8” thick x ¼” or wider is suggested as boundary control to the wing plan form outline. Pin this material at the edge line for TE-1 to start. The wing tip panels have washout built in during construction, and TE-2 will not be held against the building board during assembly as done for TE-1. Use thicker balsa to provide a boundary edge that still controls the plan form location of TE-2 while it is rigged for washout during assembly. The LE-1 and LE-2 parts can be controlled for plan form alignment in the same fashion as done for the trailing edge segments. Position LE-1, LE-2, TE-1 and TE-2 parts on the plan for alignment. Note that the LE-1 and LE-2 parts have ends cut at an angle for dihedral. Be sure to locate these parts with the angled ends up at the dihedral joints. Pinning through these parts is not recommended; use scrap balsa blocking to press the parts against the boundary strips, and pins through these to secure part locations. Trailing edge section

TE-1 is shimmed 1/16 at the forward edge to provide tilt that approximates the under camber of the wing section, with the aft edge touching the building board surface. TE-2 is not going to be assembled against the board surface, but run the shim under TE-1 past the dihedral break for the wing tip to allow TE-2 to be tilted in the same manner at the joint. For assembly purposes with the tip ribs, make a shim that tapers from a point at the dihedral joint to about 3/16" tall just past the end of the wing. Make the shim from 1/16 balsa or thicker material and slide under TE-2 near the front edge to help support this part when installing the ribs. With the tilted position of TE-2 set by the inboard shim, adjust the tapered shim inboard or outboard as needed to obtain a fit that is flush to the bottom of ribs W-2 through W-5. Ribs W-1 are also set flush to the bottom of TE-1; this is achieved by allowing the lower rib edges to rest against the 1/16 shim used to tilt TE-1.

It is optional to pre-shape the trailing edge segments for finish tapered cross section to ease the sanding process that follows wing assembly. Do not sand thinner than stock on the forward edges, and leave the aft edges at least 1/16 thick to allow fine shaping after assembly.

Assemble the tip gusset T-2 to the outboard end of TE-2 with the parts against the plan for alignment (to start). Use a piece of wood blocking pinned to the plan at the inboard line of the T-1 rib to provide a reference surface for the forward and aft gussets. Glue the T-2 gusset against TE-2 with the T-1 side against the blocking. Similarly, bond one T-3 gusset against the aft side of LE-2 against the plan for alignment, and against the T-1 blocking. Bond the second T-3 gusset on top of the first to make up the 3/16" thickness in this area for T-3.

At the inboard ends of TE-1 and LE-1, glue in the WG-1 parts to complete the subassemblies for the wing edges.

Position spars WS-1 and WS-2 in place over the plan. Use scrap balsa blocking pinned into the building board between the rib locations to maintain the spar position forward and aft. Make sure the spar stand-off tabs are against the plan. Begin assembly by dry fitting the W-1 ribs over the spars notches and into the TE-1 notches. Adjust the position of the spar segments and trailing edges to achieve best fit of all parts to the drawing. Dry prefit the tip panel next. Note that all the tip ribs have standoff tabs to support the trailing edge of the rib in proper location for washout. TE-2 is shimmed up until it is flush to the lower edge of each tip panel rib as described above. Check the fit of sub ribs W-1A through W-5A; these have a tab at the top edge that fits into a corresponding notch on top of the wing spars. The bottom edge of the sub ribs match the lower wing surface contour; the upper edges don't contact anything and have been scalloped to remove weight.

Prefit the T-1 rib next, with the TE-2 shimmed for washout as controlled by the ribs already positioned. Cut off the end of WS-2 and LE-2 to match the joint as shown on the plan and with T-3 gussets respectively. Position the T-1 rib for best fit forward and aft, making sure there is sufficient material to clean up at the trailing edge when wing sanding is performed.

When satisfied that all parts are aligned and fitting properly, carefully bond the wing assembly together. Do not install the W-1 ribs at the wing center and polyhedral joints yet; these will be installed when the dihedral is added.

Install the WG-2 stiffeners on either side of ribs W-3, W-4 & W-5 at the trailing edge of the wing. These are installed to be a little above the rib profile as shown in View D-D on the drawing. The stiffeners add strength to keep the trailing edge from twisting as well as prevent buckling of the thin rib sections from the wing tissue covering tension.

Add the 1/16" square turbulator spars next. At the dihedral and polyhedral joints, allow ½" overlap of the spars to allow the scarf joint to be made when the dihedral is added. Again, no W-1 rib is installed yet in these locations.

Remove the tip panel from the drawing carefully. Using a fine sanding block, VERY LIGHTLY sand a shallow bevel at the end of TE-2 and LE-2 where they join the inboard wing panel and form the dihedral joint. The material cross section is so small there is very little sanding required-you can easily overdo this. Note the color change at the end of these parts to judge how much material is removed. Carefully rig the tip panel at the dihedral dimension for the tip shown on the plan and inspect the resulting joint at TE-1 and TE-2 and also the LE-1 and LE-2 for little or no gap. If this area became over sanded, a small filler of balsa can be added during the bonding process to correct.

Move the tip panel out of the way to install the W-1 rib onto the inboard wing panel still on the board. Carefully tilt and slip into place under the excess turbulator spar ends and onto the WS-1 end that is notched to fit. Check the alignment to LE-1 and TE-1. Position the outboard rib angle gauge against WS-1 and W-1 to provide the tilt toward the inboard side of the wing. Check alignment of the rib for being on center to the dihedral joint, and bond in place; do not glue in the turbulator spars yet..

Place the tip panel back into position with dihedral as shown on the drawing. Plan form align to the drawing using the blocking to trap the tip panel in place. Make sure the end of WS-2 is correctly against the end of WS-1, and the LE and TE joints are touching. Once satisfied, bond the inboard end of WS-2 to WS-1 and W-1; LE and TE joints. The turbulator spars should still be left with the excess on either side of W-1, and nothing glued into the notches in W-1 yet.

The next step requires a very sharp, fine razor to perform. Do not attempt with a #11 knife blade. One half of a new double edge razor is recommended, although a extra fine single edge razor is almost as good. The process requires light pressure and a very fine blade is best used to perform the cut.

At the dihedral joint, the turbulator spars are overlapped on top of each other, with the lower one positioned in the W-1 notch. Using the razor , slice down through the stack of spar material at a diagonal similar to what is shown on the plan, centered on rib W-1. The resulting scarf joint should slip into the W-1 notch, straddling the rib. Bond this in place and repeat for the rest of the spars. Direction of the scarf joint is not important, only that the joint has no gap and is a shallow angle as shown on the drawing to transfer wing bending loads effectively. If a gap manifests in the joint after cutting, make a filler from thin balsa that can regain contact with both joint surfaces and bond in place. Cut the excess fill material off after the glue has dried. Resist all urges to add additional doublers at the dihedral joints. This wing has never had a failure at these joints the entire time this design was being test flown and used for competition flying, including some very hard crashes. Good joint quality is a must however!

After both tip panels are rigged for dihedral, follow a similar procedure to rig one half of the wing to the dihedral angle shown. Add the short 1/16" square support spars common to the three W-1 ribs at the wing center; this completes the wing structural assembly.

Wing sanding and shaping

Begin shaping the wing by profiling the wing tip leading edge to blend into T-1 and match the radius shown on the plan. Clean up the wing edge profile to remove any mismatches and inconsistencies. Remove the stand-off tabs from the spars, tip panel ribs and T-1.

Make a contoured sanding block to use for light sanding of the wing underside. On a scrap balsa block 1" wide, carefully trace the bottom profile of rib W-1 using the cutout in the scrap laser cut sheet as a template. Saw this profile into the block with a band saw, scroll saw, etc. An alternate method is to make a series of balsa templates cut to the same profile and assemble into a contoured block at least 1" wide. To the contoured surface bond a strip of 120 grit sandpaper the same width as the block. On the opposite side bond another strip that would be a flat surface to use for sanding all other areas of the wing. Also useful for getting into small areas for shaping are small emery boards.

Start the wing sanding and shaping on the underside to start. Sand the lower surface of the leading edges to be flush with the lower edges of the ribs. Inspect the lower surface of the trailing edge for flush fit to the ribs, and at the dihedral joints. As the trailing edge segments were tilted to approximate the under camber runout of the airfoil, it should take only minor sanding to improve this area if you were careful in setting all the ribs flush to the bottom surface of the trailing edges during assembly. If conditions look flush and fair, only minimal finish sanding is suggested.

The best way to sand the trailing edge is to place the wing upside down against a flat surface that allows one section of the trailing edge to be held flat against it while the adjacent areas with dihedral are allowed to drape off either side. Typically this would be the corner of a table or other raised working surface that will allow the other areas of the wing to be in the clear as you restrain the one section of wing for shaping.

Once the leading and trailing edges have been blended flush to the bottom edge rib contours, use the contoured side of the sanding block to very lightly touch up any areas of the under camber for flush condition at the lower edge of the rib and wing spar joints. Make sure the wing spars are flush with the W-1 rib at each dihedral joint. Work the underside of T-1 to be smooth and flush with WS-2 and TE-2 / T-2 contours. Leave T-1 as a rectangular cross section for now.

Shape the upper surface of the wing by sanding down the LE-1 and LE-2 contours to be flush with the rib edges for the upper side. At the dihedral joints the emery board may be more useful to shape the areas adjacent to this area. Once the leading edges are blended flush with both the upper and lower rib profiles, finish the leading edge radius to a fairly sharp blend-approximately .06 radius or what is shown on the wing cross section on the drawing. Use the flat side of the sanding block to carefully sand down the tops of the turbulator spars to level these in to the contour of the wing-it doesn't take much sanding here. Blend the top of T-1 lightly to complete the necessary profiling to fair this in with the wing contour. Now blend off the tops of the TE-1 and TE-2 segments until flush with the tops of the ribs and any of the projecting WG-2 stiffeners sanded flush as well. Again, this is best performed by holding one section of wing at a time against the workbench edge and carefully sanding just the top of the TE- or TE-2 to locally shape and refine until the wing contour is represented.

Use a small piece of 120 grit sandpaper for fine shaping all areas of the wing and blending corners. The lower outboard edge of T-1 is radius blended to the upper outboard edge to remove all boxiness to T-1 and provide a streamlined shape to the wingtip. Continue to finish sand the wing with 220 and 320 grit paper until you are satisfied with the smoothness of the result.

Finish the wing substructure with one coat of full strength nitrate dope, lightly sanded with 320 grit when dry. Follow this with an additional full strength coat of dope to seal the grain where the covering is to be adhered. This means the entire framework on the lower surface of the wing needs to be edge sealed, as the tissue covering will be adhered to each rib and spar to maintain the under cambered airfoil contour. Seal the entire leading and trailing edge, top and bottom. Seal the T-1 rib completely and edge seal the tops of the ribs at the dihedral joints. Any additional tissue color breaks based on the wing structure should also be sealed to allow tissue attachment at these locations. If you plan to cover with MicroLite or other heat shrink covering, follow the manufacturers recommendations for preparing the surfaces for covering.

Horizontal stabilizer assembly
Construction of the horizontal stabilizer begins with assembly of the 1/32 ply S-2A doublers with ribs S-2; make sure these are assembled as opposites. Use center rib S-1 as a template to establish location of S-2A. Align the spar slots in S-1 and S-2 to index together and lightly trace against the forward edge of S-1 to mark the forward edge location of S-2A. Bond S-2A in place to the line and flush to the rib bottom. Install the filler SF-1 at the top of S-2A at this time as well. Bevel the forward edge after installation to mate with the back surface of the S-7 closeout as required.

Use the same method to control the plan form boundary of the stab assembly as done for the wing. Position the STE-1, SLE-1, ST-1 and SS-1 parts on the plan. Dry fit all the ribs and adjust everything for best fit to the drawing. Use blocking to control the inboard faces of S-2 that project forward of the S-7 closeout to maintain good alignment with the fuselage stab platform. Glue in the gussets S-2 and S-3, and the ends of SS-1 into the notch in ST-1 on either end of the stab.

Glue in the ribs starting with S-1 followed by S-2 on either side. On S-7, sand a bevel on the bottom edge to allow this to sit flush to the building surface. Glue S-7 to the front edge of the S-2A doublers and front edge of S-1. Glue in the remaining ribs.

When dry, remove from the plan and shape the leading and trailing edges to shape, etc. Do a fine sanding to cleanup overall, then apply two coats of nitrate dope as done for the wing. The stabilizer is covered before the filler SF-2 and plywood strike plate are installed. Do not cover until you have done a pre-fit of the stabilizer with the stab platform on the fuselage.

Vertical stabilizer assembly
The fin assembly is straightforward-just assemble over the drawing using the laser cut parts. When dry, sand the F-1 segment to a tapered shape as shown in the plan view of the fuselage, and round off the rest of the fin outline. Apply two coats of dope to the outline parts after fine sanding and then cover with tissue provided or the covering material of your choice.

Fuselage assembly
The fuselage assembly is largely complete as received. As noted previously, perform a prefit of the stabilizer assembly on the platform. Check for freedom of movement to allow the D/T pop-up to have complete range of motion required. There should not be a snug fit to the platform-some very slight side to side freedom of movement should be present when in the flying position. The stab covering overlap onto the inboard face of S-2 will take up some of this gap so be mindful of this when fine tuning the fit, if required. If the gap is tight, remove material from the ends of the stab platform using a sanding block until the proper fit is achieved. If desired, the upper surface of the filler on the stab platform can be sanded down to be flush with the stab contour at this time.

If you are planning to use a Gizmo-Geezer or Ikara P-30 front end, check the fit and make any adjustments necessary to install these items. The drawback on these are the extra weight they add, but they do offer ease of thrust adjustment.

At this time you should plan your D/T system. The standard tail pop-up configuration is included on the kit drawing as well as the hardware shown. Experience has shown that models of this type can be easily lost in strong lift just relying on tail pop-up alone. A more effective method is to include a wing pop-up in addition to the tail, or most effective, a wing pop-off arrangement where the wing is allowed to release from the model but remains tethered for the descent. Design arrangements to install either wing D/T system on the Boomer are available as a FREE download from the website www.cbmodeldesigns.com or by mailing 5 USD to CB Model Designs, PO Box 50018 Long Beach CA 90815 for a hard copy of the installation drawings and instructions.

This construction manual will only detail the standard tail pop-up configuration as shown on the kit drawing. Depending on your selection of wing D/T method, some elements of the following may be superseded by the documents noted above, and is the reason why you should plan the system now if you desire a wing D/T in addition to tail pop-up.

Decide which timer you are going to use. The Ikara timer option is simply glued over the hole in the pylon at the location shown. If you plan to use one of the other two timer options, a 1/32 ply adapter plate is provided for you to glue in place by aligning to the hole in the pylon. Install the Ikara timer after finishing the fuselage.

Install the D/T trip wire assembly as shown on the drawing. Use the laser cut fillers to fair in the tube and strengthen the joint. The filler can be tapered to a feather edge if desired to reduce weight and offer some streamlining. Install the timer spring tension adjustment tube as shown in a similar manner as done for the trip wire.

Do any fine sanding you feel is necessary on the fuselage and apply two coats of thinned nitrate dope over all the exposed areas, including the entire stab platform. The inside of the motor tube was sealed with dope before forming, so there is no need to do anything on this area. Sand with 320 grit between coats to remove any fuzz that stands up in the finish. Apply an additional coat to the pylon area to seal the grain a bit before applying color.

The fuselage motor tube and tail cone may be left uncovered if desired, although covering with tissue will improve strength of the wood and durability. However there is some risk in inducing warps in the tube from tissue shrinkage, so application of tissue on the fuselage should be done with care using very thinned dope to minimize warp potential. If using Microlite covering instead of tissue on the wing, you may want to consider omitting tissue on the fuselage to help offset the weight gain imposed by the plastic film covering.

Cover the motor tube using two pieces of rectangular tissue for the straight section, and one piece to wrap the tail cone area.

The rectangular pieces are installed so they overlap slightly at the approximate center line of the motor tube, top and bottom. Use dope thinned 50% to attach tissue and minimize chances of warping the motor tube. Prefit one piece against the side of the motor tube and pylon, adjusting forward or aft until the aft edge of the tissue is at the aft end of the straight section. Make sure the piece is also evenly distributed up and down to allow the edges of the piece to be on or past the center line on top and bottom. Secure the tissue in this position temporarily using a few brush strokes of dope applied near the front and rear of the pylon area to tack in place. Now make a cut in the tissue at the front of the pylon and another at the widest point in the pylon, just enough to allow the tissue to continue to drape around the motor tube forward and aft of these cuts. This also allows the paper to be tailored to match the pylon edge where it joins the motor tube by lightly rubbing the tissue against this area with your fingertip until a crease appears in the tissue that has been formed against this seam. This is your guideline to trim the pylon cutout in the tissue for an accurate fit on the motor tube wrap. You can also use a soft pencil to lightly trace this joint while pressing against the pylon edge seam (very light pressure please!).

Remove the tissue from the motor tube temporary dope dots using dope thinner or just pulling away if not adhered too strongly. Cut away the tissue based on the pylon cutout marking. You can then use this tailored piece of tissue as a template to cut the opposite side covering.

Install the tissue by applying dope on the motor tube in the area just below the pylon joint. Re-position the tissue based on your trimmed edge and adjust location while the dope is still wet. Continue to add dope along the side of the motor tube, working forward or aft from the starting point, pulling the tissue taught to keep wrinkles to a minimum. Don’t try to work down the upper or lower edges until the side area is adhered and as smooth as you can get it.

Now go back and start working down the upper edges, starting with the pylon area again and working forward and aft. Finish the bottom edge last. Work the tissue toward the upper and lower edges to remove wrinkles as you go. Repeat the installation process for the opposite side. It is recommended you do not use a razor against any tissue overlap in an effort to create a neat butted tissue seam. It is too easy to accidentally cut along the grain of the motor tube and create a flaw that then turns into a ridge during the finishing process.

Apply the tail cone tissue covering by starting along the bottom center of the cone, aligning the tissue edge to match the joint in the motor tube. Adjust this edge prior to doping in place to get a neat overlap or butted joint. Any mismatch can be covered with a contrasting tissue stripe or strip of base color tissue to resolve.

Apply dope and wrap the edges up around the cone. Slit the tissue at the front and rear edges of the stab platform to tailor this area. The tissue can wrap up onto the stab platform pylon and onto the underside of the platform. The areas forward and aft of the platform just continue to wrap up the cone until the seam meets or overlaps at the top center of the cone. Trim the aft end of the tissue to the profile of the tail cone filler and overlap over this edge and seal with dope. Clean off any excess on the stab platform edges and seal all seams with dope. Shrink the tissue covering using denatured alcohol applied with toilet paper over the entire covered fuselage. DO NOT use water to shrink the tissue, as this can soften and release the motor tube joint and result in a ridged seam down the length of the fuselage when dry. There is a reinforcement strip applied down the seam to help prevent this from occurring, but don’t take chances. Install the scrap 3/32 sheet tensioning stops at the front end for holding the nose block in place, and also the one at the fuselage center line on the bottom of the tail cone to locate the D/T tensioning bands installed for the D/T pop-up.

When the tissue is dry apply one coat of thinned nitrate dope (50/50) over the fuselage and pylon seam to seal.

Install the D/T line guide tube at the tail cone end using CA and micro balloons to strengthen the joint. The stop on the D/T line hits against the front end of this pretty hard each flight, so make sure it can't get knocked loose due to a weak glue joint.

Next, install the vertical stabilizer fin. Use a pin to peck some holes through the tail cone tissue in the area the fin will be installed-this is defined by alignment marks on the tail cone. Install the wing hold down dowels in the pylon. Use a piece of light straight wood about 12" long strapped to the pylon top with rubber bands. Place the fuselage with the wood plank installed onto a level working surface and block up the ends of the wood plank evenly to make this parallel with the working surface. Block the fuselage sides so it cannot shift when rigging the vertical fin. Now make a jig using blocks clamped to a drafting triangle or other tool that you can square to the working surface. You need to provide a gap at the bottom such that this temporary jig can be positioned with one edge over the fuselage to control the side of the fin for alignment. Set up so one edge is perpendicular to the working surface-this edge will locate the side of the fin for vertical location.

Using the alignment marks on the tail cone, adjust the location of the jig inboard and outboard until it contacts the fin on an area ahead of the tapered section and positions the fin onto the reference marks. When satisfied with the setup, apply cellulose cement to the bottom of the fin and position to the reference marks for forward and aft location (the forward most marks are the location of the fin leading edge), and against the jig vertical edge for vertical alignment. Place a thick balsa stick against the fin on the opposite side of the jig contact line and against the working surface in a lean-to position. Place a small weight against the bottom of the stick to maintain light pressure against the side of the fin and hold in place against the jig edge. Allow the setup to remain undisturbed until the glue has dried.

After the fin has been bonded in place, add the tissue gussets at the base of the fin on either side using dope to adhere.

Finish the fuselage by applying Design Master floral spray colors to fade in to your base tissue colors or provide contrast. Typically the end of the tail cone and stab platform get dusted with color, as well as the pylon. The nose area with the tensioning stops is usually dusted with color that will also be used on the nose block assembly to match. Go easy on the colors to avoid weight build up on the finish.

Nose block assembly

Assemble the provided nose block using the 5/32 aluminum thrust bearing housing tube as an alignment pin. Start assembly by first gluing disc ‘G’ and ‘H’ together. Check the fit of this assembly in the motor tube. If it needs to be sized down to fit, use a short piece of 1/8” diameter wire through the 5/32 tube as a turning mandrel. Install a 1/8 diameter wheel collar on the wire and chuck the disc assembly into a Dremel tool or similar device. Push the balsa disc assembly against the collet using the wheel collar to provide clamping pressure and tighten the collar set screw. At low RPM’s, use a fine sanding block to lightly turn the edges of the G/H assembly until it fits smoothly into the motor tube.   The mandrel turning process is repeated again after the entire stack of discs is assembled for final shaping.

Now install disc ’F’ onto the aluminum bearing tube against the previously fitted disc assembly. Check fit into the motor tube and note if the ’F’ disc is flush or oversize relative to the outside diameter of the motor tube. The forward discs have all been developed with excess material on the diameter to allow some slop in the stack assembly and still clean up to a smooth profile and faired condition with the motor tube. Glue K to the G/H assembly and then add the rest of the discs forward, including the 1/32 plywood disc for the thrust bearing doubler.   Do not install the tensioning band posts ‘K’ or the key ’J’ until the nose block has been profiled to shape and faired into the motor tube.

Install the wire mandrel, and chuck into the Dremel tool as done when shaping the G/H assembly. Using a 120 grit sandpaper sanding block, begin shaping the contour of the nose block using light pressure to keep it from slipping on the mandrel. Sand until all the square edges are removed from the diameters of the disc stack. Use 220 and then 320 grit paper to refine and polish up the surface of the turning piece. Check fit into the motor tube and fine sand until the nose block profile transitions into the motor tube with little or no step at the front of the motor tube. Cut the key notch in the motor tube to accept key ‘J’. Install key ‘J’ in the nose block slot and test fit into the motor tube. When satisfied with fit (should be fairly tight to maintain the clocking position of the nose block) turn the ‘J’ key flush to the nose block profile as shown on the drawing. Now push the tensioning post inserts ‘K’ into the bottom of the slots in ‘B’ and use a drop of thin CA to secure in place. Coat the nose block with three coats of dope, sanded between coats. Dust with Design Master color if desired, and remove the mandrel. Install the two thrust bearings, the prop shaft, Teflon thrust washer and prop to finish this assembly. Apply light oil to the prop shaft to break in the thrust bearings and obtain a smooth running fit.

Dethermalizer system installation

The last remaining task prior to flight testing is calibration of the D/T timer and installation of the D/T line for the stab pop-up.

Install the timer on the model. Make two lanyard loops using some of the heavy thread provided in the hardware pack-one approximately 2 1/2” long that will be looped over the timer arm, and another that can be about 1 inch long for an adjustment tail on the spring. Install the loops onto the tensioning spring ends. Secure the tail loop with a drop of thick CA to prevent the knot from coming apart. Leave the larger loop knot dry to allow shortening or lengthening a bit once the spring positioning step is started.

Install the spring lanyard tail through the 3/32” aluminum tube installed on the side of the pylon. Leave the end of the spring approximately 5/32” ahead of the aluminum tube for room to adjust the spring position forward or aft during the next steps. Lock the lanyard tail in place with a plug pushed into the aft side of the tube to press against the tail and secure from any movement. Make the plug from a cutoff end of a toothpick, or taper a piece of balsa to a cone to serve as the plug.
Position the timer arm at the 12:00 position (vertical-pointing up) and carefully stretch the spring and loop the lanyard over the timer arm. Release and observe the speed at which the timer revolves in a clockwise rotation. If the timer quickly rotates and releases the lanyard, the spring tension is too great. Loosen the plug in the tube a little and gently pull on the tail end of the spring to draw it forward slightly. Re-secure the lanyard tail with the plug and test the timer speed again. Repeat until the timer advances slowly (nearly imperceptible movement) until release. The inverse of this is done if the timer is slow and does not release at all-tighten the spring tension with the plug and lanyard tail until a very slow movement and positive release is obtained. From the 12:00 position, the timer should take 30-45 seconds to release. Try to obtain the slowest timer speed you can get that results in a positive release every time. Once the timer speed is adjusted to your satisfaction, secure the plug into the tube using a drop of cellulose glue. This can be softened and removed later should field adjustments or spring replacement be required. Secure the forward lanyard knot on the spring with a drop of CA to keep this from coming apart in use. Trim off any excess thread from the knot.

The D/T line is installed next. Tie one end of the thread provided around a 1/8” diameter wire to form a loop. Trim off the excess thread from the knot and slip the loop off the wire. Use a piece of small diameter wire through the loop and against the bench top and tension very slightly against the wire to form a teardrop shaped loop. Apply thin CA to the formed area-this will saturate and solidify to maintain the shape of the loop in whatever form you have held it to. This loop forms the ring that will attach the D/T line to the connector eye on the stabilizer. Open the connector eye slightly if necessary to allow the loop to slip into place.

Install the stabilizer onto the platform with tensioning bands for the pop-up motion. Tie two of the ¾“ diameter bands together for the proper length. Feed the unfinished end of the D/T line through the formed guide tube at the end of the tail cone, and the formed loop onto the connector eye on the stab. Slip the short 1/16” diameter aluminum tube onto the D/T line. Place the timer spring lanyard of the stem of the timer to tension the spring and lanyard as set for flight with the trip wire leg under the lanyard. String the loose end of the D/T line through the band and then shorten the line with the band placed on the short end of the trip wire as shown on the drawing. Pull the thread end aft to apply tension to the band and draw the stab down against the top of the incidence adjustment screw. Note the location where the line turns through the tensioning band as this is where you need to tie a second loop and harden with CA as done for the stab connection end.

Allow the stab to deploy to the D/T position. Keeping slight tension in the D/T line, slide the 1/16 stop tube up the line until it is against the front end of the guide tube. Lightly crimp the forward end of the stop tube to anchor it to the D/T line. Pull forward to move the stop tube away from the guide tube and apply a drop of CA to the tube and line to secure.

Test the operation of the D/T system to confirm consistent operation. Mark points on the pylon side where the timer arm position will yield a 2 minute, 3 minute and maximum timer run.

Notes on covering the flying surfaces

Cover the bottom of the wing first. Use full strength dope to tack the tissue to the bottom rib edges and spar lower edges. Cover in sections-spar aft to trailing edge and all the rib edges in that section. Allow to dry for 3-4 minutes, then continue to work forward of the spar and adhere to the rib edges and leading edge. Trim the leading and trailing edge tissue to overlap onto the upper side and secure the edges with dope. Repeat this process for the remaining bays of the wing.

Cover the upper surface of the wing next, only attaching the tissue at the leading and trailing edge and the boundary ribs for the section being covered. Make sure all seams at the dihedral joints are adhered and sealed and all the overlap areas are smoothly doped and secured from loose edges.

Shrink the tissue with denatured alcohol. Use two blocks of balsa on the working surface to block the wing up while the tissue shrinks. Pin the balsa blocks parallel with each other to the building board, then place the damp tissue covered wing on top of the blocks so that the block locations are symmetrical to the wing center. Use a pin pushed into the block at the leading edge, canted slightly back so that the pin shank is touching the leading edge. Add two more pins at the trailing edge in a similar manner so that the wing is trapped lightly between the pins, and also held against the blocks by the angle of the pins. This restrains most of the wing from warping as the tissue shrinks.

Use 50% nitrate dope and 50% thinner mix to clear dope the wing. Do this by lightly brushing dope to the top and bottom of each rib bay at a time. Dope one, skip the next, dope the next one, etc. so that at no time is the wing completely coated with a single wet coat of dope. Allow each doped bay to dry before doping the one you skipped. This helps minimize the tendency for the wing to warp by keeping the stress of the shrinkage from the dope highly localized. Use the same technique on the stabilizer and fin structures to minimize warping. Only one coat of thinned dope is recommended to finish the flying surfaces. Add the wing tissue cal logo after the wing is doped. Remove the tissue cal from the backing paper first and then trim around the outline to avoid damaging the image. This can be attached with thinned dope as well-do not use excessive brushing or rubbing as the thinner will eventually cause the ink to smear. Wet the area to be attached with dope, place the image and use the brush to work out bubbles and wrinkles and let dry.

Flight trimming-glide phase

Install a 10 gram motor using the aft motor peg location. Establish glide trim using this position as the baseline for trim flights. Assemble the model and check that the center of gravity is approximately as shown on the plan with the wing in the forward peg position. Adjust the incidence screw until the stabilizer is neutral or slightly negative incidence. Use cellulose cement to attach a 1/16" thick shim to the right side of the stab platform such that when the stab is pulled down to flight position it is tilted with the right tip up about 1/8" higher than the left, as viewed from the rear of the model. Taper the shim to make sure the contact with the bottom of the stab is at the edge of the stab platform.

If possible, find a shallow hill from which you can launch the model for test glides. The objective is to observe the glide path for stalling or diving, and also to obtain a right hand glide circle. Hand wind some turns in the motor to give the prop some revs as the glide starts and get the prop up to free wheel speed. Launch the model gently-wings level into any slight breeze (always test glide in calm conditions) that is apparent. Observe for the glide angle-too steep and fast, or pitching repeatedly in a series of shallow stalls. If the model glides fast, turn the incidence screw out about ½ turn to remove incidence to the stab (raises the nose of the airplane) and glide again in the same manner. If the model is stalling slightly turn the screw in to add incidence to the stab (lowers the nose of the airplane). Adjust the incidence screw until the glide is shallow, slow and steady and turning to the right as it settles to the ground. If necessary, shift the wing aft if stalling cannot be overcome in the wing forward location. Observe the right hand turn during the glide; this should be roughly 30 feet in diameter. If it is a tight spiral, remove some of the stab tilt by shaving or sanding off some of the shim. If there is little or no turn, add more shim to increase the stab tilt. Make sure the stab will still pop-up completely with the stab tilt in effect. Make sure the glide is safe and consistent before moving on to power flight trimming.

Flight trimming-power phase

If you did not alter the front of the motor tube for right and down thrust, apply a 1/16" shim to the top of the nose block such that it will be canted to the right and down to start power flight trimming. Use cellulose glue or a dab of thick CA to attach the shim to the nose block, not the motor tube. Make the shim by sanding one edge with sandpaper wrapped around your blast tube to yield a radiused notch. Bond this to the aft surface of the nose block where you determine the best location is for the angle you wish to test. When dry, shave the excess material of the shim roughly flush to the nose block contour with a sharp razor.

Hand wind the motor to about 300 turns. Set the D/T timer for short duration (20 seconds or so) and gently launch the model, wings level. Observe for a right hand shallow climbing turn. If there is no turn, you need to increase the right thrust. If the model pitches up into a stall, more down thrust is needed. Make these adjustments until the model climbs evenly (no stalling) and to the right. Again the turn needs to be roughly 30 feet in diameter at low power. Adjust thrust angle until the model becomes predictable and safe under low power. Now begin lower power flight using a torque meter to make observations about power in the motor and the effect on climb trim. Stretch wind to 3-3.5 in/oz torque and launch. The model should still be fairly shallow in climb, but with much more duration, Again observe the climb characteristics for turn and stall-adjust thrust angles slightly if necessary. Also watch for the glide transition and glide pattern that follows. The model should transition to a slow floating glide with a right hand turn pattern. It may be necessary to adjust the stab incidence slightly to obtain a good glide after the power runs down.

Continue to add more torque on subsequent test flights. Fine adjust the thrust angle to control the climb characteristics. The target is to obtain the maximum climb performance profile for the model. Too steep and the power is wasted on overcoming the drag of the high angle of attack. Too shallow and fast is obviously not going to offer duration gains from altitude. The model should be climbing slightly faster than glide speed to be on a good climb performance profile. At higher power the turn may tighten somewhat, but this can help on a steep climb during the power burst to prevent stalling and is desirable. If the model banks heavily to the right under high power and does not climb, you need to remove right thrust until the model flattens out and climbs in the turn.

Once thrust angles are established by testing, sand the front end of the motor tube to be parallel with the aft face of the nose block as rigged with the thrust shim in place When the temporary shim is removed, the nose block should install at the same angle as when shimmed. Minor sanding may be required to fine tune the front end of the tube once additional power flights are undertaken. Always make conservative flights after any trim adjustment is made.

This model has been flown in torque ranges of 3 to 10 in/oz with no problems within the trim setting once established.

Now try some powered flights using the forward motor peg location. This position is to facilitate a 10 gram motor that is shortened into a thicker cross section for higher torque. The center of gravity will shift forward significantly when changing motor peg locations. As the model is already trimmed for power and glide, the easiest way to deal with the C of G shift is to add a ballast weight at the end of the tail cone. Use a small ball of clay applied to the top of the tail cone, under the stab and in front of the incidence screw. Check the balance point and perform some test glides to verify the trim settings are still correct to what was demonstrated earlier. Add or remove ballast to fine tune the glide angle.

Power flights can then be undertaken-use lower power and short D/T on the first one to make sure nothing is upset by the new motor location. Then start power trials using the maximum torque level you tested on the longer motor. Watch for excessive right turn as the power increases-some of the right thrust may need to come out, and down thrust increased to handle the additional energy. These will be very small changes-make them carefully.

After adjusting the model with clay ballast, remove and save after the flying session. In a contest, you will need to re-install if you decide to change motor strategy to suit conditions. It is suggested that the clay ballast be weighed, and that a small aluminum tube be installed on the tail cone to serve as a ballast box. The ballast can be a short length of solder that is installed through the aluminum tube and either end bent slightly to keep it from falling out in flight. The combined weight of the aluminum tube and solder should equal the weight of the clay ballast and installed in the same location as the clay.

Learn all you can about the performance potential of your model by experimenting with various motor sizes using 10 grams in each case. Long power cruise (1:40 has been demonstrated fairly consistently) can be had on a 4 X 1/8 SuperSport motor. This motor can only take about 3.5-4 in/oz. of torque and does not offer a robust climb. It will allow a long hunt for lift, and in light conditions will often yield max time easily without the model getting very far off the ground. If any lift is contacted the model will climb for quite some time and towering height can often be achieved in this manner.

Similarly, a 6 x 3/32 SuperSport motor will offer a long cruise (1:25 consistently) and better climb performance. This motor can take up to 5 in/oz. of torque consistently.

Use the forward motor peg location for 6 X 1/8 or 8 X 3/32 motors and high torque ranges. You don't have the motor run duration (45-53 seconds typically), but you will gain altitude rapidly. This type of motor is probably best suited to turbulent conditions when you need to get high above the ground quickly into smoother air.

Make sure the motor is well lubed to prevent binding in the motor tube. The use of an oversize tube on the tail end of the motor is suggested to allow the motor end to pivot on the motor peg and reduce binding potential. Use 5/16" OD X .014 wall aluminum tubing, 3/8" long for this purpose.

Care should be taken to store the model out of light and in a reasonably constant temperature location with low humidity. The tissue covering can eventually ruin the framework with continued exposure to heat and humidity, and sunlight will deteriorate colors and strength quickly. Store the fuselage carefully as this too can develop a slight bow. At contests, always test fly first to be sure new warps haven't crept into the model and impacted your trim settings.

Dental bands provided will eventually need to be replaced, especially the ones used to drive the Dethermalizer system. Obtain new dental bands from FAI Model Supply, PO Box 366, Sayre PA 18840-0366 USA. Phone 570-882-9873.
Please contact me at www.cbmodeldesigns.com if you need additional information about building and flying the Boomer.
Thanks again for purchasing a kit from CB Model Designs!
Clint Brooks