



11. Slide ribs off center and apply glue, reposition and nail. Do not glue end ribs at this time. Hold in position with staples only.
12. Square up ends of wing to front spar. All ribs should be at 90 degrees to spars.
13. Four anti-drag diagonals are installed to keep wing square. The inboard two are cut from RS-9, the outer two from RS-8. See drawing 16, area "D". Cut and glue to lower caps of spars.
14. Compression members are required on ribs #3, 5, 7, and 9. They are lengths of RS-5 or RS-7 stock glued to the inboard surfaces of the ribs, as shown on drawing 16.
15. Glue corner blocks cut from RS-11 to reinforce the anti-drag diagonals and compression members, per drawing 16.
16. Cut spacers from scrap 1/4" thick wood and glue between lower rib cap and anti-drag diagonals. See drawing 16, Section View C-C.
17. Allow this assembly to dry, then remove from bench and turn around so that the trailing edge will now be against the wood fence. Place wax paper between wing and bench.
18. Place trailing edge stock, RS-15, against fence and lightly tack nail into bench top. Mark off location of ribs with a pencil. Push wing assembly up against trailing edge and line up rib ends with pencil marks. Check wing ends for squareness and that ribs are straight.
19. Swing rib ends to one side and spread glue. Square plywood gussets cut from RS-533 are glued and stapled over all rib ends except #1 and #10.
20. Aileron spar webs are cut from RS-653, per drawing 17. Trim ends as shown.
21. Remove root and tip ribs from wing and slide in aileron spar webs. Glue them to 1/4" square rib verticals per drawing 17.
22. End ribs are now replaced and glued.
23. Glue lengths of RS-3 stock between each rib and against web rear face. They will be about 14-5/8" long, however, cut to fit accurately. Only the top strips can be installed at this time.
24. Glue the 1/8" plywood aileron nose ribs on all ribs except rib #5.
25. 1/4" square diagonals cut from RS-1 are glued between each rib bay, per drawing 16 and 17. Only the upper members can be installed at this time.
26. Wing end ribs and rib #1 and 10 are "boxed in" with plywood strips cut from RS-534. Glue them to top surface of ribs. Allow assembly to dry.
27. Pencil mark exact position of trailing edge on bench top. Remove hold down nails from trailing edge and invert wing. Now go back and glue 14-5/8" lengths between ribs and against aileron web face.
28. Glue 1-1/4" square gussets on the bottom surface rib ends and trailing edge.
29. Turn wing back over, reposition wing on pencil marks and re-tack down trailing edge. Use scrap plywood shims under trailing edge to allow for thickness of gussets.
30. Cut and glue in opposite set of 1/4" square diagonals.
31. When dry, remove and glue RS-534 strips to the bottom of the end ribs.
32. Leading edge ribs are cut from 1/8" and 1/4" plywood, per the full size rib drawing. Slot front for RS-4 stringer. All ribs must be cut exactly the same, except the 1/4" ribs are trimmed by 1/4" at the rear, per the drawing. Glue 1/4" square pieces cut from RS-1 stock to the 1/8" ribs. The 1/4" square member allows the rib to be glued and nailed to the front spar. Note that there will be right and left hand ribs.
33. Glue a 1/4" plywood rib (no 1/4" square required on these) on inside of each end of wing. This doubler will give more glue area for attaching the plywood leading edge skin.
34. Glue a 1/4" plywood rib doubler to the 1/8" ribs at position 4 and 7. The ribs at these positions are now 3/8" thick.
35. Before glue has time to set, line up all nose ribs and glue in the RS-4 nose stringer.
36. Plywood skin is wrapped around the nose ribs. Skin one length at a time, starting at the tip. The plywood skin sections are butted together over the centerline of ribs 4 and 7.
37. Before attaching RS-539 plywood leading edge skin, place wing on bench top, with about 10" of leading edge extending over edge. Tack nail trailing edge in 3 or 4 places and place weights on wing to ensure it is flat against bench top. Any twist or bow in the wing or bench surface will probably be built in during the next operation, so take care.
38. Sand ribs, caps, etc, so the skin will wrap smoothly. Starting at tip end, clamp edge of plywood skin to front spar upper cap. Wrap around rib and clamp to lower cap. To pull skin tight against ribs and nose stringer, cut scrap pieces of wood 3/8" to 1/2" square and about 8-1/2" long. Most any size scrap will do here.
39. Obtain a box of rubber bands about 1/4" wide. Place a stick at rear face of front spar with ends extending equally above and below. Hook one end of band over stick and stretch band around plywood to other end of stick. If edges of skin extend beyond rear edge of spar cap, place a wood shim between stick and spar. Use a rubber band clamp at each rib.
40. With a pencil, mark, from the inside, the location of ribs and nose stringer on the plywood skin.
41. Remove skin and trim ends. Transfer stringer centerline from the inside surface to the outside of the plywood. This line is used for stapling to stringer.
42. Scuff-sand the plywood on inside where glue will be. Varnish the remaining plywood to within 1/4" of the glue lines. Apply glue to skin and wing and re-assemble as before, using your rubber bands to help hold the skin in place. Be sure that all the plywood area you did not varnish has a good coat of glue. Staple along the center line of the leading edge stringer first, then along the upper and lower spar cap, starting at the center of the panel and working toward the ends. Staple into caps every

inch or less. Do not staple to 1/8" plywood ribs.

43. Repeat for each of the plywood leading edge sections.

44. With leading edge complete, the ailerons can be cut off. Refer to full size rib drawing for details. Use a fine tooth modeler's saw to cut 1/4" square members. Cut end rib skins top and bottom. Aileron should now be free and held only by the tip hinges. Remove aileron from wing.

45. Stringers of RS-17 stock are now glued on top and bottom of wing, per drawing 17. A 45 degree bevel is required on the inside edges. They may be cut before gluing or planed down after.

46. Trim off all 1/4" square rib cap strips extending beyond edges of aileron nose ribs. Sand smooth so plywood will wrap tightly.

47. Glue on rib #5A, and 1/4" doublers on ribs #4 and 7.

48. Aileron leading edge "D" box skin is installed similarly to wing leading edge. Begin by tack nailing trailing edge to bench top with front edge overhanging bench. Again, weight assembly down to ensure no twist.

49. Glue skin on as before, except that no inside marking is necessary. It may be necessary to wet the skin to get it to bend smoothly around the ribs.

WING CENTER SECTION CARRY THROUGH DETAILS

Since all wing loads must be transferred to the fuselage, it is important to have a structurally sound system. Yet it is also important to easily and quickly remove and re-install the wing without disturbing the rigging angles, control adjustments, etc.

1. The front spar carry-through is an aluminum channel. Make from RS-300.

2. The rear spar carry-through is the fuselage bulkhead at station 4.

3. To determine the location of holes for wing mounting pins, refer to drawing 10.

4. Make a stiff paper pattern of the wing root rib. Cut slots in pattern where spar fittings come through. Staple pattern against fuselage side and mark slot cut-outs on plywood. Do not over cut slots since they may have to be recut up or down later.

5. Place front spar channel in position and lightly "C" clamp.

6. Place wing against fuselage with a scrap 1/16" plywood spacer between the wing and fuselage (this is to prevent too snug a fit and to allow for the fabric thickness). Adjust front spar up or down until fitting holes line up vertically with the centerline of the carry-through channel. It may be necessary to move channel fore or aft slightly and clamp again. Firmly clamp the wing fittings to the channel.

7. Carefully match drill a 1/4" hole through the carry-through channel using the pin holes in the wing fitting as a guide. Insert a steel spar pull pin through wing fittings and channel. Adjust wing tip up or down for a 3 degree dihedral angle.

8. Draw a line down the centerline of the fuselage vertical member under the channel, per drawing 10. At the point where the bottom edge of the wing root rib crosses this centerline, make another mark. This will give you the location of distance "X".

9. Draw another centerline down fuselage at station 4. Measure distance "X" and add 1".

10. Adjust rear spar of wing vertically until bottom surface of wing root is on this mark. Clamp rear spar fittings to bulkhead.

11. Very carefully drill through rear spar fittings into bulkhead at station 4, with a 1/4" drill.

12. Remove wing. Carefully re-drill bulkhead hole out to 3/8" diameter.

13. Cut a 1" length of RS-401 tubing and chamfer I.D. of ends. Press bushings into bulkhead, per drawing 10.

14. The front spar channel may now be mounted to fuselage by drilling through the pre-drilled holes in the channel up through RS-11 and bolting.

15. The front pull pins should be retained by hooking a small coil spring over the pin ends as shown in drawing 10. The rear pins are held in place by clips made from RS-700 and installed per drawing 10.

TAIL WHEEL

The steerable tail wheel is mounted on an aluminum spring leaf (dwg. 9).

1. The tailwheel spring is supplied in the kit pre-cut and bent. If you are building from plans, saw the spring leaf from RS-103 stock. Grind or sand all saw marks from edges. Corners should be rounded and the edges buffed or polished.

2. Cut steering bar from RS-701 material.

3. Two bolts hold leaf to fuselage. The clamp up bushing should be just long enough to allow steering bar to turn freely, but not be sloppy.

4. Tail wheel assembly is a weldment. A steel steering arm is welded to castor fork, and the ends bent up.

5. Connect the steering bar to the tailwheel steering arm with the steering rod assembly, built per the drawing.

6. After assembly on aircraft, check king-pin bolt angle of castor to ground. It must be about 85 degrees, or slanted 5 degrees from vertical.

WING STRUTS AND WING ALIGNMENT

The "V" struts are of aluminum tubing assembled with fittings of aluminum bar and channel. The strut may be semi-finished and then assembled on aircraft for final adjustment. Note that the landing gear and fuselage must be completed before starting this section.

1. Make up all small fittings and short lengths of tubing per drawing 18.

2. Wherever possible, line up and match drill fittings and tubes. You may wish to keep these sets together until permanent assembly.

3. Cut and drill the front strut tube per print.

4. Bolt on the strut bracket (RS-301) and strap fitting (RS-100) at lower (axle) end of front spar tube. Bolt the RS-701 rear strut strap fittings to the rear strut tube.

5. Attach wing panels to fuselage. After wing root fittings and pull-pins are in place, block up wing tip to 3 degrees dihedral.

6. Install front strut sliding tube in wing fittings. Next slide outer end of strut over sliding tube.

7. Slip lower end of strut fittings over 1" long outer collar on end of axle. Be sure the collar is properly located (see section on landing gear) or else the wheel will not fit properly.

8. Line up fitting holes with hole in collar and drill through axle from both sides.

9. Recheck the 3 degree dihedral angle, then carefully drill through the holes in the outer strut end and through the sliding tube, and bolt in place as shown on the drawing.

10. With the front tube now bolted in place, attach the RS-410 block to the rear strut wing fittings.

11. Attach the rear strut outer end to the block, per the drawing.

12. The rear strut tube controls the amount of wing twist. No twist or washout is used on the aircraft. To set the wing tip angle, hold a board or plywood sheet against the lower section of the wing at the root rib. Have a helper place a carpenter's level on the side of the board and adjust the level until the bubble centers.

13. Draw a line on the board along the top of the level.

14. Next move this assembly to the tip end of the wing and hold in the same position as at the root. Adjust the wing twist until the carpenter's level again indicates the reference line on the board is level. If necessary, lift or push down on the trailing edge. There is now no twist in the wing.

15. With the rear strut outer end bolted to wing fitting, swing the lower end to the channel fitting. It may require several trim and fit operations until the end of the strut will slide into the fitting.

16. Before drilling through channel into tube, check once more that the fuselage has not moved and is still level, and that the wing still has no twist. Now drill and bolt.

17. Now repeat the procedure for the other wing.

GAS TANK

The plastic tank is located just behind the engine compartment.

1. To mount tank fitting, drill a hole in tank 1/2" diameter minimum, 17/32" maximum.

2. Cut four tank mount brackets from RS-10, per drawing 4.

3. With the fuselage top deck, RS-670, removed, locate the tank in position. The tank top will slide under fuselage longerons, about 2" from the engine compartment.

4. Carefully measure location of tank filler neck. Transfer this location to plywood top deck and cut an opening just large enough for the neck to slip through.

5. Next, place tank on top deck with filler neck through opening. Locate two of the tank brackets between the tank and top deck as shown on drawing 4. Mark the locations, then remove tank and glue brackets to the top deck.

6. Temporarily mount the top deck on the fuselage. Locate the tank and hold in place with braces, tape, or whatever is handy.

7. Measure the width between the fuselage sides beneath the tank. Make the tank support platform of RS-589 braced with RS-8 to fit, per the drawing.

8. Locate this platform and the two lower tank mount brackets, and mark the location of the brackets on the inside fuselage sides.

9. Remove tank and top deck. Relocate the lower tank mount brackets (if you removed them) and drill through the 3/16" holes and through the fuselage sides.

10. The tank can now be installed after the top deck is installed by fitting up against the upper tank mount brackets and installing the tank support platform and lower mount brackets with AN-3 bolts.

WINDSHIELD AND FRAME

1. The windshield frame is fabricated from RS-411 aluminum tubing. Cut the tubing to the correct angle and join with .050" thick aluminum gussets and 1/8" pop rivets as shown on dwg. 10. Mount the frame to the fuselage with two angle brackets and bolts.

2. The windshield is fabricated from the three flat pieces of lexan. The edges are pre-bent to provide flanges for attachment.

3. With the windshield frame attached to the fuselage, fit the lexan sides and top in place. Hold in place temporarily with tape, clamps, or clothespins.

4. Join the lexan sides and top with the machine screws and nuts provided. Attach the windshield to the frame with pop rivets.

5. A section is cut out of the windshield at top center so that the top frame tube can be used for a handhold when entering and exiting the cockpit.

HEADREST

Build up the headrest from plywood per drawing 8.

1. Cut the headrest sides, top, and front from RS-650, per the cutting diagram on drawing 8.

2. Lay the sides flat on the workbench. Glue RS-18 frame to the sides.

Be sure the edge of the top frame extends 1/8" over the plywood edge to allow for beveling.

3. Use the plywood front as a jig and bevel edges to mate with the fuselage top, headrest top, and headrest front.

4. Glue headrest top, sides, and front together, per the drawing.

5. Cut and glue RS-18 front frame members in place.

6. Cut holes for shoulder harness and round off edges as shown in the drawing.

7. Attach to fuselage with metal clips and wood screws.

8. If desired, headrest may be hinged at front to allow for inspection of fuselage interior.

TAIL BRACE STRUTS AND ASSEMBLY

1. Make four brackets from 3/4" x 3/4" x 1/8" aluminum channel, per drawing 6.

2. Bolt stabilizer and fin together with AN-3 bolts.

3. Bolt brackets to fin and stabilizer as shown on dwg. 6.

4. Clamp stabilizer flat to bench. Be sure stabilizer spar is straight.

5. Use a carpenter's square to ensure fin is perpendicular to stabilizer.

6. Cut RS-402 tail brace tube slightly longer than needed. Drill 3/16" hole in one end, as shown in dwg. 6.

7. Attach tube to bracket on fin. Make sure fin is still perpendicular to stabilizer. Insert lower end of tube in bracket on stabilizer. You will have to trim and fit several times to get it to fit.

8. Drill 3/16" hole through tube. Drill carefully from both sides, using holes in bracket as a guide.

COVERING

Minimax is covered with a lightweight polyester fabric ("Dacron"), commonly referred to as "glider" fabric, which weighs 1.6 ounces per square yard. A specially formulated fabric cement is used to glue the fabric to the structure. The method of finishing the aircraft is optional and is not covered here. The Experimental Aircraft Association publishes several manuals, including "Aircraft Dope and Fabric", and "How to Install and Finish Synthetic Aircraft Fabric", along with many others. Also, Stits Poly-Fiber Aircraft Coatings, Post Office Box 3084, Riverside, CA. 92519, provides excellent finishing materials and instructional pamphlets which are highly recommended. Whichever finishing method you use, be sure to include an ultraviolet barrier, such as Stits "Ultraviolet blocked Poly-Tone". Otherwise, the fabric can deteriorate in direct sunlight in as little as four months.

1. All wood surfaces, including the surfaces to which the fabric is to be glued, should be varnished with polyurethane varnish before covering. One thinned coat followed by one full strength coat should be sufficient.

2. If you are a beginner, start with a small item, such as the vertical fin.

3. Cut the cloth for one side slightly oversized. There should be a minimum of one inch overlap around all corners and trailing edges.

4. Pre-coat all surfaces to which the fabric is to be glued with a heavy coat of cement. Note that the fabric should also be glued to all the rib caps.

5. Apply a coat of cement to the frame about 12 inches at a time. Lay the fabric on top of the wet cement and press and rub the fabric until the weave is saturated. If necessary, a little cement may be brushed on top of the fabric.

6. You may develop your own technique, but this one works for us. Begin at one end of the frame to be covered, for example, the root rib of the fin, and glue the fabric down. Now work up both sides about 12 inches at a time until the fabric is attached all around the outside of the frame. The fabric should not be excessively taut at this time, just enough to prevent bunching up. If you make a mistake, the fabric cement may be loosened with solvent.

7. Cover the other side similarly, but allow a minimum of one inch overlap over the fabric on the back side. This fabric-to-fabric bond is strongest.

8. Now shrink the fabric lightly with an iron set at about 250 degrees. Examine the frame for warping or "pulling in". Continue shrinking until the fabric is lightly "Drum" taut. It is best to have someone knowledgeable check your work and judge the appropriate tautness. Note, however, that this is an ultralight airframe, and the fabric should not be quite as taut as on a typical production aircraft.

9. Now glue the fabric to the ribs by brushing a thinned coat of cement through the fabric to dissolve the pre-coat of glue. Ensure that the fabric weave is saturated with cement and well bonded to the underlying wood.

10. All surfaces, including the wing leading edge plywood and fuselage plywood should be covered in a similar manner, however, when covering large areas of plywood, the fabric should be glued only to the outer edges of the area.

11. Flight tests up to the design flight conditions have indicated no tendency for the fabric to separate from the ribs. If you desire, and especially if you are using a large engine and planning to operate outside the ultralight category as an "experimental" category aircraft, it is recommended that the fabric be ribstitched. The EAA manuals can instruct you in this procedure.

12. Drain grommets supplied with the kit should be installed to ensure the structure is adequately drained. A general guide to determining where to install these grommets is to imagine the aircraft completely submerged in water. When the aircraft is removed from the water and set on its landing gear in the normal ground attitude, the grommets should be placed so that all the water drains out. Areas of particular importance are the fuselage rear and the wing, stabilizer, and elevator trailing edges. The grommets are installed by gluing to the fabric with the fabric cement and punching out the fabric in the center.