

40% Scale Schweizer 1-26E ~ Design and Kit by Peter Goldsmith

The first kit (second model to be built and flown) was built using a combination of products from ZAP and Deluxe Materials (available at your local hobby shop and Horizon Hobby).

Wings

- Locate the 8 sheets of 24" x 48" x 1/32" plywood and lay them out flat. These will form the top and bottom skins of the wings, so sort the sheets and decided which sides you want to face out and which pieces you wish to join to make each surface.
- Join two of the 1/32" plywood sheets end to end to make a 24" x 96" x 1/32" piece. You will need to make four of these.
- Determine which end will be the root end and which the tip end. Since the wings taper, there will be a significant amount of excess material that will be removed as the wing construction progresses. The cord of the wing at the root is greater than 24", so a piece of 1/32" plywood sheeting will need to be added. Do this by removing a triangular section from the rear of the tip end of the 1/32" sheeting approximately 2" x 12" and add this to the rear of the root end of the sheeting.
- A simple and effective way to join these sheets together is by sanding a 1/4" wide taper on each end to be joined. Draw a line on the plywood with a ballpoint pen. Support the edge with a 1/8" thick steel or aluminum flat bar stock. Use a sanding block about 2" wide with a strip of sandpaper about 1" wide on one side. The bare side can then ride on the workbench surface without cutting into it. As you sand, the glue between the three layers in the plywood will appear as strips. Sand until the ink line just disappears and the

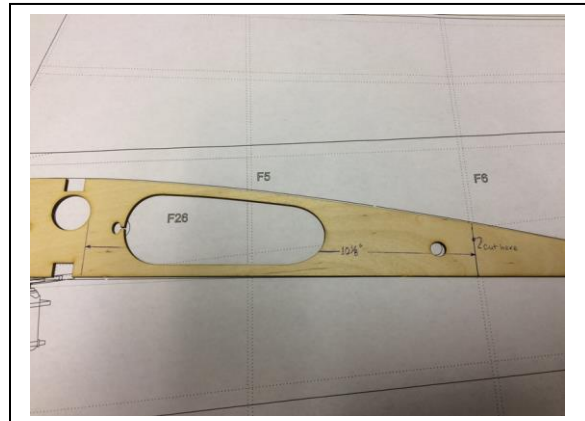
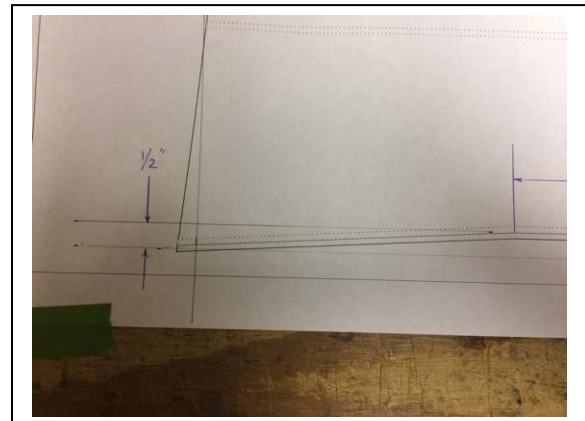


plywood glue lines are straight and parallel. This will provide a nice 8:1 ratio scarf joint between the sheets of 1/32" plywood.

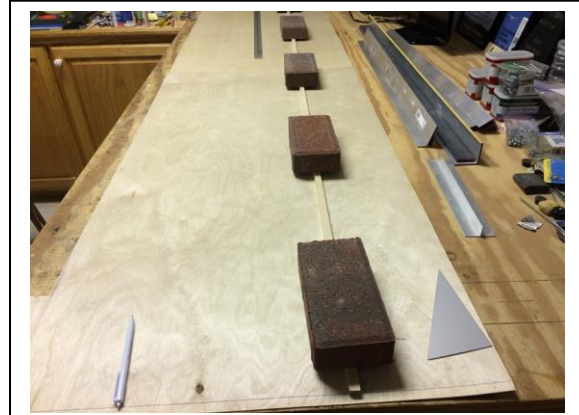
- Overlap these tapered ends and glue together. Deluxe Materials Speed Bond glue works very well for this task. Apply a thin film of glue to the tapered area on each piece. Allow the white glue to dry to clear, then use a covering iron set to its maximum heat setting to glide over the joint and seal the two pieces together. Heat activates the glue and the parts will bond almost instantly.
- Once these four pieces of wing skin sheeting are completed move on to making the wing spars. Spar material is 3/8" x 1/2" x 48" basswood. Sort the 8 pieces included in the kit to make two sets of top and bottom spars 96" long. Actual length will be shorter because of the scarf joint that joins them.
- Cut a taper 3" long on one end of each piece of the 3/8" x 1/2" basswood spar material. Overlap these ends and glue them together to produce an 8:1 ratio scarf joint. An easy way to ensure a straight spar is to clamp the two pieces being joined to a piece of 3' to 4' aluminum angle. This keeps the two pieces aligned in a nice straight line. The scarf joint was cut through the 3/8" thickness.



- Locate all the ribs and shear webbing for each wing. Study the plan and arrange the pieces in order. Note that the shear webs have a top and bottom as well as a left and right. Make sure you have these properly oriented as you glue them in place. The bottom corners of the webs are 90-degree angles; the top edges are not 90-degree angles, as this side follows the taper of the wing from root to tip.
- Note that the root rib has a bend in it 10-1/8" behind the rear of the wing socket tube hole in W1. The tip of W1 is offset 1/2" from this bend (this is necessary so that the wing root will follow the side of the fuselage). Study the plan carefully to understand this alignment.
- Place a bottom wing skin on a flat work surface large enough to support the entire length and width of the wing. This is essential to produce a wing that is straight and true.
- Place a spar onto the sheet along with the root rib and tip rib. Measure the distance between these on the plan and then place them on the spar according to the measurement. Hold the W1 root rib back at least 1/2" from the edge of the sheet to account for the bend. Position the spar and rib assembly over the bottom sheeting to establish the necessary spacing all the way around. Once satisfied, mark the location for the spar. You may want to place all of the ribs onto the spar on the first wing just to get a sense of how they will be situated relative to the full sheet of 1/32" plywood lower wing skin, and to establish a good reference for the trailing edge line.



- Remove the spar and rib assembly and draw a straight and true line on the bottom sheeting as a reference for gluing the spar to the sheeting. At the root end, draw a reference line that is 90-degrees to the spar line. This will be the reference for the edge of W1. Make sure that there is that ½" width to accommodate the bend in W1.
- Glue the bottom spar to the bottom wing sheeting. Place W1 on the root end of the spar and align it with the reference line. Use the root rib template pieces to set the W1 between its proper tilt (necessary because of the dihedral angle of the wing to the fuselage juncture).
- Glue W1 in place after cutting it to make the bend. You may want to use scrap 1/8" plywood to make an internal support for the bend between W1 and W2.
- The first three shear web sections are in two pieces for top and bottom of the wing tube socket. Carefully examine these parts for their correct orientation. Once you identify the correct orientation, you will note that the shear web part numbers will be oriented on the same side on every piece; this will help you keep these parts in correct orientation as you go along. Note also that the remaining single piece shear webs are square on the lower edges but not on the top. This accounts for the taper in thickness of the wing from root to tip. Make sure that these shear webs are not installed upside down. Again, note the part number labels to help with this.



- Use each shear web as a spacer for the next rib location. Place the next rib in place (without glue) and use a builder's square or a drafting triangle to align the rib at a 90-degree angle to the spar. Draw a reference line then glue the rib in place using this line. Note that the ribs are flat on the bottom from just in front of the spar back to the trailing edge. Only apply glue to this flat section for now.



- After adding ribs W1 through W5 along with the shear webs, slide the cardboard wing socket through the ribs and up against the stop. Mark the outside of the tube at W1, then cut the cardboard wing rod tube socket about 1/8" longer than the mark (to accommodate the addition of the wing root rib in the last step of wing construction).

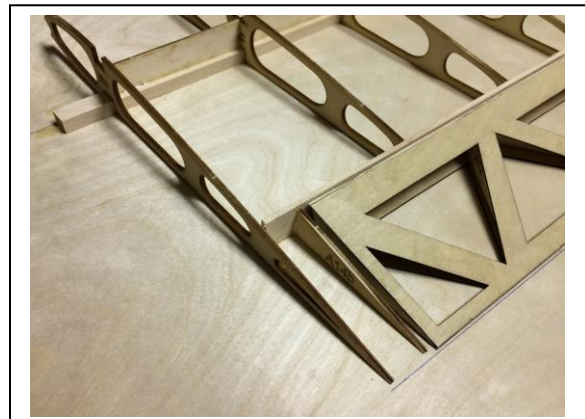


- Glue the tube in place and add the top parts of the shear webs between W1 and W4. You may want to use epoxy with a filler (Like West System 404) to bond these shear webs to the wing tube socket.



- Add the next shear web and then the next rib. Keep doing this sequence until you have all the parts glued in place.

- Add the 8-32 T-nut (for wing bolt) to the inside of rib W1 in the hole just in front of the wing tube. Use epoxy to anchor it in place. You may want to use a piece of scrap 1/8" plywood as a doubler here.



- Add the 1/8" balsa to the trailing edge of the ribs in the aileron bay. Sand the top side of the aileron cutout trailing edge balsa to the contour of the ribs. You may want to add scrap balsa along the top inside edge of this piece to increase the gluing area for the top sheeting.



- Add the partial rib A14b at the tip as shown on the plans to complete the aileron bay.

- Add the Spoiler servo mount (check orientation of this part with the plan) between ribs W9 & W10. It is set 1/4" down from the spoiler pocket edge cut into the ribs on either side.



- Add the strips to the front and back edges of the spoiler pocket, and box in the ends using scrap balsa along the outside edge of the ribs at each end.

- Add the bottom section of the aileron servo mount support between ribs W18 & W19. Cut out the opening in the 1/32" sheeting before laminating the second part of this assembly.



- Add servo extension wiring for aileron and spoiler servos. Note holes in ribs for wiring.

- At the rear of each rib, make a mark about 1/8" behind the rib. Use a straight edge to connect these marks and then cut along this line and remove the excess sheeting. A construction grade utility knife works extremely well for this task.



- Add the 3/8" square balsa leading edge to the rib notches. Pull the sheeting up to the bottom of the ribs and mark the sheeting along the front edge of the leading edge. Cut along this line and remove the excess sheeting.



- Use various thicknesses of sticks and or a piece of aluminum angle to hold the sheeting up against the ribs between the spar and the leading edge and glue sheeting to the ribs.



- The sheeting makes somewhat of a sharp bend as it transitions onto the 3/8" leading edge balsa stick, so a piece of 1/8" x 3/8" balsa is included which can be sanded to a tapered cross-section to fill in between the sheeting and the 3/8" square balsa leading edge.

- Test fit the top spar and sand the ribs and shear webs as needed to get the spar to drop down flush with the top of the ribs. Once satisfied, glue the top spar in place



- Make 45-degree triangles out of scrap material and use these to support a piece of 1/32" scrap plywood to fashion the wing tip. Sand the top of these pieces to follow the contour of the tip rib.



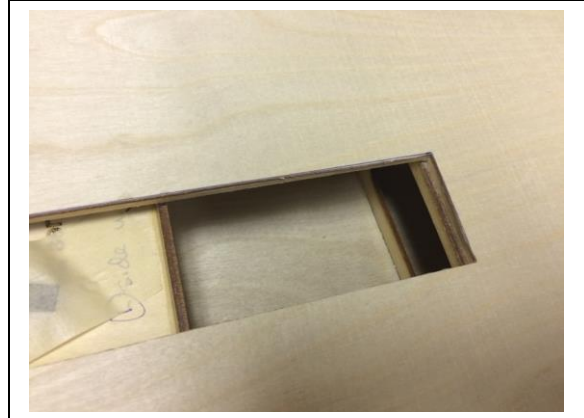
- Lay the top wing sheeting on your workbench and then place the wing structure on top of it. Mark along the trailing edge and draw a line about 1/8" behind these marks. Lift the front of the sheeting upward and mark along the front of the leading edge. Again, draw a line about 1/8" forward of these marks. Remove the wing structure from the top sheeting and cut off the excess from the front and back. Remember that the top sheeting curves over the top of the ribs and needs to be cut a little oversize to account for this. You may want to cut out the spoiler opening here.



- Carefully sand any high spots so top wing sheeting will apply smoothly over the structure.
- The top sheeting can now be added to complete the wing. One way to do this is to use Deluxe Materials Speed Bond and a hot iron. Apply a good bead of Speed Bond to the entire length of the spar, leading edge, trailing edge, and all ribs. Carefully place the top sheeting over the lower panel and drop in place pushing the top sheeting down over the underlying structure. Now lift the top sheeting away and smooth out the glue lines (adding extra glue as needed) until there is a thin film everywhere the top sheeting and underlying structure come in contact. Let the glue dry until it is clear instead of white. Position the sheeting over the wing structure with the wing structure supported on a flat and true surface (so that the wing will not have a built-in twist). Once satisfied with the location of the top sheeting, use the hot iron and press down on the sheeting along the



spar line to activate the glue. After doing this along the length of the spar, do the same along each rib, moving from the spar to the trailing edge and forward from the spar to the leading edge. This will take a little time as you move slowly along, pressing down with the iron and following with the other hand in a hot mitt to hold the sheeting down while the glue sets. You will find the necessary pace as you go along. If you discover an area where the sheeting is not stuck down, you can go back, even days later, and apply heat and stick it down. Another useful trick is to wet the surface of the plywood where it curves sharply down over the ribs onto the leading edge. The hot iron will cause this water to steam down through the plywood, helping to establish the curve and to activate the glue.



- Cut out the spoiler bay and sand the edges as needed.
- Cut off the excess plywood sheeting along the tip and root and sand as needed.
- Do the same along the trailing edge and in the aileron cut out.

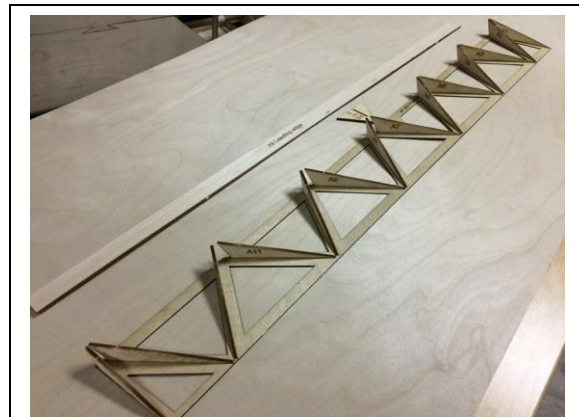


- Finally, sand the leading edge to shape.
- Plywood root rib is added once the fuselage is completed. The wings are attached with the plywood root rib placed between the fuselage and W1. The goal here is for the root rib to be snug against the fuselage side. Glue



in pieces of scrap to fill any gaps between W1 and the root rib. (Don't accidentally glue the wing to the fuselage!)

- Remove the wings and sand the root rib to the contour of the wing and add filler as needed to hide any gaps between the root rib and wing. Wings are now ready to be covered.
- Assemble the aileron servo mount plate and laminate on the 1/32" plywood skin.
- Locate all the parts for the ailerons. The ribs are glued directly to the lower plywood skin as per the laser etched lines on the skin.
- Add the triangular plywood control horn block and then the balsa leading edge. Block sand the top of these parts to level everything out and then glue on the top plywood skin to complete the assembly.
- Ailerons use a top hinge made from covering material. Control horn is made by laminating two of the laser cut G10 parts together and gluing the horn tab into the aileron slot.
- Aileron servo recommended is Spektrum A6265. Hangar 9 metal 1-1/2" half control arm used for control hookup. Hangar 9 4-40 Pro-Link 1-1/2" rods with DuBro 4-40 ball links were used to make the connection between the servo arm and control horn. Recommended control throws for the ailerons are 55mm up and 35mm down.



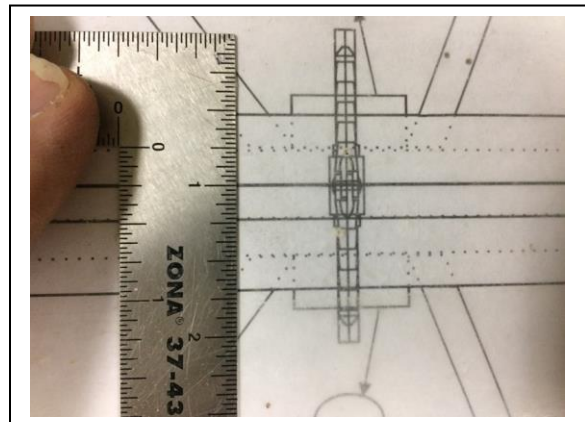
- Spoilers are made by laminating the plywood spoiler skin to the lite ply doubler part. Spoiler is hinged with covering material along the front edge. A wire stirrup is fashioned 8mm wide by 17mm tall for the servo arm to capture and lock down the spoiler.



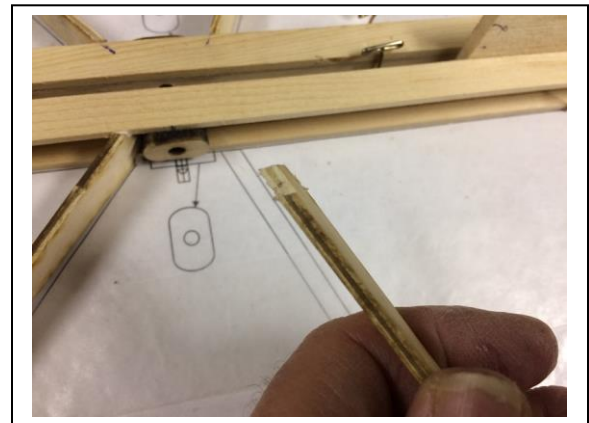
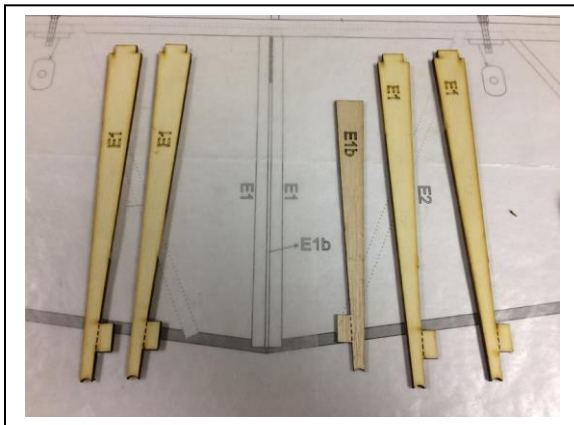
- Recommended spoiler servo is Spektrum A7050 thin wing servo with 1" Hangar 9 metal half control arm. The arm pushes the spoiler door open and the springiness of the covering hinge lets the spoiler door go closed. The arm hooks into the stirrup to hold the door closed. Use endpoint adjustments to set the correct amount of travel. If possible, set the servo travel speed so that the spoiler doors open and close slowly.

Horizontal Stabilizer & Elevator

- Locate all the parts to complete this section. Study the plan carefully and determine the correct orientation of all parts. The ribs have build tabs that allow the structure to be assembled on a flat surface without the need for special shims.
- The trailing edge of the stab and the leading edge of the elevator are both constructed as a beam that sandwiches these edges between the spruce spars in a "C" shape cross section.
- Add the balsa "donuts" on the backside of these structures aligned with the pre-drilled hinge point holes.
- The stab leading edge is made from 3/8" wooden dowel rod while the trailing edge of the elevator is made from carbon rod.



- The ribs have tabs that fit into the “C”. Use a sanding stick to angle the tabs for a best fit. It is helpful to build the stab and elevator over the plan to assist with correct rib angles.

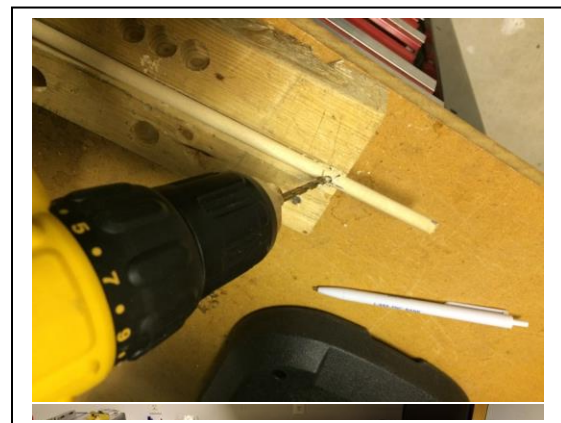


- Laminate the E1 plywood elevator center ribs together with the balsa E1b rib on the center line. This configuration forms the slot that the elevator horn fits into.

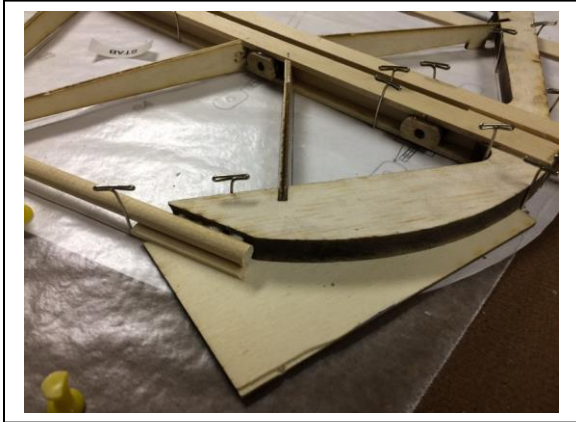
- Use a round file to cup the trailing edge on the ribs so they make a good joint with the carbon rod trailing edge. CA was used for this joint.



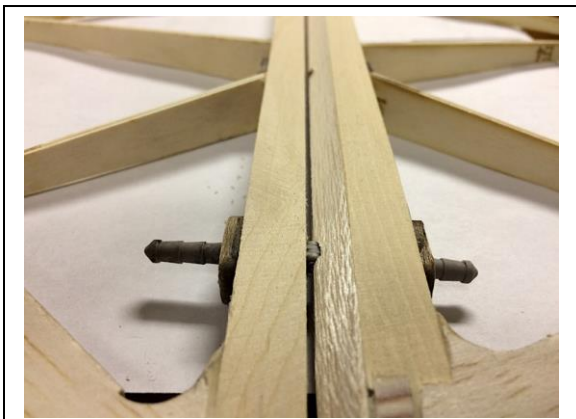
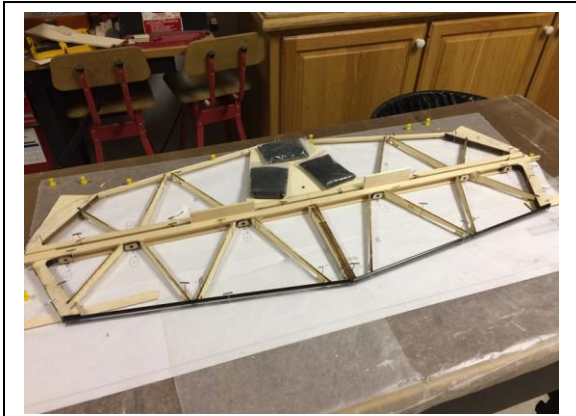
- Leading edge dowel is drilled so that the center ribs can key into these holes. Plywood center sheeting is then added.



- Laser cut balsa ends are added to the stab and elevator. Use scrap pieces as shims to assist with keeping the leading edge wooden dowel and trailing edge carbon tube centered on these parts. Note that these thick balsa pieces will get sanded to a taper.

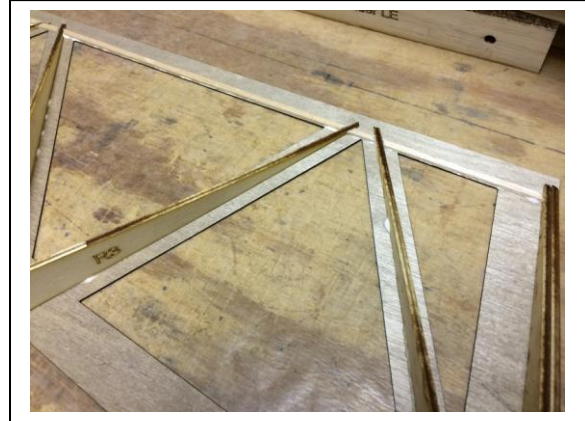
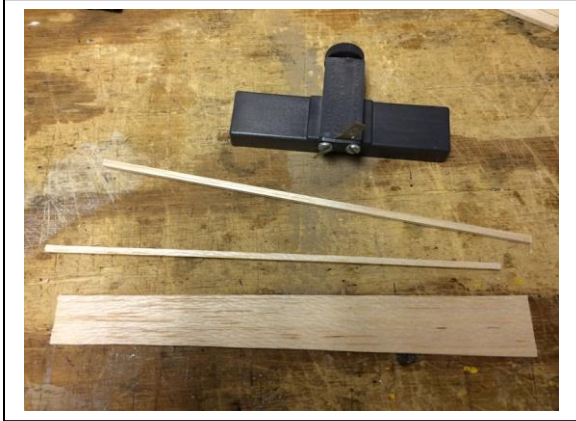


- Significant sanding is needed to round and taper the edges of the spars and balsa ends. It is helpful to temporarily hold the stab and elevator together by inserting 3/16" wooden dowel pins in the hinge point holes (before sanding the "V" onto the elevator leading edge). Drill through to connect the holes in top and bottom center stab sheeting.



Fin & Rudder

- Study the plan and locate all the parts for the rudder and fin. The rudder is built on the 1/64" plywood skin and is similar in construction to the ailerons. Glue the ribs onto the skin using the laser etching as a guide. To strengthen the trailing edge, cut a thin strip of balsa from scrap and glue it along the inner side of the trailing edge of the plywood skin. Sand this to the taper of the ribs before adding the top skin.



- Complete the rudder by sanding the leading-edge balsa to a "V" aligned with the center of the hinge point holes.
- The fin is constructed as a unit that plugs down into slots in the fuselage with its base sitting on the F21 platform. Start with the laser cut balsa long inner trailing edge part and add the ribs using an angle template guide. Add leading edge, hardwood spars, and outer laser cut balsa trailing edge. Sand leading and trailing edges to match the contour of the ribs and then sheet with 1/16" balsa. Outer leading edge balsa is added and rounded, then fin and rudder are capped with balsa and sanded to matching height. At



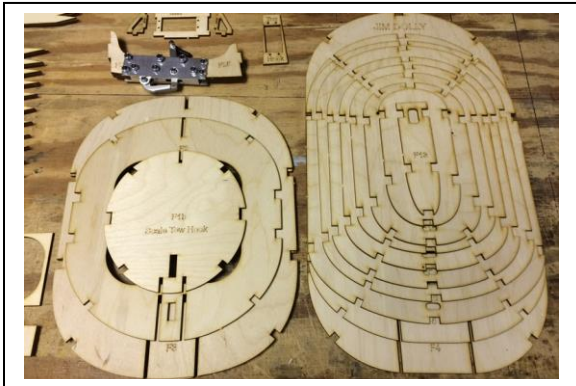
the completion of the fuselage construction, the balsa fuselage sheeting over the F21 platform is cut out using a template made from the base shape of the fin.

- The fin will drop in through this opening and only slight fill needs to be added to close the gap between the fin and fuselage.



Fuselage

- Locate all the fuselage parts and start by joining the plywood sides. Then, using the plan as a guide, add the hardwood longerons around the perimeter of these sides.

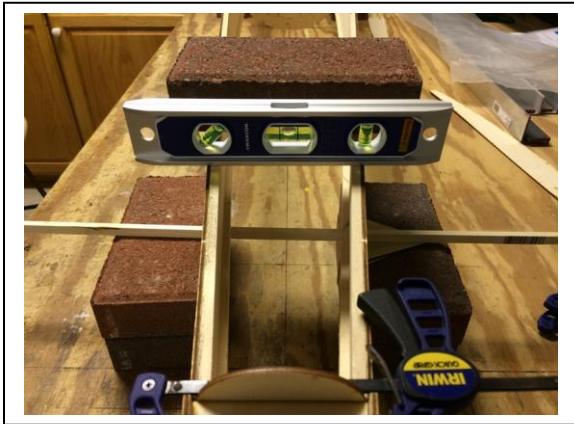


- The accuracy of the longeron placement can be cross checked by using the notches in the formers to establish proper spacing between the top and bottom edges. Laser etching on the fuselage sides mark proper placement of the formers.
- The plywood F26 doubler is a key part that needs to be accurately aligned with the wing tube, wing bolt, and servo extension lead holes. It is helpful to use the wing tube as an alignment tool. Use wing anti-rotation dowel to set F24 doubler.
- The fuselage is a constant width between F3, F4, F5, and F6. Set these formers in place, making sure that they are perpendicular with the fuselage side. Use scrap sticks in the former notches as temporary brace to maintain proper spacing between the formers.
- Set opposite fuselage side onto formers and check alignment at the tail and nose to make sure both sides are true with each other. Take your time here as this is a critical step in building a straight fuselage. A large drafting triangle is a very helpful tool for this task and can readily be found at any office supply store. The one used here is transparent and does not readily stand out in the pictures.



- Once this main section “box” is established, a fuselage support can simply be made with several landscape bricks and hardwood sticks. Add hardwood stick braces across the back of former F6 to keep it from bowing as the aft fuselage sides are pulled together.

- Use a level and shims as needed to ensure that the fuselage support is level and true.



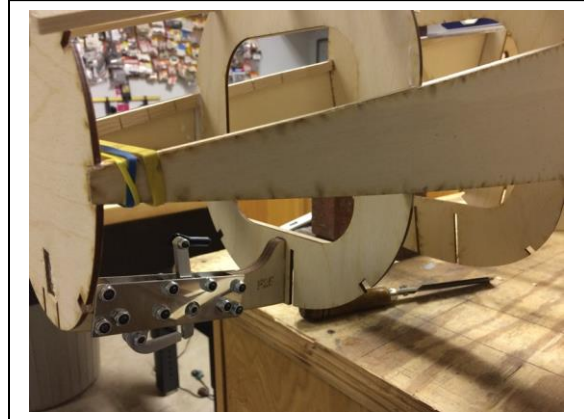
- Assemble the elevator servo tray and add it to the left fuselage side, then pull the tail together using former F12 & F13 and parts F19 & F20 to assist with proper alignment.



- Add in the remaining formers F7, F8, F9, F10, and F11, checking the laser etching on each fuselage side. It is helpful to draw a straight line on the worksurface and to draw a centerline on each former. Then you can align the fuselage over this centerline and check it against the centerline on each former as you go along. Also, keep checking to see that the fuselage sides remain level across. Run the elevator servo extension forward through the provided holes in the formers. Top fuselage stringers can now be added between formers F4 and F11.



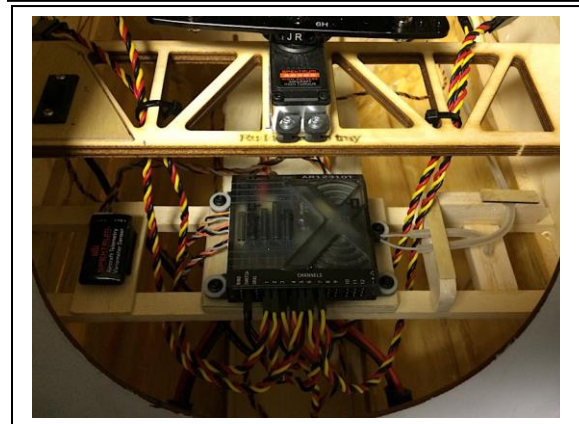
- Next task is to pull the nose together. To assist in bending the fuselage sides, make cuts with a razor saw about 90% of the way through the hardwood stingers spaced apart about every inch. Strong rubber bands will help to hold the sides together while the glue sets. Picture shows the optional scale tow release.
- The kit includes a simple wire loop with pull pin style tow release mechanism. A scale tow release mechanism is available in several configurations. If the modeler chooses the scale release, it may require some customization of this nose area to mount the scale release adequately. The provided servo tray and location should be fine for either choice.
- Add part F17 between formers F1 and F3. F17 helps set the angle of F3. Then add the top stringers between F1 and F3. You may want to fashion several triangular braces between F1 and the fuselage sides using the top and bottom longerons as an anchor point for these.
- Turn the fuselage upside down on the support stand and again check for level and centerline. Add the bottom stringers and the F16 keel pieces.
- Add the plywood axle supports to the keel sides, then add the bottom laser cut F14 plywood strip to the bottom. Leave a little space on each 1/8" wide keel for the bottom balsa sheeting to rest on.



- While the fuselage is supported on the temporary stand, sheet the entire fuselage bottom. The sections from F4 back can be done with various size sections. From F4 forward, 3/4" wide strips work best. Bending the 1/8" balsa over the formers can be greatly assisted by spraying the outside surface with ammonia-based Windex or equivalent.
- Add the F23 balsa tail blocks and sand the bottom to shape. A little time consuming but very rewarding when completed.
- The fuselage can now be removed from the temporary stand and turned upright. The bottom of the fuselage has a flat area around the wheel opening that allows the fuselage to sit upright without the need for any other support. Add a canopy release mechanism before sheeting the top of the fuselage.
- Sheet the top of the fuselage with 1/8" balsa working again in sections. Some of these sections can be long because of the fuselage shape. Note that the top of the fuselage changes slope at F6 and then remains straight back from there.
- Sheeting the nose is the most challenging area. Using 1/2" wide strips of 1/8" thick balsa running diagonally up and over the formers between F3 and F1 seems to work best. It is recommended that the inside of this area be reinforced with fiberglass as well as the inside of the fuselage bottom from F5 forward.



- Both the prototype model and this first kit model required about 5 pounds of nose weight in addition to a 2-pound scale pilot. It is recommended that some ballast be built into the nose block. About 1-1/2 pounds were added here. Additional ballast was attached to the back side of F1 thus keeping the ballast as far forward as possible to minimize the total weight needed.
- The nose blocks are glued to a plywood form that provides the horizontal and vertical contour of the nose. The large balsa blocks can be cut to rough shape before being attached to the nose of the model. Then they can be carved and sanded to final shape using the plywood formers as a sanding guide. By using this wooden nose, the entire model can be covered with a film covering like UltraCote without the need to find matching paint for a separate plastic or fiberglass nose part.
- The rudder servo tray is mounted in the fuselage behind former F4 and allows easy access to the rudder servo from the open cockpit. Rudder uses a pull-pull drive system and the DuBro 4-40 Pull-Pull cable system is recommended.
- The area just behind former F4 and below and forward of the rudder servo tray offers a good location for the power distribution box or a receiver with servo connections. This is easily accessible from the open cockpit area.



- The top fuselage sheeting between formers F11 & F12 gets cut out for the fin to drop through to the F21 support platform. Make a template for this cut by tracing the bottom shape of the fin and centering it over the area to be cut out.



- Add the plastic rudder cable guide tubes. The front of these tubes is inserted through the holes in F11 (just above the F21 platform on each side). They exit through the 1/8" balsa sheeting on a line between the hole in former F11 and the rudder control horns. Be sure to add the fiberglass rudder control horn to the bottom of the rudder BEFORE gluing its hinges into the fin.



- Tailwheel can be made using the included caster wheel or using the semi-scale plywood pieces and a 1" DuBro tailwheel.



- Glue the laser cut plywood canopy frame together and carefully cut the canopy to fit. Glue the canopy to the frame to complete the assembly. Your model is now ready to cover!



Completed Prototype built by Peter Goldsmith



Completed Kit #1 built by Jim Dolly (view build thread on www.forum.scalesoaring.com)



Specifications:

Wing Span: 192"

Fuselage Length: 105"

AUW: 29-30 pounds

Scale: 2.5

Recommended Parts:

Servos:

(3) Spektrum A6265 HV – ailerons and rudder

(2) Spektrum A7050 HZ – spoilers

(1) Spektrum A6150 HV – tow release

Hardware:

(2) Hangar 9 Titanium Pro-Link 4-40 x 1-1/2" – ailerons

(1) Hangar 9 Titanium Pro-Link 4-40 x 3-1/2" – elevator

(2) Hangar 9 HD Half Servo Arm 4-40 x 1" – spoilers

(2) Hangar 9 Aluminum Servo Arm 4-40 x 1-1/2" – ailerons

(1) DuBro Pull-Pull system 4-40 – rudder

(7) DuBro 4-40 Ball Links – ailerons, elevator, tow release

(1) DuBro 1" tailwheel

Control Throws and CG:

Ailerons: Up 55mm, Down 35mm, Elevator 60-70mm Up & Down, Rudder 100mm Right & Left

CG: 5-15mm in front of the wing tube with the wings on.