YARD STICK

Construction Manual

Kit No. CBMD-002

CB MODEL DESIGNS

www.cbmodeldesigns.com

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

Wing Construction

Cover the wing plan section with wax or parchment paper prior to construction to prevent parts sticking to the drawing.

Begin wing construction by laminating the left and right hand leading edge bows from three layers of 1/32 x 3/16 balsa. These parts are easily formed directly over the plan by pinning scrap balsa blocks to the board and forming the strips against them to maintain the profile shown on the drawing. Adjust blocks to control the profile to the outside edge on the drawing, and to the mating joint for T-4. Achieve this using the stock with no glue applied. Once this setup is established, use a thin coat of white glue between the three layers of balsa and reposition against the blocks on the plan and against the building board surface. Make sure there is excess material inboard of the polyhedral break-this will be trimmed back at the joint location once the bow laminations have dried.

While the bow adhesive is drying, assemble the wing tip segments T-1, T-2, T-3 and T-4 directly over the plan. Use white glue at the joints and position each segment to match the drawing. Use pins placed against the sides of the parts to maintain position, as pin placed through the parts may cause splitting or otherwise weaken the final product, which will be sanded to a tapered section to match the airfoil contour.

While the tip trailing edge assembly is drying, position the laser cut trailing edge segments to the plan. It is suggested to use a balsa strip pinned to the building board along the edge of the trailing edge line on the plan to support the location of the trailing edge segments during assembly. The same suggestion applies to the leading edge segment installation as well, as both boundaries of the wing will be well controlled dimensionally if this is done.

When the tip bows are dried, remove any blocking near the polyhedral joint to allow access for trim of the bow. Use the laser cut leading edge segment end as an angle gauge to mark the cut line for the polyhedral joint onto the tip bow. Use a new, sharp razor to cleanly cut the tip bow along this line. Locate the leading edge segments in position over the plan based on the dihedral and polyhedral joint locations. All segments should touch at the bottom edge. Block the leading edge segments against the strip stock used to control the boundary. Again, avoid pins through both the leading and trailing edge segments, as these items get much thinner during the finishing steps of the wing construction and will be weakened by pin holes.

When the tip trailing edge assembly is dry, remove from the plan. This section will be installed off the plan based on the rib geometry and offsets for undercamber. Position the inboard and outboard main spars over the plan using scrap balsa blocking pinned to the plan to maintain vertical position as well as forward and aft position. Note-the lower side of the spar has standoff tabs for proper offset for the rib undercamber. The wing leading edge bows should be left in position on the drawing as they were during lamination and trim for the polyhedral joint. Fit the tip trailing edge assembly in place over the top of the main spar, against the trailing edge segment at the polyhedral joint, and against the backside of the leading edge laminated bow. Use a few scrap balsa blocks pinned at the edge of the tip outline on the drawing to control the boundary of the trailing edge segment as you best fit all the joints. Do not glue anything yet. Position wing ribs W-2, W-3 and W-4 over the main spar according to notches in the spar. Best

fit wing ribs to the drawing by moving inboard and outboard slightly with the spar. Engage the tip trailing edge assembly notch to the end of the spar. The main spar dihedral and polyhedral joint ends will not touch until the dihedral is rigged at assembly.

The tip trailing edge assembly should be off the building board from the polyhedral break outboard. It is supported at the spar end by the removable tab on the spar lower edge. Ribs W-3 and W-4 also have standoff tabs to maintain the proper assembly rig, and the trailing edge assembly should be set to assemble flush with the top edge of these ribs. This also applies in general for all wing ribs-set the top edge to be flush at the upper surface of the trailing edges. The reason for this will become apparent during the final sanding and shaping step. If necessary, add scrap balsa shims under the tip trailing edge assembly to support during the bonding assembly. Position the forward edge of T-4 to be centered on the aft surface of the leading edge bow. This will create a slight undercamber and washout effect in the tip, which is highly desirable.

Once the outer wing panel is prefitted and all parts positioned, bond in place with light application of thin CA. Do not install the polyhedral joint rib W-1 yet. Dry assemble and best fit all the inboard wing panel W-1 ribs to the drawing location. Do not install the center dihedral rib W-1 yet. When satisfied with the inboard wing panel dry prefit, bond the assembly with light application of thin CA adhesive.

Install the 1/16 square turbulator spars in the outboard wing panels. Allow excess material for scarf joint overlaps at the polyhedral joint location. Bond the spar ends to the wing tip and ribs. Do not bond spars to rib W-2 yet-this will make it a little easier to assemble the polyhedral joint and W-1 joint rib. Install the inboard panel turbulator spars, again allowing for material excess at the dihedral and polyhedral scarf joint locations.

Carefully remove an outboard panel from the plan. Use the outboard joint rib gauge from the laser cut sheet to install the joint rib W-1 against the end of the inboard wing panel still on the board. Align carefully, but do not glue yet. Position the outboard wing panel onto the plan again, making sure to pass the loose ends of the turbulator spars over the top of the joint rib W-1. Carefully block the outboard panel tip off the building board to the 1-5/8" dimension shown on the drawing. Position to obtain contact with the end of the main spars, trailing edge and leading edge. Once the rig is established and all joint members are in contact, bond the trailing edge joint first, then the main spar/rib joint, and finally the leading edge/rib joint, with the rib positioned at the angle maintained by the gauge.

The turbulator spars should be overlapping at the spar notches in the joint rib W-1. Position one on top of the other over the rib notch, and using a very sharp razor, cut both spars at the approximate angle shown on the drawing, straddling the joint rib. The scarf joint should fall into the notch, and the tapered edges in firm contact with each other. Apply thin CA adhesive to solidify the joint to the rib and each spar. Repeat for the remaining turbulator spars and rib joints. The same basic process applies to the dihedral rig of the wing center. Leave one side flat on the building board and block the other side up to the dimension noted on the drawing, after positioning the wing center joint rib W-1. This completes the basic wing assembly.

Sanding the Wing to final shape

Sand the lower surface of the trailing edge to blend into the lower contour of the wing as determined from the wing ribs. If the ribs were installed flush to the upper surface of the trailing

edge segments, you will note a small step at the end of each rib relative to the lower surface of the trailing edges. This step needs to be sanded away to blend the lower surface of the trailing edges to match the undercamber of the wing. Use a small sanding block and position the wing lightly into your hand or against a working surface (wing upside down) and carefully work the lower surface of the T.E. stock by removing the material uniformly across the forward edge, until it is evident that the lower wing contour is smoothly blended to match the rib contours. At the leading edge, blend the lower surface of the leading edge segments and tip bow to blend smoothly to the profile of the ribs. Remove all the spar standoff tabs and very lightly sand any mismatches between the lower edge of the spar and ribs to get a flush match at all joints.

Once the wing bottom is sanded, perform similar cleanup on the upper surface. Using a flat sanding block, lightly sand the tops of the turbulator spars to be flush with the rib contours. Finish shaping the upper surface of the leading edge segments and bows and blend into the bottom contour with fairly sharp radius at the nose. Carry the leading edge radius into the wing tip and blend as required to transition from leading edge to trailing edges. Finish sanding the upper surfaces of the trailing edge segments and tip assembly to a tapered cross section, leaving a 1/32 thick edge across the entire trailing edge of the wing.

Perform final cleanup sanding with 220 & 400 grit paper, and apply two coats of nitrate dope to all the lower wing surface edges of the ribs, spar, and boundary members of the wing frame, and also the upper surface boundary and dihedral break rib edges.

Cover the wing with tissue provided starting with the bottom surface, making sure to bond to each rib and spar, tissue grain in spanwise direction. Apply one coat of non-tautening nitrate dope thinned 50% after shrinking tissue with alcohol or water mist.

Horizontal Stabilizer Construction

Begin assembly by placing scrap balsa strips along the leading and trailing edge lines of the stabilizer drawing to control the boundary of the leading and trailing edge segments, as done for the wing. Assemble the S-2 ribs with doubler ribs S-2a, making a left and right hand assembly.

Position the stabilizer spar over the drawing using scrap balsa blocking to maintain position, as done for the wing. Position leading and trailing edge segments over the plan, using the balsa strips to position against. Use no pins through the leading and trailing edge members. Position center rib S-1 onto the spar and best fit the spar and rib location to the drawing. Position the S-2 rib assemblies on the drawing and spar, with the S-2a doublers facing inboard to create the bonding edge for the S-8 closeout. Use scrap balsa blocking against the S-2 ribs to control the location of the ribs to the drawing. Use S-8 to check the fit of this part into position against the front of S-1 and S-2a doublers. Sand a 45 degree bevel on the lower edge to allow this part to sit flush to the building board surface. Once satisfied with fit of these components, bond in place to the spar, leading and trailing edge segments, and S-8 to the rib ends. Install the remaining stabilizer ribs S-3 through S-6. Install the S-9 stiffeners to the top of the spar against the inboard side of S-6, and to the trailing edge. This item prevents warp of the S-6 rib during covering and provides stability for the vertical stabilizer fins attached to either end of the horizontal stabilizer.

Shape the stabilizer by blending the leading and trailing edge to airfoil contour, with a fairly sharp leading edge radius and a trailing edge thickness of 1/32 as done for the wing. Blend the upper edge of S-8 flush with S-1 and S-2 ribs. Sand with 220 and 400 grit sandpaper.

After shaping the stab structure, seal with nitrate dope at structure boundaries and the edges of the S-2 ribs and closeout common to the notch area. Before covering prefit the stabilizer to the stab platform on the fuselage and adjust the fit of the notch to the platform edges.

There should be very little lateral movement of the stab in the flight position, but still enough clearance to allow minimal friction when the D/T release occurs for stab pop-up. If there is a tight fit to the stab platform, sand the edges of the platform lightly until a good sliding fit is obtained with the stabilizer. Finish profile the stab platform filler to match the upper contour of the stab airfoil in flying position.

Cover the stab with tissue but do not shrink yet. Lightly sand the exposed side of the S-6 ribs to level any tissue overlap from the covering step. It is suggested that the vertical fins be covered with tissue prior to installation. It is not a requirement to cover these with tissue, but they should be sealed with several coats of thinned dope or wipe on polyurethane and then sanded lightly prior to installation if not. The fins have laser etched reference lines that denote the bottom edge of rib S-6 to guide positioning during installation. If you covered the fins with tissue, pin prick the tissue on the bonding surface that will contact the S-6 rib. Rub cellulose cement (Duco, etc.) over this area with your finger to force the glue into the pin holes and also to saturate the tissue grain and improve adhesion of the tissue to the fin in this area. Use cellulose glue to install the fins; position according to the reference lines and with the fin held at 90 degrees to the bottom of the horizontal stabilizer.

Once the fin installation is completed, shrink the tissue covering and apply one coat of thinned non-tautening nitrate dope to seal. At the stab center section, apply two additional layers of tissue over the bay that will be in contact with the stab platform on the fuselage, to improve mounting stability and allow a strong surface for stab tilt shims applied during flight trimming steps.

Install the two D/T band hooks by pushing the ends into the top of the doubled S-2 ribs and apply a small fillet of medium CA dusted with microballoon filler to improve the glue fillet strength. Install S-7 and the wire D/T connector eye on the aft end of the stab. Cover this with a patch of tissue and dope to improve strength.

On the bottom of the T.E., on the centerline of rib S-1, bond the 1/64" x 1/4" x 3/8" ply to act as a strike plate for the incidence adjustment screw. Construct the fuselage before adding the scrap balsa keys on the strike plate.

Fuselage Assembly

Cover the plan with wax paper prior to assembling the two side frames. These assemblies are shown with the inboard side up for construction, to allow flush outside fit of the filler parts which are not 3/32 thick.

As done for the wing, it is suggested that balsa strip be positioned at the edge of the fuselage longerons for boundary control in the areas that are straight-the area under the wing covered by F-5, and along the fuselage bottom under the wing. As the fuselage box will be assembled sitting upright, the straight bottom section is used as a control surface from which to maintain squareness of the fuselage box. Also provide a boundary control strip for the short longeron in the stab platform area. Similarly, provide a boundary control strip for the forward edge of F-1.

Assemble left and right hand motor peg filler F-8 with the F-9 doubler; make the grain of the F-9

doubler horizontal for strength. Remove all the rest of the filler pieces for the fuselage side frames from the laser cut sheets for installation during assembly.

Begin construction by positioning the main fuselage longerons. These four long pieces of 3/32 square are segregated in the kit and cut from the same balsa stock for uniform stiffness. These should form easily to the shape on the drawing; if necessary soak the forward ends of the longeron in water to ease the forming of the curve at the forward end of the fuselage. Use scrap balsa blocks to maintain the position of the longerons to the plan outline, as done for the wing tip bows. Make the longeron conform to the outer edge of the drawing profile to avoid any mismatch between the two sides. Do not pin through any of the longerons, use blocking to control position and to hold against the building board if necessary.

Some builders prefer to construct this style of frame by starting with the upper longeron in place, and then installing all the other vertical members and diagonal bracing with excess left at the lower longeron joints. These members are then trimmed to match the plan at these points, and the lower longeron installed against the trimmed ends of these members. This method produces very good joint quality, and is somewhat easier to assemble than installing the upper and lower longerons to start, and fitting all the vertical members in between. Both methods are capable of producing quality joints if care is taken in trimming everything to match exactly. Whichever method is chosen, make sure the outer edge profile of the fuselage frames are matching the drawing. Use new, sharp single edge razor blades for construction of the fuselage frames.

It is also suggested that the filler parts F-3, F-4, F-6, F17 are positioned prior to installation of diagonal bracing to allow accurate fit against the three surfaces they are bounded by.

Use of white or aliphatic resin glue is suggested for fuselage frame assembly. Moistening the ends of the 3/32 square and 1/16 x 3/32 members prior to glue application will improve joint strength by allowing the glue to penetrate the end grain. Allow the fuselage frames to dry completely before removing from the building board. Use a 220 grit sanding block to lightly sand the inboard side of the frames to level any mismatching vertical member surfaces to the longerons prior to taking up the frames.
Cover the plan view of the fuselage with wax paper, to the extent of the fuselage bottom flat area. Assemble the fuselage box in place over the top view of the fuselage on the drawing. Measure the constant width section cross members and cut enough of these from the 3/32 square and 1/16 x 3/32 strip to install at each location. Also cut all the variable width cross members per the upper plan view in pairs to allow installation top and bottom as you assemble the fuselage box. Align the fuselage sides to the vertical members at the front of the wing area to start. Place a piece of wood or other large flat sided object at the front of the fuselage frames to provide a forward and aft reference stop for the two sides, based on creating the front end with no right thrust built in (this is added after assembly). Use 90 degree blocks or stops to square up the fuselage sides and maintain position during the assembly process.

Begin assembly by pinning scrap balsa blocking to the plan on the forward side of the constant cross section 3/32 sq members, at the bottom of the fuselage. Position the pre-cut 3/32 cross members against these blocks, held against them by pins, and aligned such that the ends are touching the longeron profile on the drawing. Now position the fuselage side frames (on the bottom flat area) against these cross members, holding them square to the building board with blocking and against the cut ends of the cross members. Adjust the sides until the forward ends are touching the blocking placed on the plan from the previous setup step. The cross members and vertical members of the side frames common to these should be in alignment, and both sides of the

fuselage frames touching the forward blocking. Do a check on the aft end of the fuselage for being even when held together on the centerline of the plan view. When you are comfortable with the best fit of all the features and rig of the two side frames, bond the lower cross members in place with thin CA, used very sparingly. Add the upper cross members at the same fuselage stations you just bonded, maintaining squareness to the building board surface and match to the drawing plan view. Use white glue or cellulose glue to allow these to be positioned carefully. Make sure the fuselage side frames are held against the building board on the flat section, and supported evenly at the aft end to insure no twist can develop, and allow the constant cross section area to dry before attempting to install additional cross members.

Using blocking to maintain squareness to the building board, lightly bend the fuselage sides to the plan view and fit of the variable cross members, working one bay at a time, starting with the first bay forward of the constant section already bonded. Pin the back edge of the blocking to keep the fuselage sides bowed and in contact with the upper and lower cross members, matching the plan at each cross member station. Install cross members with white or cellulose glue to allow some ability to position. Continue to work forward until F-1 is installed. Allow the glue to dry, then add the upper filler F-16, the lower one is easier to install after the fuselage is removed from the board.

Perform a similar operation moving aft on the fuselage from the previously bonded constant section, making sure to block the fuselage to match the drawing plan view at each cross member station, until the tail end is joined on the centerline of the drawing. Allow the adhesive to dry completely before breaking down the setup. Remove the blocking holding the tail end together first and observe if the fuselage springs or twists at all. If you took your time on the assembly and worked carefully, the center of the joint should remain exactly where you had it restrained. Carefully remove the rest of the support blocking you may have had in place, and remove the fuselage box from the plan. Add any remaining cross members that were too troublesome to get to from the upper side, including the lower F-16 filler at the nose. Carefully block sand the upper and lower sides of the fuselage box to level in any cross members that are above the profile of the fuselage sides. Sand the tail end of the fuselage square for installation of the filler assembly F-8. Detail the edges of the fuselage sides that will contact the stab platform assembly for cleanup, and check that the two short longerons that the stab platform attaches to are parallel with the top of the fuselage, and not twisted.

Assemble the stab platform and filler assembly from the 1/32 and 1/8 balsa laser cut part sheets. Assemble the filler block separate from the stab platform to start. Use a piece of scrap balsa blocking pinned to the building board, and assemble the stack up of 1/8 balsa segments against this, the aft face being in contact with the blocking to create an even surface. Use white glue to assemble, for ease of positioning. Allow to dry completely before removing from the board.

Assemble the stab platform doubler to the stab platform. Assemble the bonded filler assembly flush to the forward edge and sides of the stab platform, leaving a gap of approximately 3/32 wide to the platform doubler.

Assemble the tail cone filler from the two F-8 parts. Bond the 1/16 x 1/4 x 5/8 basswood filler to the top face of this. Sand the basswood end flush to the block assembly. Bond this assembly to the aft edge of the fuselage, making it flush to the top of the stab recess longerons. Block sand the filler block assembly sides to carry the taper of the fuselage to an edge 1/16 thick, on the center of the fuselage as shown in the drawing plan view. Block sand the bottom of the fuselage and filler block flush to complete the basic shaping.

Position the stab platform assembly in place, making sure it is centered on the fuselage, and square to the fuselage center line when viewed from above. Also check to make sure it is sitting horizontally on the fuselage. It is optional to build in the stab tilt for a right hand glide pattern at this point if desired. Our recommendation is to build the model square to start in case warps or other imperfections preclude the stab tilt as shown. When satisfied with fit and position, bond in place.

The filler area on the stab platform can now be trimmed slightly to match the taper of the upper longerons. Use a razor blade to carefully slice off the small taper required to carry this contour to a feather edge, on either side of the fuselage. Using a small sanding block, finish the top of the filler to blend into the top of the fuselage. Check the fit of the stabilizer to the stab platform installation. The sides of the S-2 ribs should clear with a minimum gap, allowing the stabilizer to tilt up easily from the flying position. Mark where the stabilizer trailing edge crosses the tail filler block with the stabilizer in place against the stab platform filler. Measure forward 3/32" from this line, and establish the center for the incidence adjustment screw location. This should be approximately centered on the stab trailing edge. Use a sharpened wire or similar to create a center starting hole for the screw pilot hole. Drill a 1/16 dia pilot hole square to the fuselage all the way through the tail filler block. Thread the screw into this hole completely; remove for covering the fuselage. Cutoff any excess screw length with the screw completed turned down to the surface of the basswood filler to prevent damage to the D/T guide tube joint. This completes the basic fuselage assembly.

Build up the noseblock assembly next. Start by installing the 1/32 plywood noseblock doubler over the 5/32 diameter aluminum thrust bearing tube, which will be used as a pin to stack the laminations for bonding. Position segment ‘A’ against the doubler with tube through the pilot hole, and bond together with thin CA. Make a mark on the upper edge of segment A for reference to the top of the block. Now install the remaining segments using the tube as a guide and best fitting to the laser etched outline of the previously installed segment, bonding with thin CA. Install segment ‘G’ with the corner notched. The corner piece itself is to be installed into the mating fuselage corner to allow keying of the noseblock assembly into the fuselage opening.

Mark the fuselage front end for the right thrust angle. Use a fine ballpoint or pencil to layout an angle on the top surface of F-2. The angle should start at the left forward longeron corner and taper to a point 1/32 aft of the right corner of the upper longeron. From this point, draw this line parallel to the edge of F-1 on the right side of the fuselage front edge, and then repeat the tapered line from the lower right hand corner to intersect at the forward lower left hand longeron point. Use a sanding block to carefully sand to the lines, making the entire face a planar surface that the noseblock will seat against.

Install one of the plastic thrust bearings into the front of the tube to use as a reference when sanding the noseblock contours. Install the noseblock assembly into the fuselage and hold in place with masking tape on the upper and lower sides. Use a sanding block and blend the sides of the noseblock flush and into the sides of the fuselage. Be careful not to remove too much of the longerons in this process. Sand the surface until all the steps in the segments are flush. Blend the plywood doubler to the edge of the thrust bearing. Repeat the process for the opposite side.

Now tape the noseblock in place with tape applied to the smoothly shaped sides, and remove the upper and lower tape, sanding the contour of the segments until smooth. Blend the plywood doubler to be flush to the thrust bearing. The block should now be profiled smooth on four sides, with sharp intersecting corners. Blend the corners just aft of the thrust bearing to continue the blending of the plywood doubler to match the thrust bearing, allowing the corners to still be slightly sharp at the aft edges of the noseblock common to the longerons. Avoid heavy radiusing through

this section, as it will significantly reduce the strength in the longerons in a highly stressed area. Do some final cleanup sanding to finish blending the fuselage and noseblock together, and then seal the noseblock with three coats of nitrate dope to seal, including the back faces.

Final sand the fuselage box assembly to remove all mismatches between the longerons and other members. Finish with 220 and 400 grit sandpaper, then coat with two coats of nitrate dope, sanded with 400 grit paper between coats. Dope the inside surface of the nose area as well.

Cover the fuselage with tissue, attaching to all the cross members as well as longerons. This type of fuselage will eventually see lots of tissue repair with use, and having the tissue bonded to the structure in cells will make this aspect much neater and faster to accomplish. Shrink the tissue and finish the fuselage with two coats of thinned non-tautening nitrate dope. Cement the two F-5 wing rails onto the top longerons where shown on the drawing. For a finished look, cover these with tissue strips to match the fuselage color after bonding in place.

Install the 1/16 aluminum D/T guide tube on the end of the tail filler block using a spot of thick CA at the top and bottom, dusted with microballoon filler. Install the two 3/32" scrap balsa D/T band stops on the bottom of the fuselage as shown on the side view. Reinstall the incidence adjustment screw in the tail filler block.

Stabilizer Rigging

The rig of the horizontal stabilizer is somewhat critical in plan view. The effect of having two vertical stabilizers mounted off center to the fuselage means a high degree of turning force for small angular changes in the horizontal stab position. For this reason, the keys shown on the strike plate are necessary to insure consistent trim of the model. Without, little variations in seating the stab on each flight will likely result in inconsistent turning performance, and some frustration on the part of the builder to get the model in trim.

Using 3/32 scrap material, make a small block with tapered sides to match the size of the plywood strike plate already installed on the bottom of the stabilizer. Bond this in position over the strike plate.

Position the stabilizer assembly on the stab platform and determine as best you can an equalized position for the two fins, as close to parallel to the fuselage center line as you can. It is possible to set the stab slightly skewed such that the right tip is slightly forward of the left tip for built in right turn trim if you so desire, but we recommend setting up with a parallel condition to start and leaving rudder tab adjustments as a last resort to obtaining a right hand glide pattern. Once the position is obtained, press down carefully on the trailing edge of the stab to allow the head of the incidence screw to make an impression into the balsa block glued to the strike plate. Allow the stab to tilt up, and using a new sharp razor, carefully make a forward / aft slot in the block to the width of the screw head impression. Test the fit of the slot over the screw head, and keep lightly cutting the slot until it is wide enough to snugly grip the screw head, and deep enough to let the screw head hit the strike plate. Use a small file or emery board to develop a tight but slipping fit of the slot with the screw that allows the stab to pop-up easily upon D/T release, but with no lateral slop that would impact the turn trim of the model. Once this accurate fit is obtained, you can carefully sand down the thickness of the keys to be no taller than the thickness of the screw head.

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D/T Timer Setup

Install the timer spring using the wire ‘U’ that is installed in the laser cut holes in F-14. Carefully apply a small dot of medium CA at the intersection of the wire ‘U’ with the pylon to secure this item from pulling out during use. Dust the CA dots with microballoon filler to improve strength. The spring should be free on the wire ‘U’ to align with the pull direction of the lanyard.

Install the tripwire assembly as shown on the drawing. Use thick CA applied sparingly to bond the alum tube bearing to the fuselage side. Check for loose freedom of movement-this item must pivot very freely to allow release of the D/T line. Add the two laser cut fillers on either side of the bearing tube to secure this installation. Shave the fillers to a feather edge and cover this area with a small piece of colored tissue to match the fuselage.

Install an IKARA viscous timer as shown using a small amount of thick CA to bond directly to the side of the fuselage on F-6. Pin prick the tissue under the timer mounting area to improve adhesion and allow the CA to penetrate into the F-6 filler. This timer can be purchased from FAI Model Supply-see ordering information at end of this manual.

Form a lanyard loop with a piece of thread included in the kit; keep about 24" for the D/T line. Make the lanyard loop longer than necessary to start. Loosely tie the lanyard through the free end of the timer spring, making a single hitch knot; do not tighten completely until the length of the lanyard is adjusted to calibrate the timer movement and spring tension-you will need to loosen and adjust this knot during the next steps to obtain good timer performance.

Set the timer arm to the vertical position (12:o’clock). The timer setup is intended to turn in a clockwise rotation as viewed from the side of the fuselage. Install the lanyard over the timer arm, and adjust the tension in the lanyard knot to extend the spring approximately 3/8" to start. Observe the timer for movement-it should be very slow prior to releasing-observe for approximately 25-30 seconds to release from the 12:00 position. If it runs faster than this, you will need to loosen the knot and lengthen the lanyard slightly to slow down the timer and reduce spring tension. If the timer fails to release after this amount of time, loosen the knot and shorten the length of the lanyard slightly to speed up the timer and increase spring tension. Make absolutely sure that the timer will release at the minimum tension you can obtain from the spring. Now install the lanyard and turn the timer arm to the 6 o’clock position and time the movement until release. Some adjustment of the lanyard length may still be required, but in all cases, you must not minimize spring tension to the point the timer does not completely pull through and release. Repeat timer start position and note time for validating consistency in cycle from the same start point. Mark the fuselage near the timer with small lines to reference a start point for a two minute, 3 minute timer setting, etc.. Once satisfied with the timer calibration, tighten the lanyard knot at the spring end, and apply a drop of CA to secure the knot-cutoff the remaining tail of the lanyard.

Dethermalizer rigging

Use the remaining piece of thread to fabricate the D/T line assembly. Start by tying one of the retainer hooks to one end, and apply a dot of CA to the knot to prevent coming apart in use. This is attached to the D/T connector eye on the horizontal stab, and the stab positioned onto the fuselage using two dental bands tied together as the tensioner for the pop-up. In practice, install the D/T pop-up bands by crossing over on top of the stab platform fairing-this prevents any possibility of the rubber falling into the gap between the stab notch and filler and preventing full pop-up position. Feed the unfinished end of the D/T line through the guide

tube, and feed the 1/16 alum tube D/T stop onto the line. String the second retainer hook onto the D/T line, with tensioning band installed, but do not tie yet. Install the timer lanyard over the stem of the timer to allow the end of the tripwire to become trapped under the lanyard. Place the D/T line tensioning band on the retainer hook over the trip wire end, and pull the D/T line tight until the band tensions the D/T line and pulls the stab down against the incidence adjustment screw. Pinch the retainer hook and D/T line to capture the position, and release band from the tripwire. Tie off the retainer hook and apply a drop of CA to secure the knot-cutoff the excess D/T line.

Allow the stab to move to the 45 degree position and slide the 1/16 aluminum tube against the end of the guide tube with the D/T line in light tension. Lightly crimp the forward end of the stop tube to capture the location and pull the D/T line to clear the stop tube from being against the guide tube and apply a drop of CA to the stop tube to secure onto the D/T line. This limits the stab from over rotating during pop-up and becoming dislodged from the stab platform.

Prop / noseblock assembly

Finish the noseblock assembly by installing the second thrust bearing into the aft end of the 5/32 OD tube. Secure the thrust bearings into the tube using cellulose cement or silicone adhesive, as it may be desirable to remove these items in the future. Install two bead head pins to act as posts for the rubber band retainers used to hold the noseblock against the fuselage for flight.

Next, install the two scrap 3/32 retainer stops on either side of the fuselage. Pin prick the tissue in the area these install to improve joint strength prior to bonding. In practice, the dental band attaches against one retainer stop, stretches around the noseblock against the pin heads and onto the opposite stop. Finish the noseblock with colored tissue or dust with Design Master floral spray or colored dope if color is desired. Install prop shaft, Teflon thrust washer, prop and bend prop shaft end to complete the noseblock assembly.
Install the two wing hold down pins. These are made from common toothpicks with the ends cut off-in case replacements are needed. Start flying with the wing dowels in the center set of holes. Do not glue the dowels in place. If you need to shift the wing for center of gravity adjustment, you will need to reposition the pins to either the forward or aft hole locations.

Install the stabilizer as used for flight. Adjust the incidence screw in or out to set the stab bottom to a horizontal position to start (parallel with the stab inset longerons).

Flight trimming

Check wings for washout in the outboard panels. It is suggested that the left wing have slightly more washout than the right wing tip to help keep the right wing up during a climbing right hand turn under power. The model should be trimmed to fly right-right (right hand power climb transition to a right hand glide circle).

Install a lubricated rubber motor into the fuselage. This model has been flown very successfully with 10-13 grams of rubber. Two loops of 3/16 rubber are provided in the kit, and it is suggested to start with this for initial flights. Other combinations using 1/8 and 3/32 rubber can be experimented with once you have the model setup and trimmed.

Install the horizontal stab, checking for an initial neutral setting of incidence-adjust the incidence screw in or out to obtain this setting to start. The model should be set up to fly right-right, which includes adjusting stab tilt to obtain this. Start with the stab tilt even (level with wings) for initial glide tests. Attach the wing using four of the dental bands provided in the kit. If more of these are desired, order from FAI Model Supply at the address noted in the end of this manual.

Check the balance of the model at position shown on drawing, with the rubber motor slightly wound to take up slack and laying uniformly in the bottom of the fuselage. If the model appears to be balanced slightly nose down, proceed with test gliding. If the tail is obviously lower than the nose, remove the wing and adjust the wing pins back to the aft holes in the fuselage and remount the wing. Check for balance again. Similarly, move the wing position forward if the nose is very strongly tilting down. It's best to be slightly nose heavy to start. Experiment with wing position and incidence of the horizontal stab before resorting to adding ballast-you should not have to add any ballast to this model to get it to trim.

Begin test glides with gentle level push forward under calm conditions. Wind the motor up just enough to make the prop turn at the approximate free wheel speed. An alternative to this is to not install the prop or motor during the test glides. Instead ballast the model with the noseblock installed and test glide as a glider. Once a good glide trim is obtained, mark the center of gravity and then remove the ballast. Install the prop and motor and adjust the wing position to achieve the center of gravity location you found during your test glides.

In either case, observe the glide path-adjust the incidence screw out to pull the nose up or in to drop the nose in the glide. Repeat glides and screw adjustment until a very flat glide path is achieved. If no turn is evident in the glide, start adding shim to the right side of the stab platform to tilt the right stab tip higher than the left until a flat right hand glide pattern is obtained, about a 30 foot radius. If stab tilt is not quite enough to gain the right hand turn, reduce washout in the left wing. If this still is not enough, add small amounts of right rudder tab until the right turn is satisfactory. If necessary, reset the stabilizer keys on the strike plate to reposition the stabilizer to the right a slight amount and increase the turning force to the right. Be very certain you have a consistent and safe glide pattern before attempting powered flights. You may have to adjust incidence slightly again once the glide transition is observed during power trials. The model should be adjusted to glide just above stall speed. Any observation of repeated shallow climbs and stalling pattern in the glide should be adjusted out by tightening the incidence screw a little at a time until the glide flattens during transition from power. Perform glide transition testing at lower power settings-use the same motor torque levels for each trial. Once the glide is sorted out, higher power climb stalling and turning are handled with shimming or sanding in down and side thrust.

Begin power flights using minimum torque to start; about 400-500 turns or 3 in/oz. torque. Use a 3/4" diameter blast tube to protect the fuselage from damage should a motor burst during winding. Set your timer for a 20-30 second release in case there are problems-this can save damage from aggressive stalls or other problems on the initial powered flight. Launch the model in level attitude, and observe for a smooth climb out to the right as a goal. If the model climbs and stalls under low power add downthrust shim to control. If the model wants to go left add right thrust shim. If the model decays into a spiral dive to the right under power, reduce right thrust shim or add left thrust shim. If the model still continues to shallow dive under power, remove some downthrust shim. Add more power and adjust shimming until a smooth climbing right hand spiral is obtained-from 30 to 40 feet in diameter. As a rule, when

making thrust adjustments for high power, use very minimal changes. When consistent flights are achieved at maximum power (8-9 in/oz. torque), finalize the thrust setting by sanding the front of the fuselage to match the angle established by the temporary shims, or build in permanent shims to allow repeat of the thrust setting on each flight. If trimmed correctly, your model will spiral up in a right hand turn under power, level off and continue to orbit to the right as the motor expires it's energy and the prop begins to freewheel. The glide at this point should be very flat and sustained-if the model picks up speed and appears to fly fast, adjust the incidence screw out about 3/4 turn until the glide flattens to a minimum sink speed (just above stall). If the glide transitions into a roller coaster stall and recovery, tighten the incidence screw in about 3/4 turn until the glide flattens and becomes smooth and slow. It may take 8-10 full power flights to observe the model and get it adjusted for maximum performance.

Make sure your D/T setup is functional before attempting powered flights. This model will disappear easily if the D/T does not release! Put your name and phone number on the model too-you may get it back.

Esaki covered models will fade quickly if left exposed to light. For maximum protection from fading and warping, it is suggested to store the model in a cardboard box or other storage container. Models stored in this manner will look fresh for many months and perform consistently.

Motor setups

If you have never built and flown rubber powered models, visit our website to view an article concerning the methods of making motors, installing and maintaining them. Otherwise, some basic recommendations for motors follow:

13 grams of 3/16 SuperSport rubber (included in kit) formed into two loops is a very serviceable motor to start, and will provide fairly long runs. Wind this to 8-9 in oz. torque for a motor run of approximately 80-90 seconds. Four loops of 1/8 SuperSport wound to 9-10 in oz torque offers a powerful climb but run time about 53 seconds. Experiment with other motor sizes and weights to obtain a long duration run and moderate climb performance for maximum cruise time to stay in lifting air. Overpowering the model may not improve performance, as it is possible to overspeed the prop and reduce efficiency with excessive power.

This model has been flown with a balsa folding prop quite successfully. A free download plan for a folding prop is available on our website.

Good luck with your model. If you need further assistance, contact us at www.cbmodeldesigns.com This construction manual is also available to view and download on line at our website.

Resources

IKARA viscous timers, **Tan SUPERSPORT** rubber, **Crocket** hooks, dental bands, other FF model supplies and tools all available from:

FAI Model Supply
P.O. Box 366
Sayre PA 18840-0366 USA
phone or FAX 570-882-9873
or contact at:www.faimodelsupply.com