



Messerschmitt ME109Z

Features:

- All balsa and ply laser-cut construction
- ABS exhaust stacks, supercharger inlets, scoop and fuel tank cover.
- Optional scale aluminum spinner
- Laser cut scale cockpit
- Designed for retracts only
- Scale flaps shown on plans and explained in manual
- Fiberglass cowls
- Contains Sullivan pushrods and Du-bro tail wheel brackets with steering arms.
- Option vinyl decal set (shown)

Specifications:

1/6th Scale Laser Cut Kit

Wingspan: 87 inches

Length: 59.4 inches

Wing Area: 1168 Sq. In.

Flying Weight: 13-15 lbs.

Engine Size: .60 to .75 2-stroke, .72 - 1.00 4-stroke

Electric Conversion: Skyshark Lightning 75

Building Experience Recommended: Intermediate

Flying Experience Recommended: Previous low or mid wing experience

Never in production, the ME109Z was a prototype that was damaged beyond repair in an allied air attack in 1943. Using the surviving 3-views and other misc. information, we have created a 1/6th scale R/C model based on the original design. The ME109Z incorporated two sets of landing gear just like the original prototype. The wing is one piece with center and outboard flaps. The fuselages (taken from the 109G) attach to the wing and tail using nylon bolts to allow for easy transportation and assembly.



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Thank you for purchasing the ME109Z from Skyshark R/C. For the first time, R/C enthusiasts have a choice in scale aircraft designs. Our goal, through computer technology and state-of-the-art production techniques, is to offer aircraft which in the past have not been modeled simply because they weren't popular enough to justify mass production. Our production techniques allow us to produce aircraft which, though not as popular and well known as P-51s and P-47s, still offer historical significance (good or bad!), Good looks and flying characteristics, and a uniqueness that is sure to turn heads wherever you take your airplane!

Your airplane has many unique features in its design:

CAD Design

CAD design allows strength to be built into the airplane without sacrificing weight. Accurate parts design and placement ensures a perfect fit.

CAD Drawn Plans

The plans in this kit are not copied from a master set! They are originals drawn directly from the CAD program where the airplane was designed. We do this because it allows us to use color, which helps you better visualize the various components of the airplane, and we can use better quality paper, which greatly reduces the possibility of shrinkage. Since you're going to build directly on the plans, they ought to be the proper size! Also, parts placement is guaranteed to be accurate, so you can build a better, straighter model. Note: Some of the photos in this manual were taken from the 109G. These photos are for reference only so just ignore any variances in wing and tail parts.

Laser Cut Parts

The same program that generates the design and plans also drives the laser, so every part is reproduced exactly as it was designed. Laser cutting also allows us to fit more parts on each sheet of wood, reducing the waste, and lowering the cost to you. Since laser cutting does not have the same limitations that mechanical cutters do, small and hard-to-produce parts are simply a computer file away, so you get a more accurate airplane.

Lightening Holes

Lightening holes are laser cut into all ribs and formers where possible. This allow us to keep the weight on each plane to a minimum without sacrificing strength. Extra care should be taken when handling parts since they are very fragile until glued in place.

Plastics and Fiberglass

The cowl is accurately reproduced in fiberglass. The exhaust stacks, supercharger inlets and other misc parts are reproduced from plastic. The canopy is accurately reproduced in clear plastic, and is molded in one piece.

A Word About the Building Options

Engine Options

Engine choices range from .60 to .75 2-strokes, or .60 to 1.00 4-strokes. We mounted our engines inverted - this allows adequate cooling for the cylinder head. Due to the size and weight of the spinners, the 109Z will probably be very nose heavy if you use a glow engine. We used electric outrunners in one prototype and were able to balance the plane without additional tail weight. We have electric conversion parts available for this plane. If you are interested in making your 109Z electric, please give us a call and we can provide you will the required parts and conversion information.

Retract Options

Retract installation is shown on the plans and explained in these instructions for Springair or Robart retracts. The 109Z uses a set of 90 degree and a set of 80 degree retracts. Of course, you are free to use any retract you wish. Scale wheel size is 4" with a maximum width of 1". We were not able to find scale wheels for this plane so we substituted the Robart 3.5" scale wheels.

Flaps

The flaps are scale and fully functional. All the servo reinforcements are included in the kit, as well as instructions of how to build and actuate the flaps.

Cockpit Detail

A fully detailed, fully researched laser cut and engraved cockpit is included in the kit. It will be installed once the fuselage is framed and sheeted.

Scale Accuracy

Our intention with this kit is to preserve scale outline and accuracy as closely as possible. There is both a benefit and cost to this. The benefit is that this kit is the first and only ME109Z in this scale that truly represents the full scale airplane. The cost of reproducing true scale, however, means that you have a kit which will require more attention to detail and in some areas and will challenge your building skills to a greater degree. This does not mean that this is a difficult kit to build but the kit is not designed for beginning builders. We have merged modern engineering design principles into conventional building methods. A few areas that are unique to the ME109Z such as the landing gear placement/alignment and the shape of the rear fuselage presented design challenges to provide the builder with a workable construction process.

Information for Scale Competition

Scale Information:

99.9% accurate scale outlines, wing planform, control surface and stabilizer sizes and shapes, scale gear location, scale tailwheel location and fuselage shape and profile.

A few areas of the model may deviate slightly from true scale, such as:

Detailed cockpit information is not available for this airplane. Instead, the 109G cockpit was used because the plane is based on this platform.

Most 3-views and plastic models show a scallop shape under the fabric covering of the control surfaces. We initially attempted to duplicate this but the detail did not show up after covering and added unnecessary weight and building complexity.

Panel lines, rivets and additional small detail items are left up to the individual builder. There are countless sources of this type of added detail available from print, internet and other sources.

General Building Information

The ME109Z can be built by a person with average building skills. Certain steps in the building process must be followed as depicted, or you might find yourself digging back into the structure to redo something. These areas are outlined when necessary.

Occasionally hints will be included at certain building steps. These are not required for completion, rather they are tips intended to ease a particular process.

The laser does not cut through the wood, it burns its way through. As a result of this, occasionally there will be scorching on the surface of the wood. This is normal, and is only a surface discoloration, and does not affect the wood in any other way. Similarly, the laser settings are optimized for wood density averages, so occasionally, due to variations even in individual sheets, some areas might not cut through completely. This is apparent mainly with the plywood. Simply use care in removing the parts from the sheets; most of the time, the parts will literally fall out of the sheets!

The Wing Section building steps are shown for retract installation only. Decide which gear you would like to use before you begin to build the wing. All airlines and air tanks will need to be installed as you frame the wing.

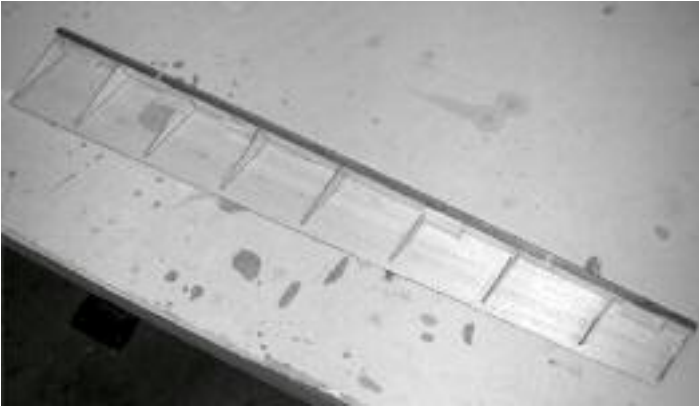
We used two separate receivers on our prototype planes. We connected one aileron, on flap section, rudder, elevator half and throttle to one receiver. The other receiver ran the other aileron, center and remaining outboard flap, remaining rudder, elevator half, throttle and retracts. We mounted one receiver and battery in each fuselage. If you plan appropriately, you can run Y-harnesses and only use one receiver.

Some hardware and a motor mount are not included in the kit. There are so many choices for quality hardware that these choices are left to the individual preferences of the builder, rather than include something in the kit that you'll probably throw away anyway. A vibration-dampening motor mount is recommended for use regardless of engine choice, so select a mount suited to your particular engine. The decals provided are fuel-proof but still should be clear-coated to insure that fuel doesn't soak underneath them.

This aircraft is not a toy. It must be flown in a responsible manner according to the rules set forth by the Academy of Model Aeronautics. The builder assumes the responsibility for the proper assembly and operation of this product. Skyshark R/C shall have no liability whatsoever, implied or expressed, arising out of the intentional or unintentional neglect, misuse, abuse, or abnormal usage of this product. Skyshark R/C shall have no liability whatsoever arising from the improper or wrongful assembly of the product nor shall it have any liability due to the improper or wrongful use of the assembled product. Skyshark R/C shall have no liability for any and all additions, alterations, and modifications of this product.

Having said that mouthful, turn the page and start building the best airplane on the market!

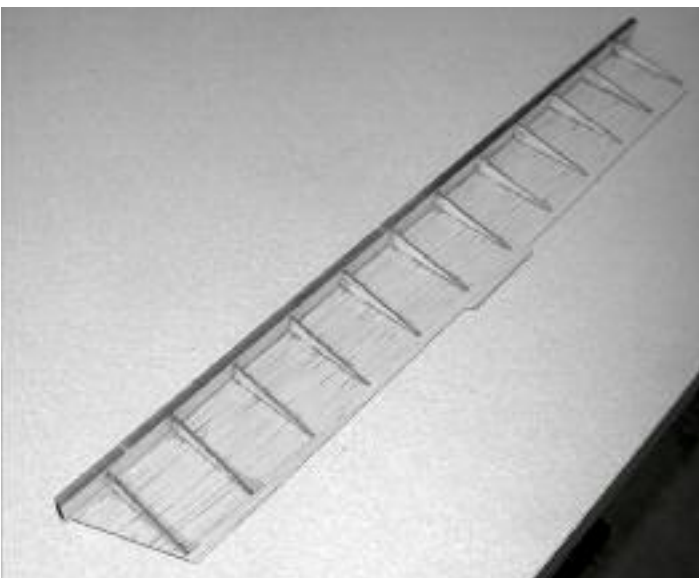
Ailerons



1. Align and glue A2 through A10 to A1. Note that the A1s are marked left and right.
2. The aileron ribs have 2 degrees of twist built into them. To properly impart this twist to the aileron assembly, follow these steps: Align the bottom of A1 to A11 at the inner edge. Glue A2 to A11 first, then align A10 to A11, again aligning A1 to the bottom of A11. Glue A10 to A11. Now glue the remainder of the ribs to A11.
3. Glue A12 to the inside of A1 where the control horn will locate. This will reinforce the control horn mount.
4. Bevel the trailing edge of A1 to match the ribs.
5. Glue scrap wood reinforcements to the inside of A11 where the hinges will locate.
6. Cut two pieces of 1/16 x 4 balsa sheet to fit to the top of the ailerons. Butt one piece against the lip at A11 and glue the ribs only. You may lay the aileron flat on the table to do this, but it very important to not glue the sheet at the leading edge or trailing edge yet (if you do, it takes the twist out!). With the ribs glued to the sheet, now glue the leading edge and trailing edge.
7. Trim and sand the aileron.

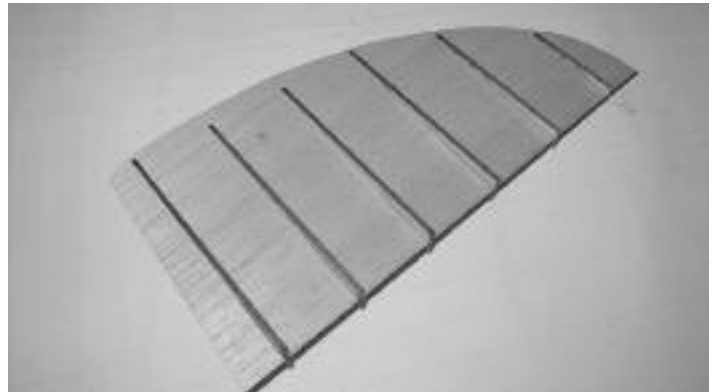
Repeat for the remaining aileron. Remember to make a left and right assembly!

Elevator

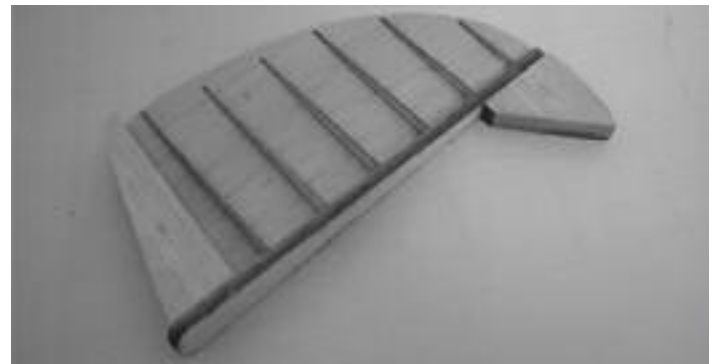


1. Insert the E2 ribs into the slots in E1 using the scribed lines as a guide. Glue in place.
2. Glue the E3 elevator spar to E1 and E2 ribs. E3 should be even with the bottom edge of E1.
3. Add hinge reinforcements as necessary. Add E4 ply control horn reinforcement.
4. Cut a piece of 1/16" x 4" x 36" and cut to 21". Lay the elevator assembly on this piece so the end butts against E3.
5. Draw a line along the trailing edge of the elevator. Cut at that line and bevel the entire trailing edge of the sheeting piece until the bevel matches the rib angle at the trailing edge of E1.
6. Glue the sheeting to the elevator assembly. Hint: To prevent warping of the elevator, lay the entire assembly on a flat surface while gluing.
7. Glue a piece of scrap 1/16" balsa to each end of the elevator and sand to shape.

Rudders



1. Slide R2 thru R7 into the slots in R1.
2. Align this assembly onto R8 with the top of R1 even with the top edge of R8, and glue.
3. Glue the ribs to R1.



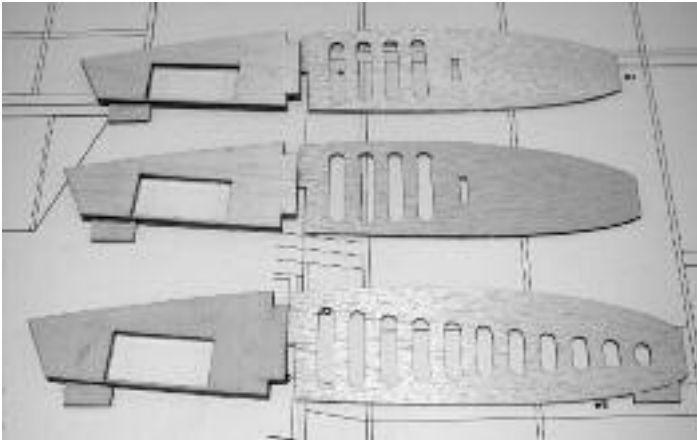
4. Glue 4 R9s together. Glue the R9s to the bottom of the rudder assembly.
5. Glue two R10s together. Glue the R10 counter balance to the front of R8.
6. Repeat for other rudder. Set rudders aside for now. The rudders will be final shaped with the fin.

Wing Construction

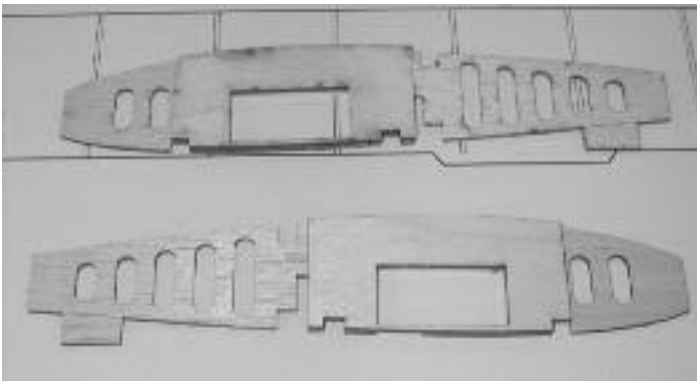
Wing construction notes:

1. Wing construction Notes: Due to the advanced nature of the ME109Z, fixed gear and fixed flap options are not presented in this kit. If you wish to install fixed gear or fixed flaps, you are on your own!

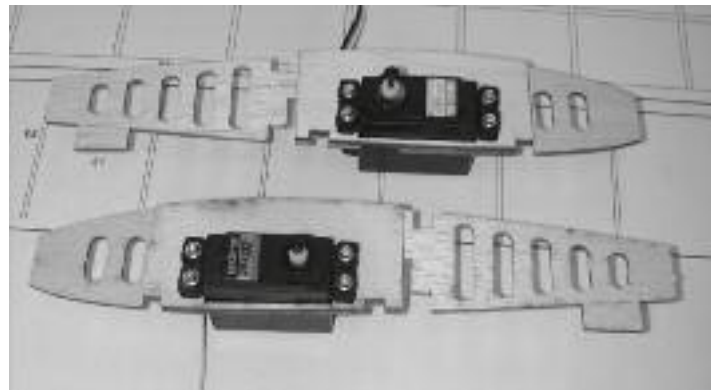
2. The ailerons are actuated by separate servos in each wing. A single servo and bellcrank arrangement was not possible due to the scale gear location and main spar location. The servos will mount to the W22 wing rib and ply doubler and will be completely enclosed in the wing and accessible through a hatch. See the opening section of this manual for the lowdown on this construction technique.



- 1. Align one W1 rib and two W19 ribs as shown in the photo. Note that all ribs are facing the same direction.
- 2. Epoxy W1A to W1. This will act as the flap servo doubler.
- 3. Epoxy W19A to W19 in the same manner. Make two W19 assemblies. The doublers are glued this way because all flap servos must face the same direction for proper geometry.

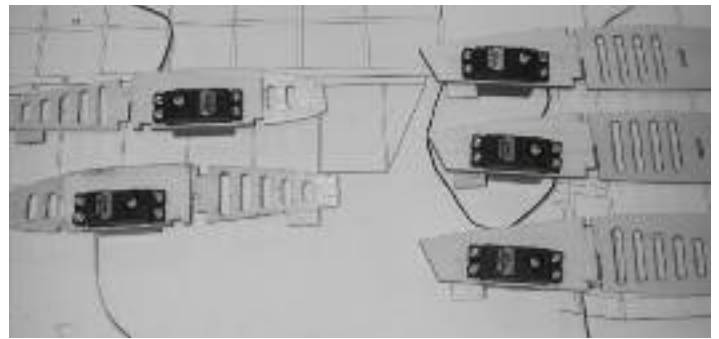


- 4. Epoxy W22A to W22. Repeat for the remaining W22. Make a left and right side.

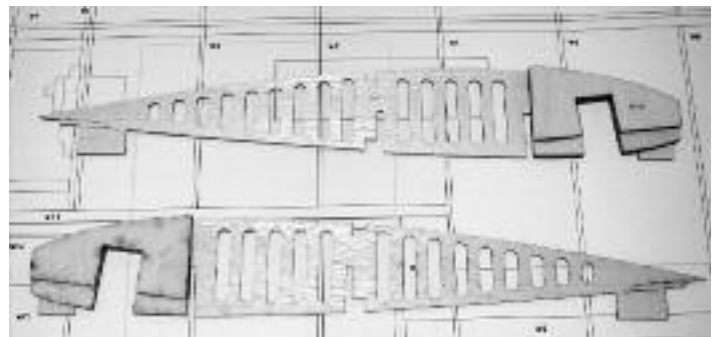


- 5. Mount the ailerons servos onto the W22s and mark and drill small pilot holes for the screws.

6. Mount the servos to the ribs. Note that the servo output shaft will be located to the rear. Use hex head or button head #2 screws to mount the servos - this will allow easy servo removal using an Allen wrench if necessary after wing construction.

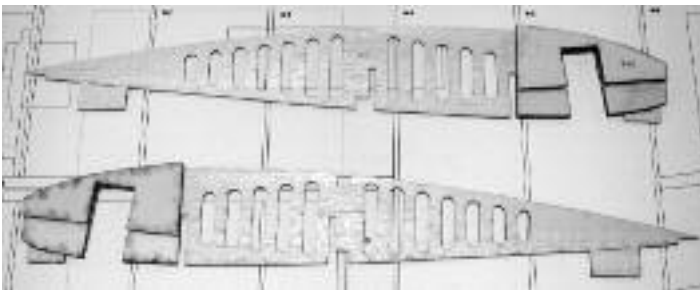


- 7. Mount the flap servos onto the W1 and W19 assemblies the same way as you did for the aileron servos except mount all flap servos with the servo output shaft towards the front for proper flap actuation.

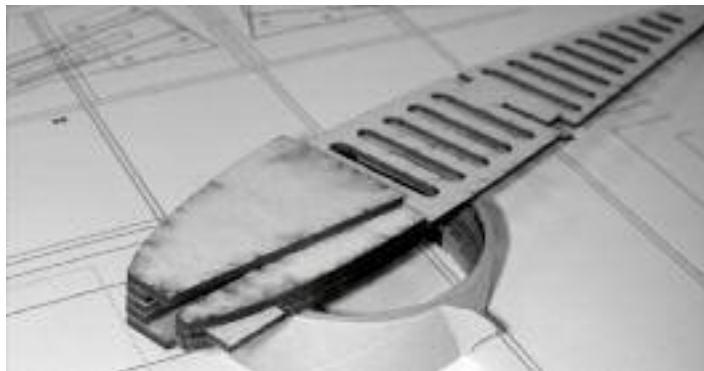
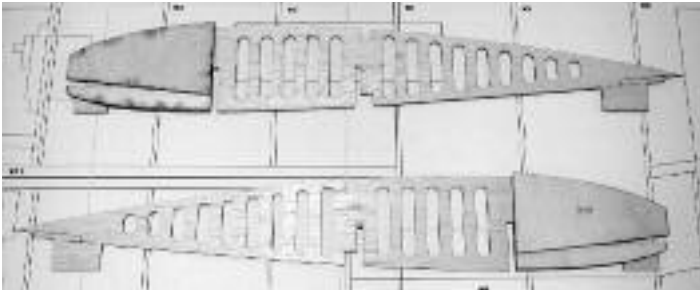


- 8. Epoxy W4A to W4. Repeat for the remaining W4. Make a left and right side.

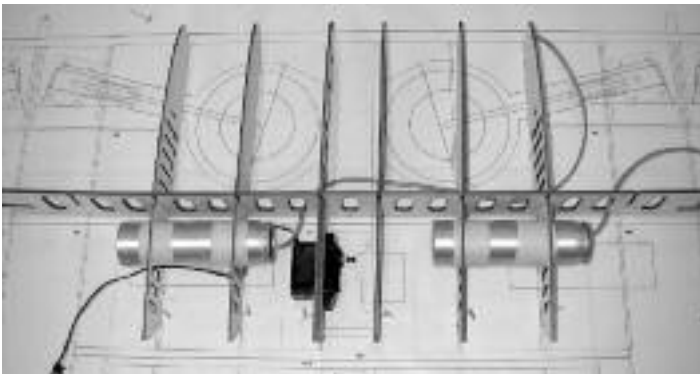
9. Epoxy W4B to W4A aligning the upper edge to properly position the part. Repeat for the remaining W4.



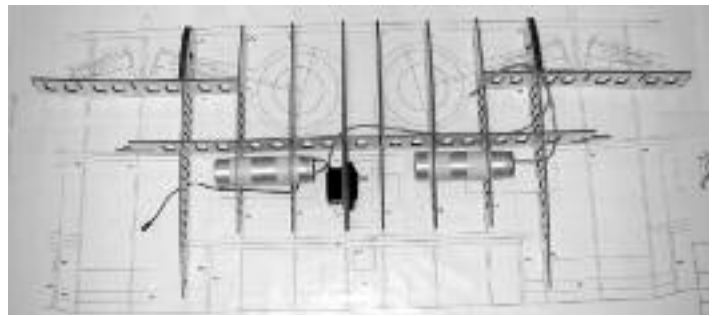
10. Epoxy W6A to W6. Repeat for the remaining W6. Make a left and right side.
Epoxy W6B to W6A aligning the upper edge to properly position the part. Repeat for the remaining W6.



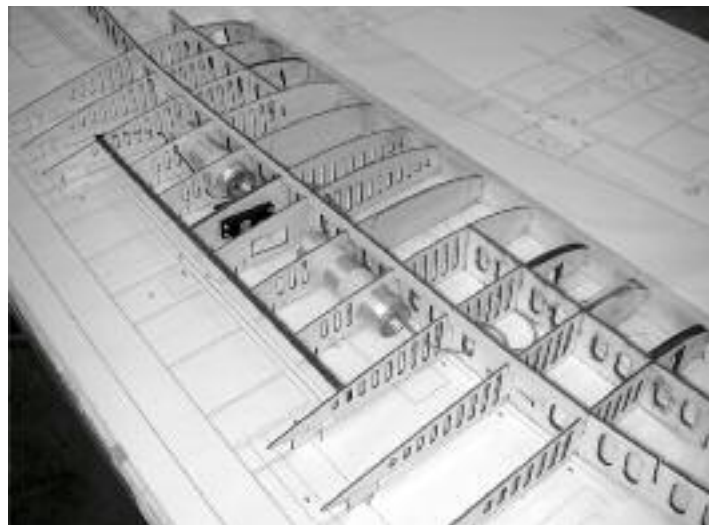
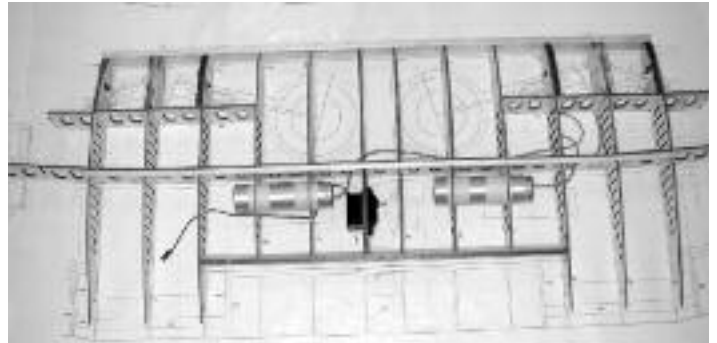
11. W5 will have retract reinforcing plates on both sides and will act as the wing dowel pocket.
12. Epoxy W5A to W5. Repeat for the remaining W5.
13. Epoxy W5B to W5A aligning the upper edge to properly position the part. Repeat for the remaining W5.
14. Turn the parts over and glue the remaining W5As to the W5s. Glue W5A to W5B aligning the upper edge to complete the W5 assembly. See photo.



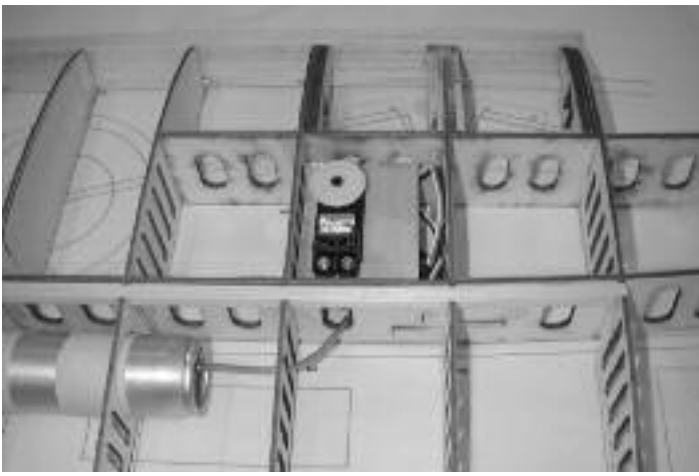
15. W7 center wing spar with the plans. Slide the W1 rib (with flap servo) into the slot that places the servo arm in the center of the flap. Slide the remaining W1 rib into the next slot.
16. Slide W2 and W3 ribs into their respective slots in W7. Slide the retract air tanks in place in ribs W2 and W3. Connect airlines as shown.



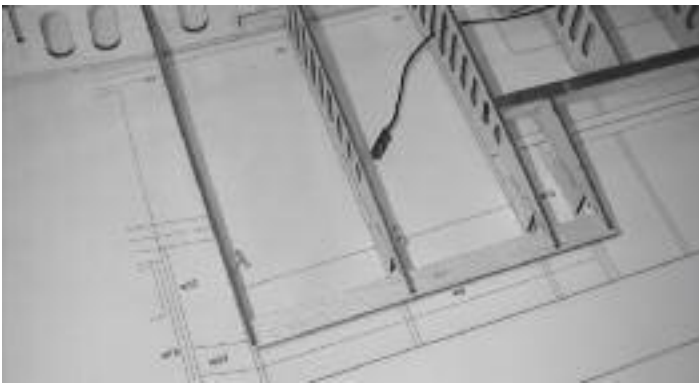
17. Align the W8 intermediate spars with the plans. Align W8 with the slot in W3 and slide the W4 ribs into the slots in W7 and W8.
18. Be sure that the ply doublers on W4 face toward the wingtips. Align this assembly with the plans and glue all parts.
19. Slide the W5s in place but do not glue.
20. Slide W17 left wing spar in place through the slot in W5 so that it butts against W5.
21. Slide W18 right wing spar in place through the other W5 the same way.



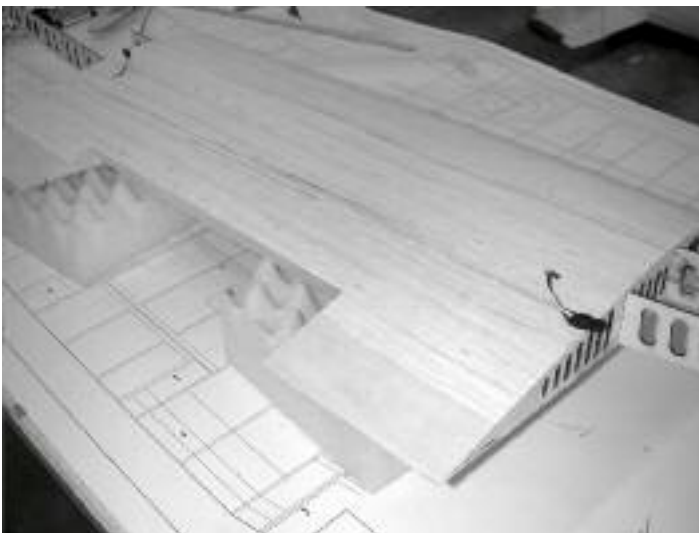
22. Align and glue the W11 to the trailing edge of ribs W1 thru W3 and the sides of W4.
23. Slide W6 into the slots in the intermediate and outer spars. Be sure the double faces inboard.
24. Carefully align W6 and W5 with the plans and glue in place.
25. Insert a piece of 1/4" x 1/4" balsa stick into the notches on the top of the center section ribs and against the center spar and glue in place. You can bend the stick slightly at the ends to match the angle of the spars.
26. Align and glue a 27.5" piece of 3/8" x 1" balsa leading edge to the leading edge of the center section ribs.



27. Fit a servo in the W12 ply plate and screw in place. Glue W12 to the cavity between W4 and W5, between the front and rear spar.



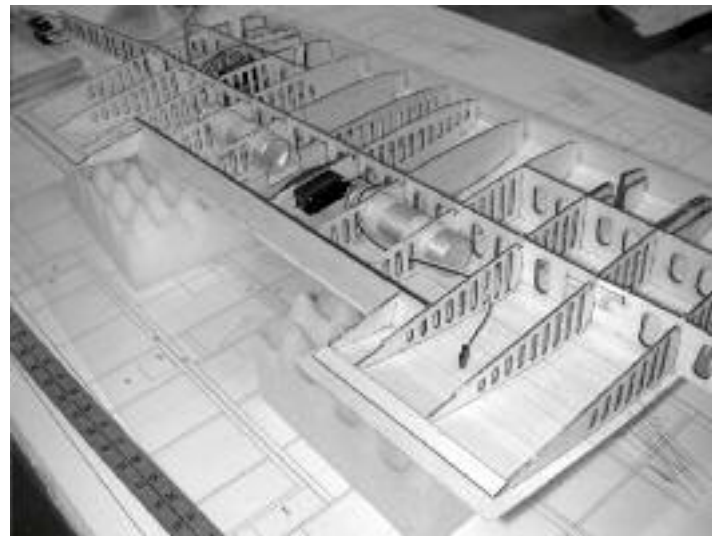
28. Align W10 with the plans and glue to the flap spar. Align and glue W9 trailing edge to ribs W10, W4, W5 and W6. Repeat for the other W10.



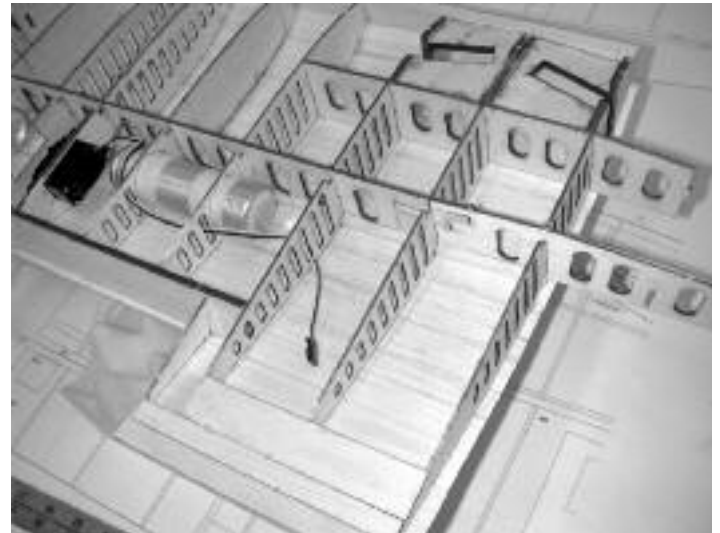
29. Sand the top of the center section to remove any high spots. Bevel the W11 flap spar to match the camber of the ribs.

30. Cut three 1/16" x 4" x 36" and one 1/16" x 3" x 36" to 28" and edge glue the pieces to create the top center sheeting.

31. Sheet the top of the wing assembly.



32. Remove the wing from the building board and trim the trailing edge of the sheeting .55" aft of the W9s and flush with the sides of W10 and the flap spar.



33. Cut a 1/4 x 1/4 balsa spar to fit into the lower spar slots in the wing ribs (along the main spar - not shown in photo). You can bend the stick slightly at the ends to match the angle of the spars.

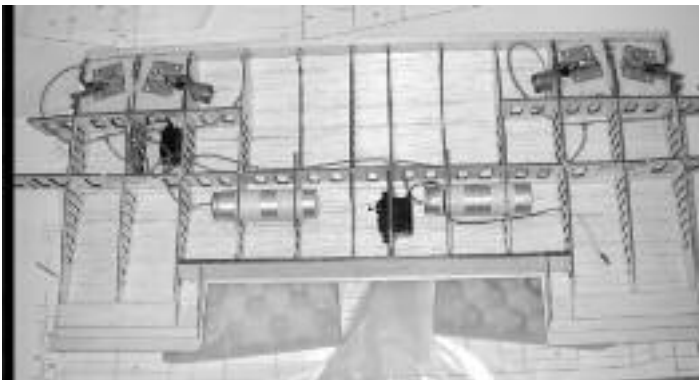
34. Glue W50 to the trailing edge of ribs W4, W5 and W6. Repeat for the other W50.

35. Epoxy the W13 ply retract plate in place between W4 and W5. Repeat for the other W13.

36. Epoxy the W14 ply retract plate in place between W5 and W6. Repeat for the other W14.



37. Mark and drill a 3/8" hole through the leading edge into the dowel pocket in W5. Repeat on the other side.

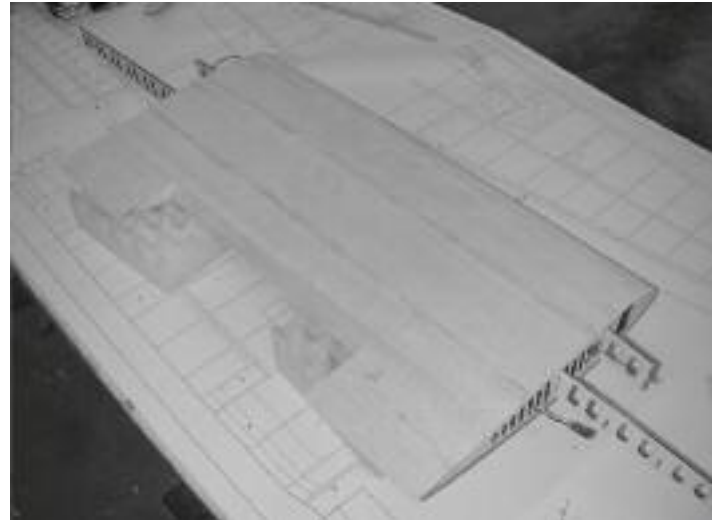


- 38. Sand the feet off the top of the W7 main spar.
- 39. Temporarily install the retracts and run the air lines and valve setup.

The following instructions are for a 2 receiver setup.

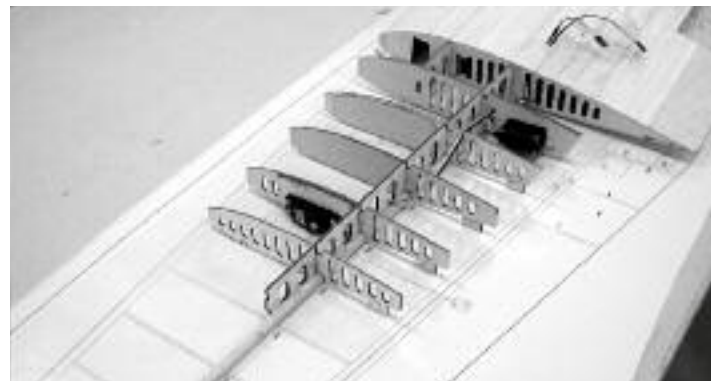
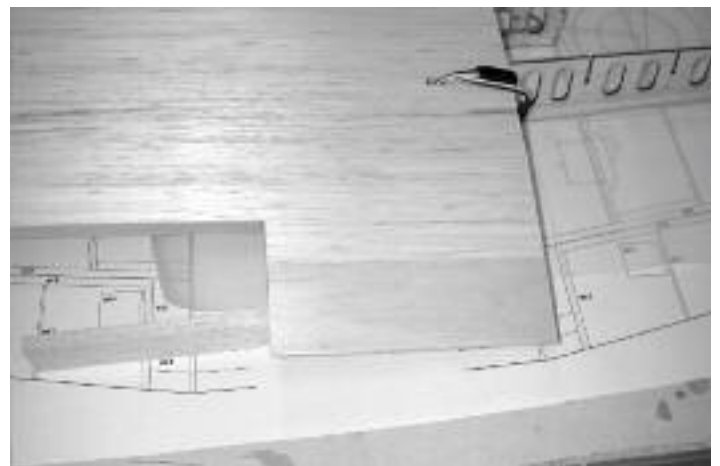
- 40. Install a Y harness from the center flap servo to either outboard side of the wing. You will plug one of the left or right flap servos into this harness. Run the plug through the top sheeting between W5 and W6.
- 41. Run a 6" servo extension from the other outboard side of the wing thru the top sheeting between W5 and W6. You can connect the ends of the extension to keep it in place. This will be used to connect the other flap servo to a receiver.
- 42. Align and glue W15 and W16 wheel well patterns in place flush with W1 and W4. Repeat for the other side.
- 43. Add a piece of 1/8" x 1/4" to the servo bay between the W1s and against the flap spar. Add another piece against the main spar. These will act as servo hatch supports.
- 44. Lightly sand the wing bottom to remove any high spots. Bevel W11 flap spar to match the rib camber. Also bevel the trailing edges of the upper sheeting to match the lower rib camber.

Now it's time to sit back and relax because you have just installed 75% of the components in this airplane!

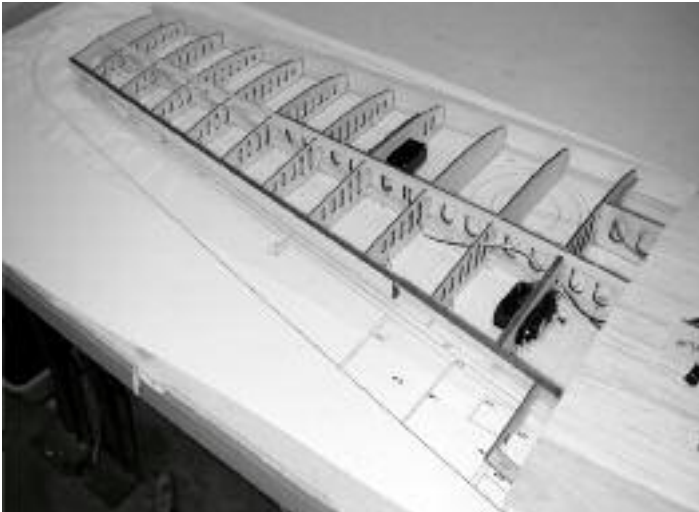


- 45. Cut three 1/16" x 4" x 36" and one 1/16" x 3" x 36" to 28" and edge glue the pieces to create the bottom center sheeting.
- 46. You can add some triangle reinforcing stock around the gear area at this time. You can also add flap hinge blocks.
- 47. Sheet the wing bottom. Be sure to glue the trailing edge sheeting last - this will insure that the trailing edge is straight.
- 48. Trim and sand the bottom sheeting trailing edge even with the top sheeting, flap spar the sides of the W10s and the sides of the W6 ribs. Run the servo extensions out the sheeting where the fuselage will sit.
- 49. Bevel the leading edge to match the rib camber.

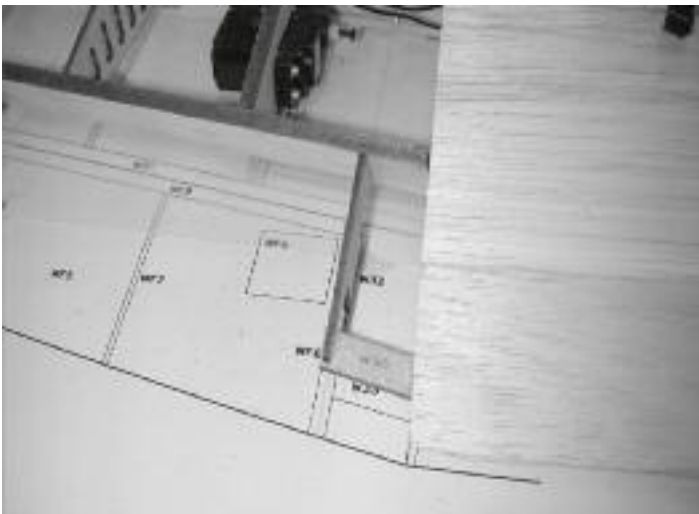
Left Wing Assembly



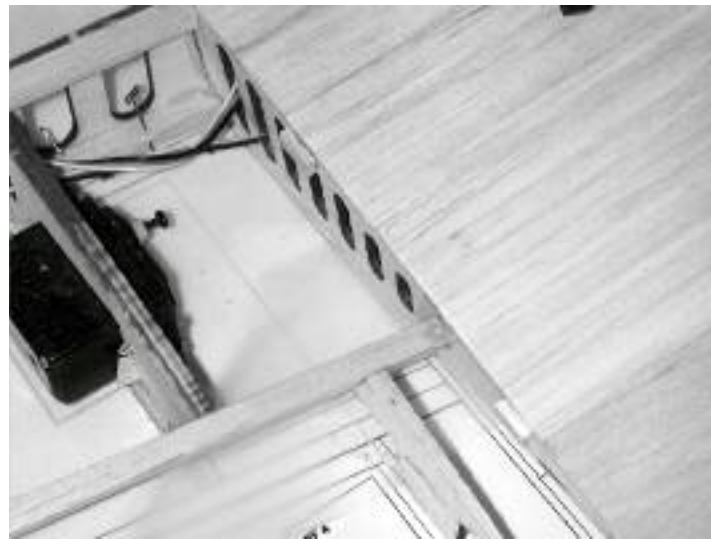
- 1. Select a 1/4" x 1/4" balsa stick to be used as a spar. Cut to 26" and glue to the rear of the ply spar from W6 outboard to W29.
- 2. Block the trailing edge of the wing center section so it is 3/4" high at the outboard W6 rib.
- 3. Fit ribs W19 thru W23 into place on the ply spar. Align the assembly to the plans and glue.



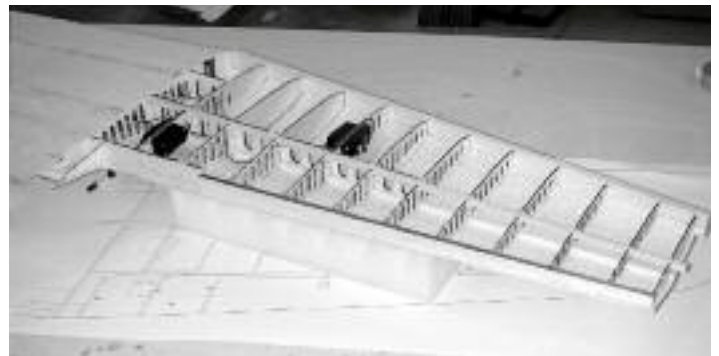
- 4. Align W24 with the tab in the W17 spar and glue in place. Align and glue ribs W25 thru W29 in place.
- 5. Align and glue W30 aileron spar to the trailing edge of ribs W21 thru W29. The spar will extend inboard of W21 - this is normal.
- 6. Trim W31 flap spar to fit between W6 and W21 at the trailing edge of ribs W19 and W20. Glue in place.
- 7. Cut a leading edge piece of 3/8" x 1" balsa to 26" and glue to the leading edge of ribs W19 thru W29 making sure to center on the ribs.
- 8. Cut a 26" piece of 1/4" x 1/4" balsa and fit into the notches on the top of ribs W19 thru W29. Glue in place.
- 9. Align and glue W32 to the trailing edge of W31 flap spar.



- 10. Glue W33 trailing edge piece in the notch in W32 and to the side of W6. This piece should match up with W9 in the center wing section.
- 11. Bevel the top of the W31 flap spar to match the upper rib camber and W32.



- 12. Cut short (1/2") pieces of scrap 1/4 x 1/8 balsa to act as stops for the wing sheeting. Glue these pieces to the edge of the W6 rib at the sheeting line.



- 13. Cut three 1/16 x 4 x 36 balsa sheets to 27". Edge glue these sheets. Edge glue one of the leftover 9" sheets to the bottom corner. Sand the sheets. Make three additional sheets in the same manner for the rest of the wing surface.
- 14. Align the sheet on the wing structure so that the end slightly overlaps the W2 rib. Mark the point at the tip for the leading edge of rib W14 and trim the sheet to match the leading edge taper.

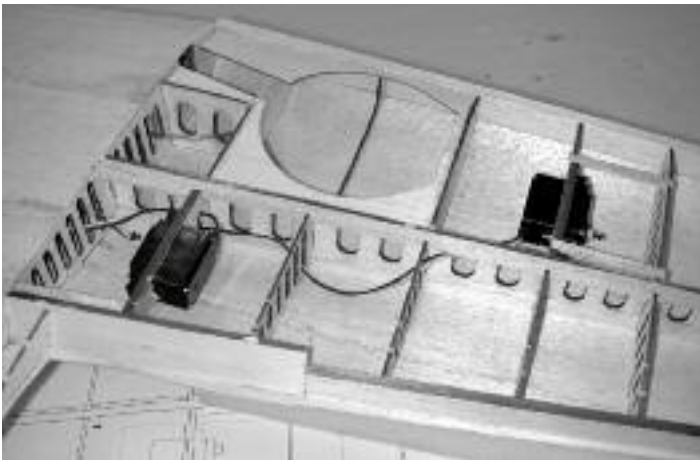
Note: The outer wing panels will be sheeted prior to sheeting the center section. The outer wing sheeting will be trimmed flush with W2.

- 15. Sheet the upper left wing panel.
- 16. Remove the wing from the board. Measure .5 inches aft of W33 and cut the trailing edge sheeting at this line. Bevel the edge of the sheeting to match the lower rib camber.
- 17. Trim the sheeting at the tip and at the aileron and flap bay. Remove the rib jig tabs and sand the "feet" off the ply spars.
- 18. Add 1/16" balsa shear webs to the spars outboard of W24 to the tip. Align the wood grain vertically.



19. Fit W34 Wheel Well Cutout to the rib bays from W6 to W21. Glue in place.

20. Fit W35 Wheel Well Cutout in the same manner and glue in place.



21. Cut pieces of $\frac{1}{4}$ x $\frac{1}{8}$ balsa to fit in the slots in W22 and W23. These are servo hatch supports. Glue the pieces in place.

22. Cut pieces of $\frac{1}{4}$ x $\frac{1}{8}$ balsa to fit between W6 and W19 to act as flap servo hatch supports. These pieces will butt against the spars and the ribs. Glue in place.

23. Add a small piece of tri-stock to the junction of the W30 and W31 spars to fit the gap. Add tri-stock reinforcements to the spars at W6 at this time.

24. Bevel the W30 aileron spar and W31 flap spar to match the lower rib camber.

25. Lightly sand the wing surface to remove any high spots.

26. Add any hinge reinforcement blocks to the ailerons and flaps now.

27. Cut short ($\frac{1}{2}$ " pieces of scrap $\frac{1}{4}$ x $\frac{1}{8}$ balsa to act as stops for the wing sheeting. Glue these pieces to the edge of the W6 rib at the sheeting line.

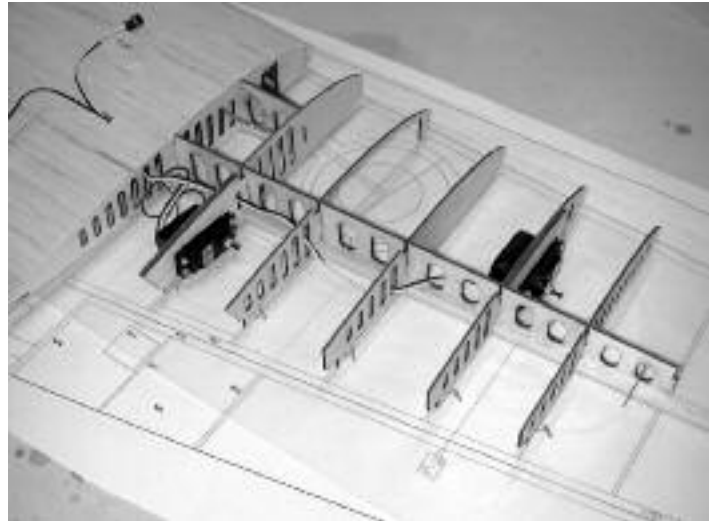
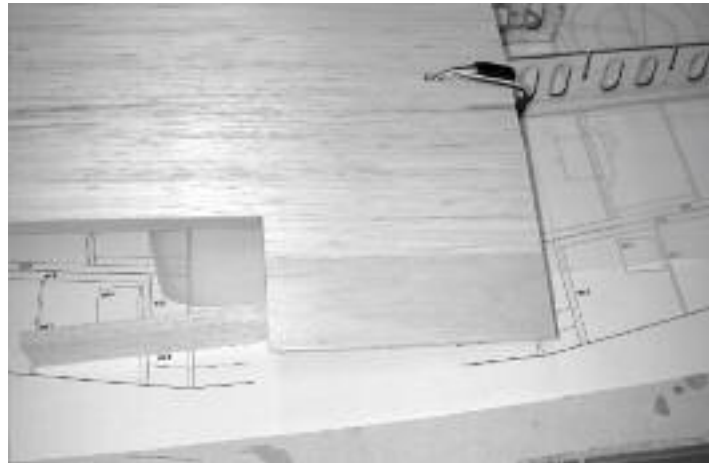
28. Align one of the (previously made) wing sheets with the wing surface, trim the sheet to match the leading edge taper, and sheet the lower wing surface.

Hint: Mark the servo bays during sheeting to more easily find them later.

29. Trim and sand the sheeting at the wingtip, aileron and flap bays, and at the W2 rib.

Note: We prefer as a building and finishing technique to leave the wing closed (hatches and wheel wells not opened up) if you are fiberglassing the wing. This will prevent water from wet sanding from entering the wing interior.

Right Wing Assembly



1. Select a $\frac{1}{4}$ " x $\frac{1}{4}$ " balsa stick to be used as a spar. Cut to 26" and glue to the rear of the ply spar from W6 outboard to W29.

2. Block the trailing edge of the wing center section so it is $\frac{3}{4}$ " high at the outboard W6 rib.

3. Fit ribs W19 thru W23 into place on the ply spar. Align the assembly to the plans and glue.



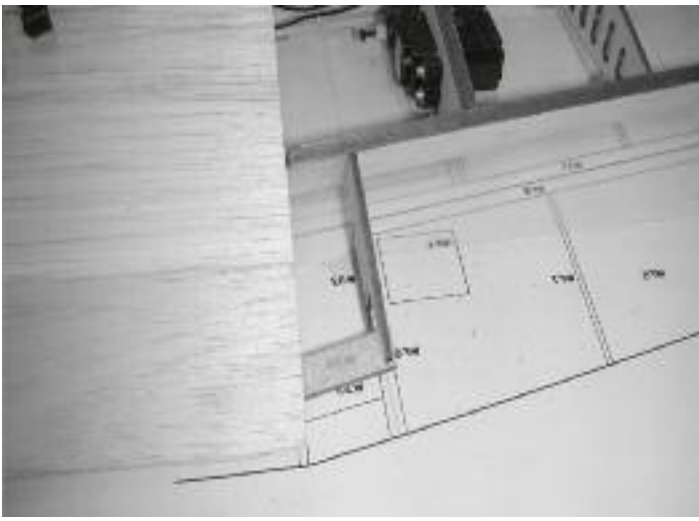
4. Align W24 with the tab in the W17 spar and glue in place. Align and glue ribs W25 thru W29 in place.

5. Align and glue W30 aileron spar to the trailing edge of ribs W21 thru W29. The spar will extend inboard of W21 - this is normal.

6. Trim W31 flap spar to fit between W6 and W21 at the trailing edge of ribs W19 and W20. Glue in place.

7. Cut a leading edge piece of $\frac{3}{8}$ " x 1" balsa to 26" and glue to the leading edge of ribs W19 thru W29 making sure to center on the ribs.

8. Cut a 26" piece of $\frac{1}{4}$ " x $\frac{1}{4}$ " balsa and fit into the notches on the top of ribs W19 thru W29. Glue in place.

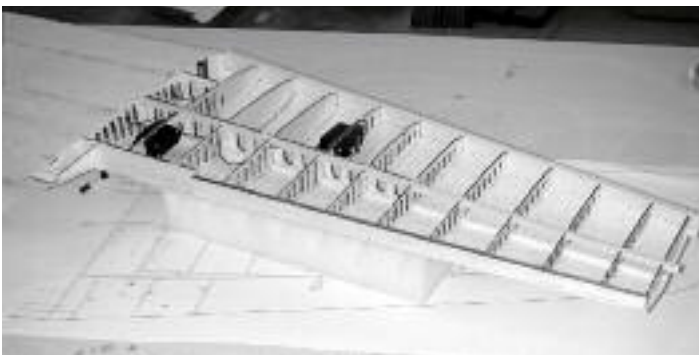


10. Glue W33 trailing edge piece in the notch in W32 and to the side of W6. This piece should match up with W9 in the center wing section.

11. Bevel the top of the W31 flap spar to match the upper rib camber and W32.



12. Cut short (1/2") pieces of scrap 1/4 x 1/8 balsa to act as stops for the wing sheeting. Glue these pieces to the edge of the W6 rib at the sheeting line.



13. Cut three 1/16 x 4 x 36 balsa sheets to 27". Edge glue these sheets. Edge glue one of the leftover 9" sheets to the bottom corner. Sand the sheets. Make three additional sheets in the same manner for the rest of the wing surface.

14. Align the sheet on the wing structure so that the end slightly overlaps the W2 rib. Mark the point at the tip for the leading edge of rib W14 and trim the sheet to match the leading edge taper.

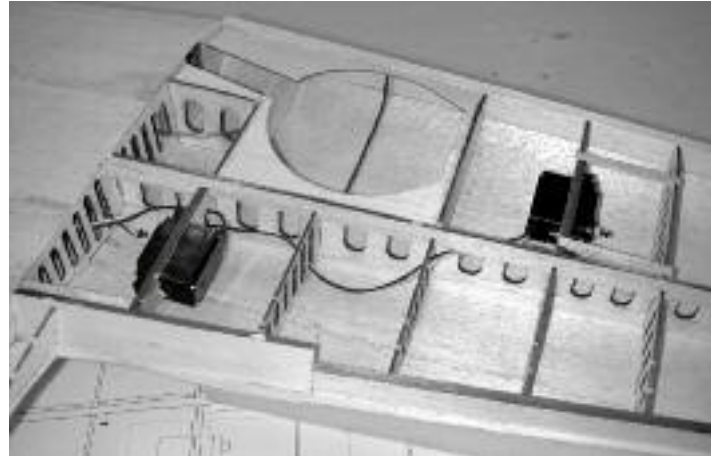
Note: The outer wing panels will be sheeted prior to sheeting the center section. The outer wing sheeting will be trimmed flush with W2.

15. Sheet the upper left wing panel.

16. Remove the wing from the board. Measure .5 inches aft of W33 and cut the trailing edge sheeting at this line. Bevel the edge of the sheeting to match the lower rib camber.

17. Trim the sheeting at the tip and at the aileron and flap bay. Remove the rib jig tabs and sand the "feet" off the ply spars.

18. Add 1/16" balsa shear webs to the spars outboard of W24 to the tip. Align the wood grain vertically.



19. Fit W34 Wheel Well Cutout to the rib bays from W6 to W21. Glue in place.

20. Fit W35 Wheel Well Cutout in the same manner and glue in place.

21. Cut pieces of 1/4 x 1/8 balsa to fit in the slots in W22 and W23. These are servo hatch supports. Glue the pieces in place.

22. Cut pieces of 1/4 x 1/8 balsa to fit between W6 and W19 to act as flap servo hatch supports. These pieces will butt against the spars and the ribs. Glue in place.

23. Add a small piece of tri-stock to the junction of the W30 and W31 spars to fit the gap. Add tri-stock reinforcements to the spars at W6 at this time.

24. Bevel the W30 aileron spar and W31 flap spar to match the lower rib camber.

25. Lightly sand the wing surface to remove any high spots.

26. Add any hinge reinforcement blocks to the ailerons and flaps now.

27. Cut short (1/2") pieces of scrap 1/4 x 1/8 balsa to act as stops for the wing sheeting. Glue these pieces to the edge of the W6 rib at the sheeting line.

28. Align one of the (previously made) wing sheets with the wing surface, trim the sheet to match the leading edge taper, and sheet the lower wing surface.

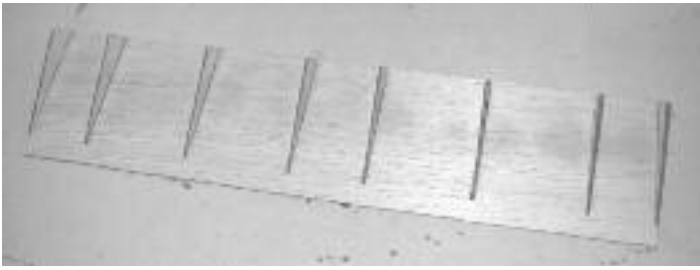
Hint: Mark the servo bays during sheeting to more easily find them later.

29. Trim and sand the sheeting at the wingtip, aileron and flap bays, and at the W2 rib.

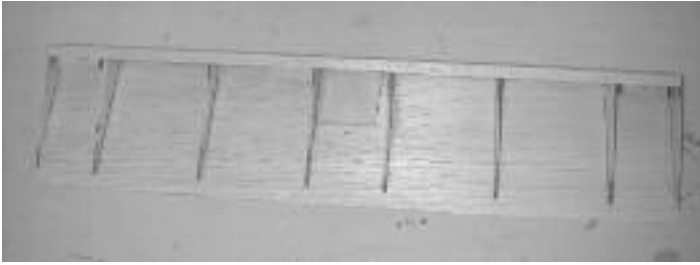
Note: We prefer as a building and finishing technique to leave the wing closed (hatches and wheel wells not opened up) if you are fiberglassing the wing. This will prevent water from wet sanding from entering the wing interior.

30. Glue the wingtips to the W29 ribs at this time. Shape and sand

Center Flap Assembly



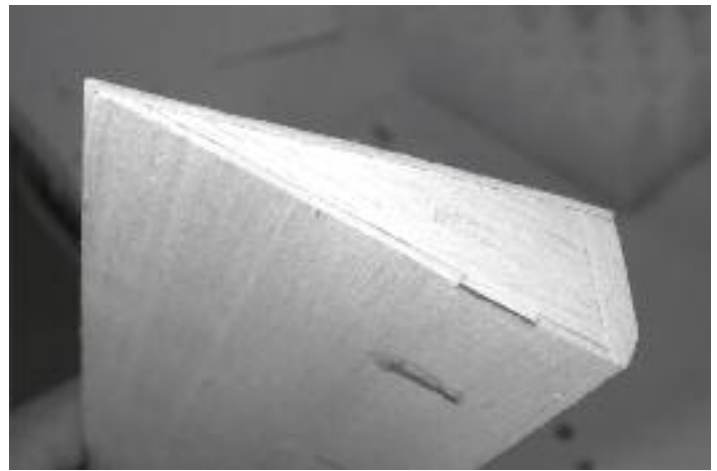
1. Glue eight WF2s into the slots in WF1
2. Bevel the front edge of WF1 to match the angle of WF2



3. Align and glue WF3 to the beveled edge of WF1 and the WF2s. Align the top edge of WF3 to the top of the WF2 ribs so any excess overhangs the bottom of WF1.
4. Sand WF3 to match the bottom of WF1 and the tops of WF2.
5. Bevel the trailing edge of WF1 to match the upper rib camber.
6. Glue the WF000 control horn reinforcement into the center bay on WF1.
7. Add hinge support blocks as required and mark hinge locations on WF3.

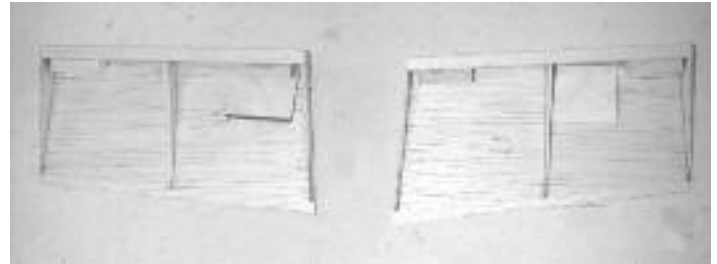


8. Cut a piece of 1/16" x 4" x 36" to 15" and glue to the top of the center wing flap assembly.
9. Sand the sheeting at the trailing edge, leading edge and sides.



10. Measure .3 inches from the bottom edge of the flap and mark a hinge line. Bevel the area between the hinge line and the bottom of the flap to allow for flap travel.

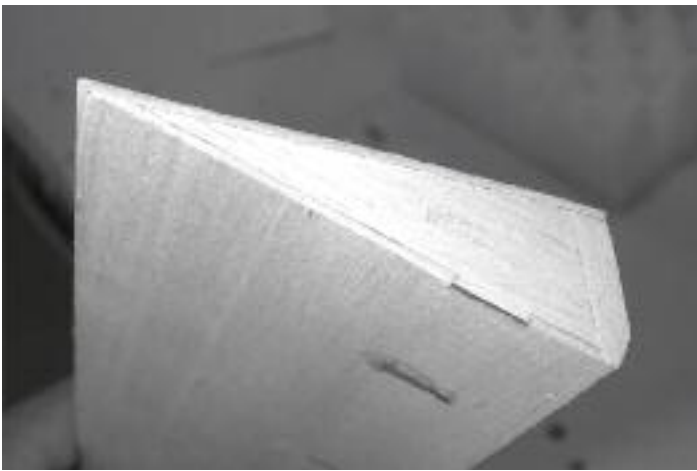
Left & Right Flap Assemblies



1. Note that the WF5 flaps are marked left and right.
2. Align and glue WF6 to the inner slot of WF5. Glue WF7 in the center slot and WF8 in the outer slot.
3. Bevel the leading edge of WF5 to match the rib angle.
4. Align the upper edge of WF9 with the upper edges of the ribs and glue.
5. Sand the bottom of WF9 to match the bottom of the flap assembly.
6. Sand the top of WF9 to match the upper rib camber.
7. Bevel the trailing edge to match the rib camber.
8. Locate the flap servo position and add the WF00 control horn reinforcement to the proper area in the inner or outer bay.
9. Add hinge support blocks as required and mark hinge locations on WF5.



10. Cut short pieces of 1/16" x 4" balsa to use at the top sheeting. Sheet the top of the flaps.
11. Sand the sheeting at the trailing edge, leading edge and sides.



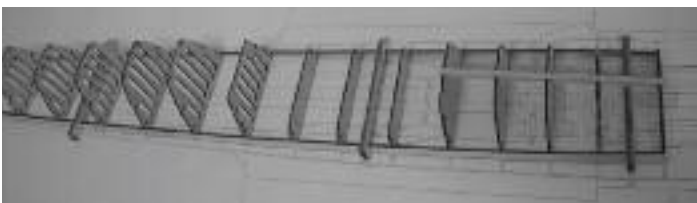
- 12. Measure .3 inches from the bottom edge of the flap and mark a hinge line. Bevel the area between the hinge line and the bottom of the flap to allow for flap travel.

Left Fuselage Assembly

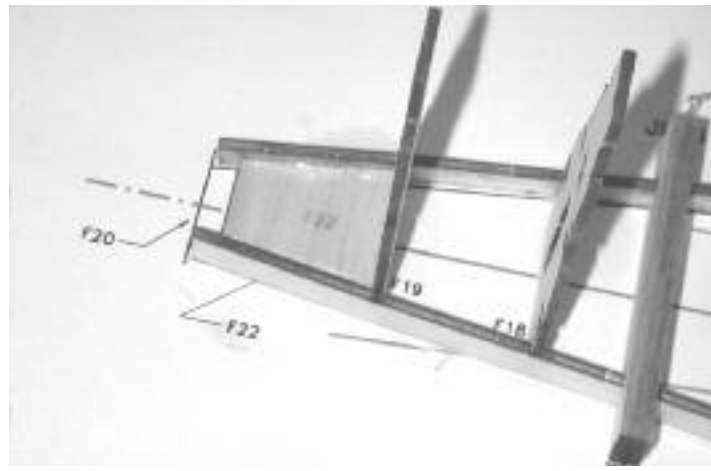


- 1. Assemble and glue F21A and F21B together. Assure that the assembly is straight. Make two pieces - these will act as the fuselage "crutch".
- 2. Align the F21 assemblies on the plans with the front edges even with the F1 bulkhead location and slide Jig 1 thru Jig 4 over the crutch as indicated on the plans. Pin the jigs in place outside the crutch.

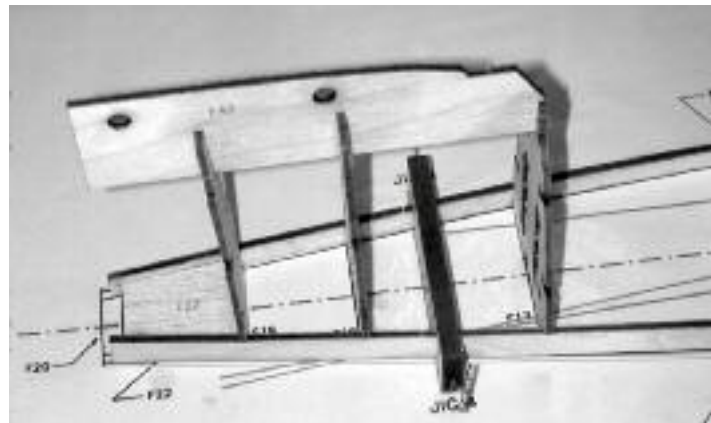
Note: The jigs are designed to place a "twist" in the crutch to follow the bulkhead contour. The jigs should stay in place during construction until about halfway through stringer attachment. The jigs are designed to be "twisted" off, breaking away to top portion while leaving the inner portion to be removed after sheeting.



- 3. Glue F1A to the crutch. There will be a slight amount of pressure on these joints while the remaining bulkheads are placed, so ensure a good glue joint.
- 4. Glue F2A, F3A, F4A and F5A to the crutch in sequence.
- 5. Glue F6A thru F8A in place. Leave the centers of these bulkheads intact. (the centers of these bulkheads will be removed, but not until cockpit assembly). Make sure the engraved side of F8A faces forward.
- 6. Glue F9A thru F14A to the crutch in sequence.
- 7. Glue F15A thru F19 to the crutch. Note that these bulkheads have pushrod holes in them. They are marked for the left and right fuselages (after construction, the fuses can be distinguished by which side the elevator pushrod exits) and marked "Front" to indicate towards the nose.



- 8. Slide F22 inside the crutch, flat on the board, and butt against the rear of the F19 bulkhead. Glue in place (a portion of the crutch will be sanded away to contour the fuselage after sheeting, so F22 will support this area).



- 8A. Fit and glue F42 into the slots on the top of F17, F18 and F19 as shown. The back of F42 should be even with the back of F22.



- 9. Soak the F27 Stab Saddles in water or a water/ammonia mix. Form the F27s to fit into the notches in F17A, F18, and F19. Align the front of the saddles with F17A and glue in place.
- 10. Test fit F20 to the rear of the fuselage. The rounded bottom of F20 will butt against F22, but the crutch will not fully contact F20. This is normal. Trim F20 as necessary if the crutch is too long.
- 11. Align F20 vertically with the board. Do not align the notches in F20 with the ends of the stab saddles - the saddles are slightly longer to allow for trimming. Glue F20 to F22, F42 and the F27s.



- 12. Cut two pieces of 1/8 x 1/4 balsa stringer to fit between the horizontal slots in F5A and F9A. Glue these to F5A thru F9A.
- 13. Cut a piece of 1/4 x 1/4 balsa to fit in the upper slots in F1A thru F5A. Glue in place.
- 14. Fit F23 into the slots in F8A level with the stringers with the engraved line facing aft and glue.
- 15. Bevel the bottom edge of F24 to fit flush against F23 with F24 laying back touching F9A. Align F24 with the stringers and the engraved line on F23. Glue to F23 and F9A. Remove top of jigs



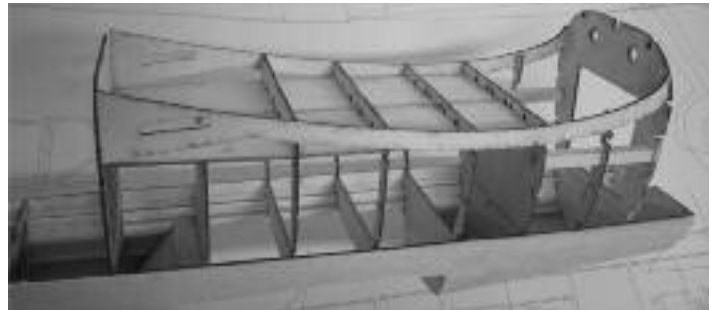
- 16. Fit a 1/8 x 1/4 balsa stringer into the lowest slots in the bulkheads from F16A to F1A. Glue in place. Repeat for the other side.
- 17. Lay the second row of stringers in place, butting against F20 to butt against F24, and from F5A to F1A. Glue in place. Repeat for the other side.
- 18. Lay the third row of stringers in place, butting against F20 to butt against F24, and from F5A to F1A. Glue in place. Repeat for the



- 19. Select similar grain sheets of 1/16 x 4 x 48. Lay these sheets against the fuselage sides. Trim the bottom edge as necessary. Sheet the upper fuselage. Wetting the sheets will help when making the curve of the forward fuselage. The sheets may crack at the fuse juncture around F17A. This is normal and will be smoothed with filler later.
- 20. Trim and sand the sheeting even with the top stringer from F24 to F16A.
- 21. Glue F25 to the fuselage top, making sure the back edge is even with F16A.
- 22. Sand F25 to match the fuselage taper.
- 23. Align and glue F26 to F25.
- 24. Remove the fuselage from the board. Trim and sand the sheeting at F1A, F20, and the cockpit area. Cut the exit holes for the rudder and elevator pushrods thru the fuse sheeting.



- 25. Align and glue F2B, F3B and F4B to the fuselage bottom (if the center of F3B falls out, tape the pieces together until after assembly).
- 26. Cut two sections of 3/8 x 3/8 maple to fit in the slots in the bulkheads. Slide the maple rails in place but do not glue yet.



- 20. Trim and sand the sheeting even with the top stringer from F24 to F16A.
- 21. Glue F25 to the fuselage top, making sure the back edge is even with F16A.

- 22. Sand F25 to match the fuselage taper.
- 23. Align and glue F26 to F25.
- 24. Remove the fuselage from the board. Trim and sand the sheeting at F1A, F20, and the cockpit area. Cut the exit holes for the rudder and elevator pushrods thru the fuse sheeting.
- 27. Glue F8B to F8A with the engraved side facing forward.
- 28. Glue the **C1L** Cockpit Floor to F4B and F8B. Note: C1 will be used in the right fuselage with the cockpit.
- 29. Glue F9B to F9A and the cockpit floor.
- 30. Slide each side of F5B into the slots in the cockpit floor and glue to F5A and the floor. Repeat for F6B and F7B.
- 31. Lay the F28 Ply Wing Saddles into the slots in F6B and F7B, and against F9B (the assembly will be straight at F9B, but F2B may not be - that's why you didn't glue the rails yet...or did you?). Glue the F28 saddles to F6B, F7B and F9B. Work forward and glue the saddles to F5B, F4B, F3B, and F2B. The saddles will squeeze in slightly at F2B - glue the inner top edge of the saddle to align with the outer edge of F2B.
- 32. Glue the maple rails in place.



- 34. Align and glue bulkheads F10B thru F17B to their respective matching upper halves.

Note: Even though the pushrods must locate to specific sides, the pushrod holes are duplicated to prevent getting a bulkhead reversed.

- 35. Glue a 1/4 x 1/4 balsa stick into the slots in the F9B thru F17B bulkheads.
- 36. Align and glue the F1B bulkhead to F1A.

Hint: to align F1B and F1A easily, first glue F1B in place. Then glue the 1/4 x 1/4 keel to F2B only. Place a straight-edge along F1A and F1B and adjust F1B, then glue the keel in place.

- 38. OK, let's install pushrods. The elevator on this fuselage must mount on Aircraft Left, Rudder on Aircraft Right. Remember, the fuse is upside-down. Slide the pushrod into the holes marked with an "E" (imagine that!) On the same side your throttle servo will sit. Continue sliding the pushrod through the holes in the bulkheads - the elevator pushrod will locate to the fuse center about halfway back. Slide the pushrod until it just clears the hole in F17. Next, for the rudder pushrod, select the hole marked "R" on the opposite side of the fuse from the elevator pushrod. Slide the rudder pushrod through the "R" holes on the same side of the fuselage (the rudder pushrod will not cross over the elevator pushrod). Cut a slot in the fuse sheeting aft of F19 and slide the pushrod through. Last, slide the tailwheel pushrod through the "T" hole next to the rudder pushrod. The tailwheel pushrod will cross over the other pushrods about halfway back.



- 39. Cut and sand a piece of 3/4 tri-stock to fit on the bulkhead cutouts from F9 to F10. Sand the tri-stock flush with F9.
- 40. Repeat this procedure for tri-stock to fit from F10 to F11.
- 41. Fit a piece of tri-stock from F11 which will fit against but not overlap F12. The corner of the tri-stock should extend about 3/8" above the curve of F12.



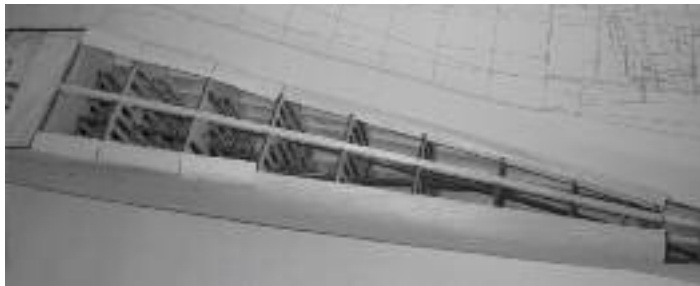
- 42. Glue a 1/8 x 1/4 balsa stringer into the flat groove of the lower bulkheads from F1B to F17B. You will have to splice about 1 1/2" to make the stringer long enough. This piece will fit against the crutch and is a sheeting anchor.
- 43. Fit 1/8 x 1/4 balsa stringers into the second and third slots in the bulkheads from F1B to F17B. You will have to splice about 1 1/2" to make the stringer long enough.
- 44. Fit short sections of stringer into the remaining slots from F1B to F2B.
- 45. Cut and fit stringers into the remaining slots from F12B to F17B.
- 46. Slide F50 Ply Holddown Plate into the slots in the F28 Wing Saddle and epoxy in place.



- 47. Cut a 1/16 x 4 x 48 balsa sheet to 39". Trim this sheet to fit against the upper fuselage sheeting between F1 and F17. The sheeting will lay flat against the side of the fuse from F1 to F12 and the tri-stock. At F12, cut the sheet so it can wrap around the curve of the bulkhead. You will have to wet the sheeting aft of F12 for it to wrap around the bulkheads. Sheet the aft portion of the fuselage only to the last row of stringers. Cut the sheeting flush with the stringer from F12 to F17.
- 48. Repeat the sheeting procedure for the opposite side of the fuselage.



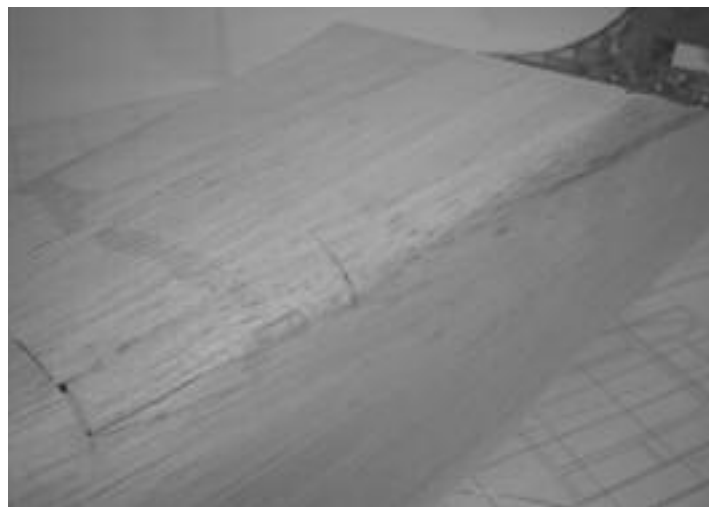
- 47. Cut a 1/16 x 4 x 48 balsa sheet to 39". Trim this sheet to fit against the upper fuselage sheeting between F1 and F17. The sheeting will lay flat against the side of the fuse from F1 to F12 and the tri-stock. At F12, cut the sheet so it can wrap around the curve of the bulkhead. You will have to wet the sheeting aft of F12 for it to wrap around the bulkheads. Sheet the aft portion of the fuselage only to the last row of stringers. Cut the sheeting flush with the stringer from F12 to F17.
- 48. Repeat the sheeting procedure for the opposite side of the fuselage.



- 49. Glue an F37 Fuse Sheet to the lower fuselage from F9 to F12 and the 1/4 x 1/4 keel. Press the sheet to the bulkheads at the tri-stock area so the sheet "forms" into this juncture. Repeat for the F37 sheet on the opposite side.



- 50. Test fit the F38 Fuse Sheet to the center aft fuselage. Trim as necessary and sheet the remaining portion of the aft fuse.



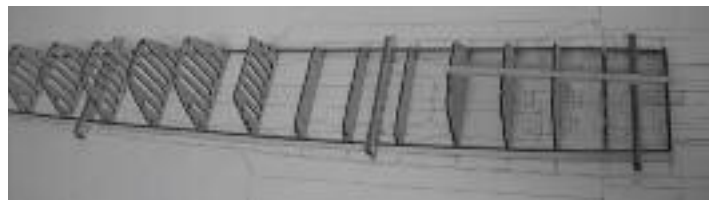
- 51. Sand the tri-stock and sheeting from F9 to F12 to blend the curve to F9. The sheeting at F9 will remain squared off. Try not to go overboard here and sand through the sheeting - most of the material removal will be from the tri-stock. Trim and sand the sheeting at F17.
- 52. Trim and sand the fuselage sheeting at the wing saddle.

Right Fuselage Assembly



- 1. Assemble and glue F21A and F21B together. Assure that the assembly is straight. Make two pieces - these will act as the fuselage "crutch".
- 2. Align the F21 assemblies on the plans with the front edges even with the F1 bulkhead location and slide Jig 1 thru Jig 4 over the crutch as indicated on the plans. Pin the jigs in place outside the crutch.

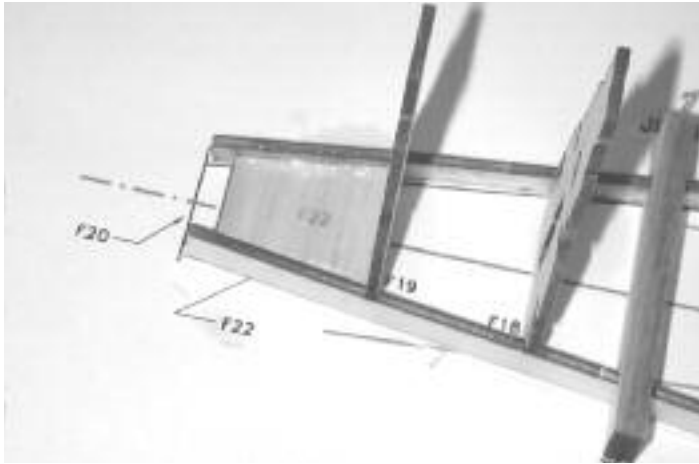
Note: The jigs are designed to place a "twist" in the crutch to follow the bulkhead contour. The jigs should stay in place during construction until about halfway through stringer attachment. The jigs are designed to be "twisted" off, breaking away to top portion while leaving the inner portion to be removed after sheeting.



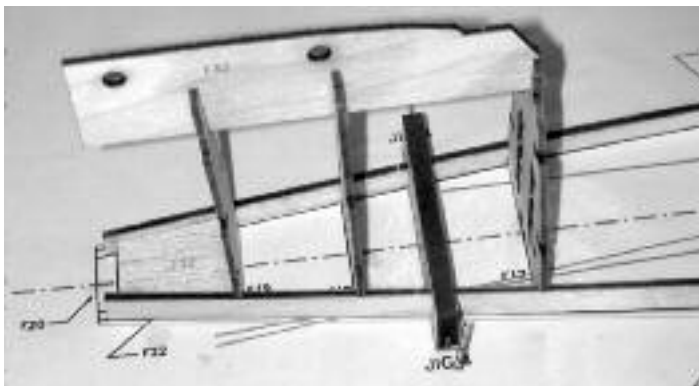
- 3. Glue F1A to the crutch. There will be a slight amount of pressure on these joints while the remaining bulkheads are placed, so ensure a good glue joint.
- 4. Glue F2A, F3A, F4A and F5A to the crutch in sequence.
- 5. Glue F6A thru F8A in place. Leave the centers of these bulkheads intact. (the centers of these bulkheads will be removed, but not until cockpit assembly). Make sure the engraved side of F8A faces forward.

6. Glue F9A thru F14A to the crutch in sequence.

7. Glue F15A thru F19 to the crutch. Note that these bulkheads have pushrod holes in them. They are marked for the left and right fuselages (after construction, the fuses can be distinguished by which side the elevator pushrod exits) and marked "Front" to indicate towards the nose.



8. Slide F22 inside the crutch, flat on the board, and butt against the rear of the F19 bulkhead. Glue in place (a portion of the crutch will be sanded away to contour the fuselage after sheeting, so F22 will support this area).



8A. Fit and glue F42 into the slots on the top of F17, F18 and F19 as shown. The back of F42 should be even with the back of F22.



9. Soak the F27 Stab Saddles in water or a water/ammonia mix. Form the F27s to fit into the notches in F17A, F18, and F19. Align the front of the saddles with F17A and glue in place.

10. Test fit F20 to the rear of the fuselage. The rounded bottom of F20 will butt against F22, but the crutch will not fully contact F20. This is normal. Trim F20 as necessary if the crutch is too long.

11. Align F20 vertically with the board. Do not align the notches in F20 with the ends of the stab saddles - the saddles are slightly longer to allow for trimming. Glue F20 to F22, F42 and the F27s.

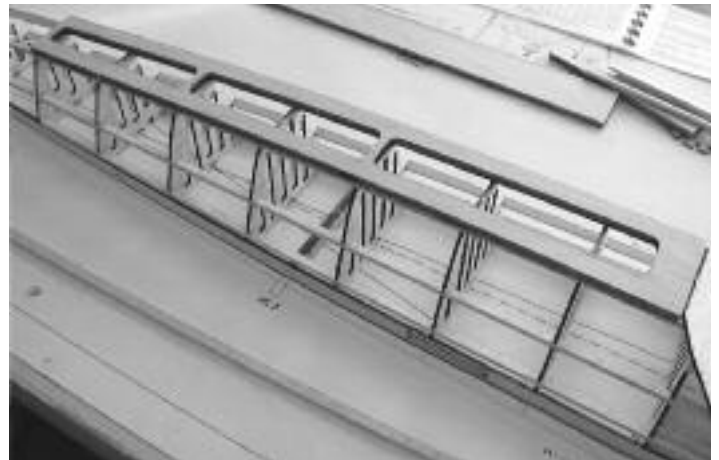


12. Cut two pieces of 1/8 x 1/4 balsa stringer to fit between the horizontal slots in F5A and F9A. Glue these to F5A thru F9A.

13. Cut a piece of 1/4 x 1/4 balsa to fit in the upper slots in F1A thru F5A. Glue in place.

14. Fit F23 into the slots in F8A level with the stringers with the engraved line facing aft and glue.

15. Bevel the bottom edge of F24 to fit flush against F23 with F24 laying back touching F9A. Align F24 with the stringers and the engraved line on F23. Glue to F23 and F9A. Remove top of jigs



16. Fit a 1/8 x 1/4 balsa stringer into the lowest slots in the bulkheads from F16A to F1A. Glue in place. Repeat for the other side.

17. Lay the second row of stringers in place, butting against F20 to butt against F24, and from F5A to F1A. Glue in place. Repeat for the other side.

18. Lay the third row of stringers in place, butting against F20 to butt against F24, and from F5A to F1A. Glue in place. Repeat for the





- 19. Select similar grain sheets of 1/16 x 4 x 48. Lay these sheets against the fuselage sides. Trim the bottom edge as necessary. Sheet the upper fuselage. Wetting the sheets will help when making the curve of the forward fuselage. The sheets may crack at the fuse juncture around F17A. This is normal and will be smoothed with filler later.
- 20. Trim and sand the sheeting even with the top stringer from F24 to F16A.
- 21. Glue F25 to the fuselage top, making sure the back edge is even with F16A.
- 22. Sand F25 to match the fuselage taper.
- 23. Align and glue F26 to F25.
- 24. Remove the fuselage from the board. Trim and sand the sheeting at F1A, F20, and the cockpit area. Cut the exit holes for the rudder and elevator pushrods thru the fuse sheeting.

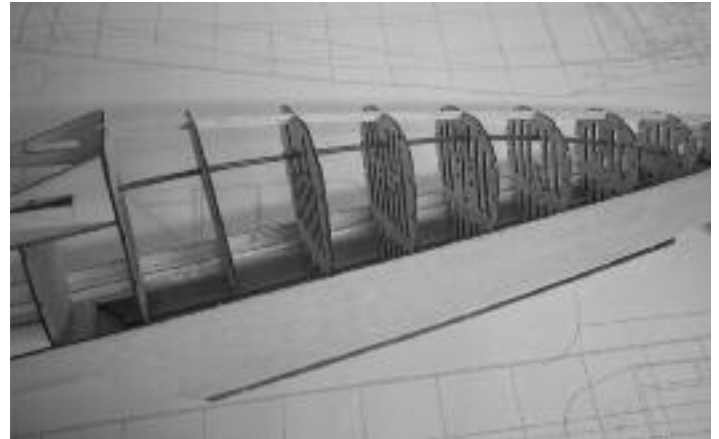


- 25. Align and glue F2B, F3B and F4B to the fuselage bottom (if the center of F3B falls out, tape the pieces together until after assembly).
- 26. Cut two sections of 3/8 x 3/8 maple to fit in the slots in the bulkheads. Slide the maple rails in place but do not glue yet.



- 20. Trim and sand the sheeting even with the top stringer from F24 to F16A.
- 21. Glue F25 to the fuselage top, making sure the back edge is even with F16A.

- 22. Sand F25 to match the fuselage taper.
- 23. Align and glue F26 to F25.
- 24. Remove the fuselage from the board. Trim and sand the sheeting at F1A, F20, and the cockpit area. Cut the exit holes for the rudder and elevator pushrods thru the fuse sheeting.
- 27. Glue F8B to F8A with the engraved side facing forward.
- 28. Glue the C1 Cockpit Floor to F4B and F8B.
- 29. Glue F9B to F9A and the cockpit floor.
- 30. Slide each side of F5B into the slots in the cockpit floor and glue to F5A and the floor. Repeat for F6B and F7B.
- 31. Lay the F28 Ply Wing Saddles into the slots in F6B and F7B, and against F9B (the assembly will be straight at F9B, but F2B may not be - that's why you didn't glue the rails yet...or did you?). Glue the F28 saddles to F6B, F7B and F9B. Work forward and glue the saddles to F5B, F4B, F3B, and F2B. The saddles will squeeze in slightly at F2B - glue the inner top edge of the saddle to align with the outer edge of F2B.
- 32. Glue the maple rails in place.



- 34. Align and glue bulkheads F10B thru F17B to their respective matching upper halves.
- Note: Even though the pushrods must locate to specific sides, the pushrod holes are duplicated to prevent getting a bulkhead reversed.**
- 35. Glue a 1/4 x 1/4 balsa stick into the slots in the F9B thru F17B bulkheads.
 - 36. Align and glue the F1B bulkhead to F1A.

Hint: to align F1B and F1A easily, first glue F1B in place. Then glue the 1/4 x 1/4 keel to F2B only. Place a straight-edge along F1A and F1B and adjust F1B, then glue the keel in place.

- 38. OK, let's install pushrods. The elevator on this fuselage must mount on Aircraft **right**, Rudder on Aircraft **left**. Remember, the fuse is upside-down. Slide the pushrod into the holes marked with an "E" (imagine that!) On the same side your throttle servo will sit. Continue sliding the pushrod through the holes in the bulkheads - the elevator pushrod will locate to the fuse center about halfway back. Slide the pushrod until it just clears the hole in F17. Next, for the rudder pushrod, select the hole marked "R" on the opposite side of the fuse from the elevator pushrod. Slide the rudder pushrod through the "R" holes on the same side of the fuselage (the rudder pushrod will not cross over the elevator pushrod). Cut a slot in the fuse sheeting aft of F19 and slide the pushrod through. Last, slide the tailwheel pushrod through the "T" hole next to the rudder pushrod. The tailwheel pushrod will cross over the other pushrods about halfway back.



39. Cut and sand a piece of $\frac{3}{4}$ tri-stock to fit on the bulkhead cutouts from F9 to F10. Sand the tri-stock flush with F9.

40. Repeat this procedure for tri-stock to fit from F10 to F11.

41. Fit a piece of tri-stock from F11 which will fit against but not overlap F12. The corner of the tri-stock should extend about $\frac{3}{8}$ " above the curve of F12.



42. Glue a $\frac{1}{8} \times \frac{1}{4}$ balsa stringer into the flat groove of the lower bulkheads from F1B to F17B. You will have to splice about $1\frac{1}{2}$ " to make the stringer long enough. This piece will fit against the crutch and is a sheeting anchor.

43. Fit $\frac{1}{8} \times \frac{1}{4}$ balsa stringers into the second and third slots in the bulkheads from F1B to F17B. You will have to splice about $1\frac{1}{2}$ " to make the stringer long enough.

44. Fit short sections of stringer into the remaining slots from F1B to F2B.

45. Cut and fit stringers into the remaining slots from F12B to F17B.

46. Slide F50 Ply Holddown Plate into the slots in the F28 Wing Saddle and epoxy in place.



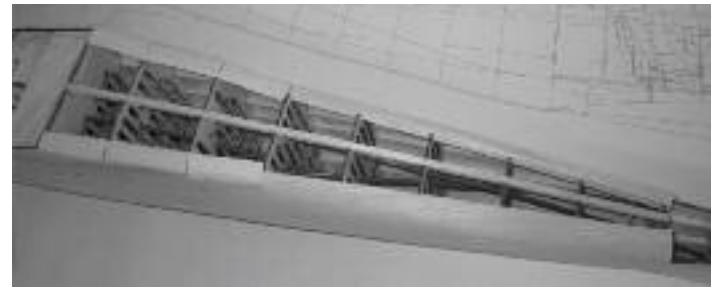
47. Cut a $\frac{1}{16} \times 4 \times 48$ balsa sheet to 39". Trim this sheet to fit against the upper fuselage sheeting between F1 and F17. The sheeting will lay flat against the side of the fuse from F1 to F12 and the tri-stock. At F12, cut the sheet so it can wrap around the curve of the bulkhead. You will have to wet the sheeting aft of F12 for it to wrap around the bulkheads. Sheet the aft portion of the fuselage only to the last row of stringers. Cut the sheeting flush with the stringer from F12 to F17.

48. Repeat the sheeting procedure for the opposite side of the fuselage.



47. Cut a $\frac{1}{16} \times 4 \times 48$ balsa sheet to 39". Trim this sheet to fit against the upper fuselage sheeting between F1 and F17. The sheeting will lay flat against the side of the fuse from F1 to F12 and the tri-stock. At F12, cut the sheet so it can wrap around the curve of the bulkhead. You will have to wet the sheeting aft of F12 for it to wrap around the bulkheads. Sheet the aft portion of the fuselage only to the last row of stringers. Cut the sheeting flush with the stringer from F12 to F17.

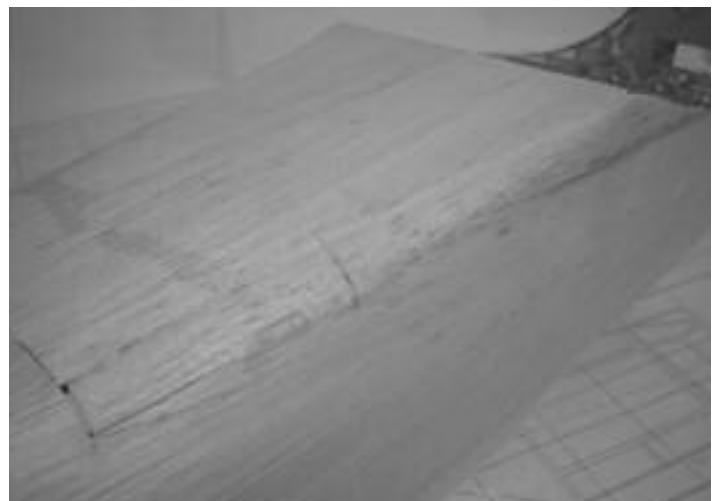
48. Repeat the sheeting procedure for the opposite side of the fuselage.



49. Glue an F37 Fuse Sheet to the lower fuselage from F9 to F12 and the $\frac{1}{4} \times \frac{1}{4}$ keel. Press the sheet to the bulkheads at the tri-stock area so the sheet "forms" into this juncture. Repeat for the F37 sheet on the opposite side.



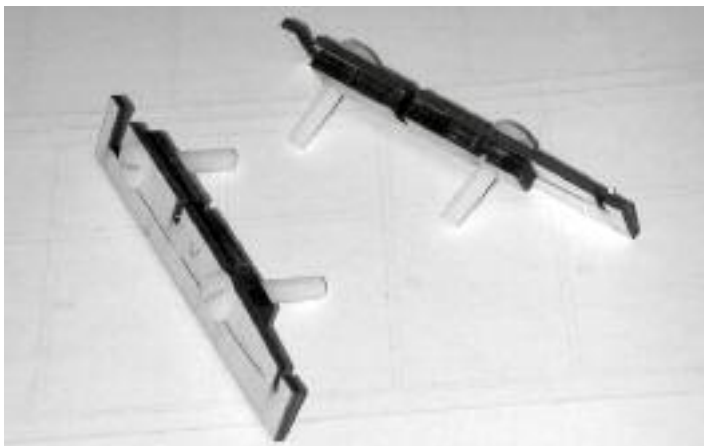
50. Test fit the F38 Fuse Sheet to the center aft fuselage. Trim as necessary and sheet the remaining portion of the aft fuse.



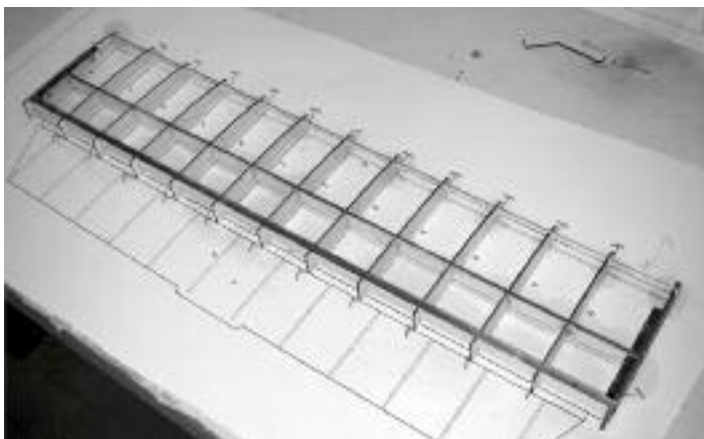
51. Sand the tri-stock and sheeting from F9 to F12 to blend the curve to F9. The sheeting at F9 will remain squared off. Try not to go overboard here and sand through the sheeting - most of the material removal will be from the tri-stock. Trim and sand the

- 52. Trim and sand the fuselage sheeting at the wing saddle.

Horizontal Stab Assembly

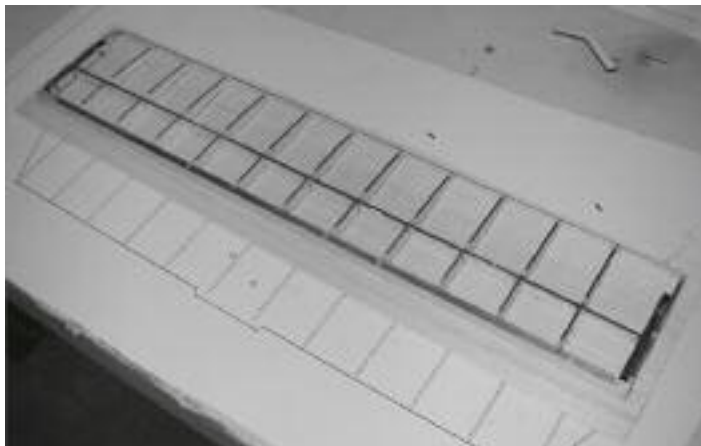


- 1. Prepare the S6 1/4" Ply Stab Holddown blocks by tapping the holes with a 1/4x20 tap (the holes have been pre-cut to .200", the proper size for the tap).
- 2. Epoxy S6 to S1 Ply rib. To align S6 properly, screw 1/4x20 bolts thru S1 into S6 while the epoxy dries.



- 4. Slide the S2 ribs into the slots in the S3 Ply Spar.
- 5. Lay the assembly onto the plans and slid the S1 assemblies onto the ends of S3. Pin this assembly to the board.
- 6. Slide S4 into the front slots in the S2 ribs. Slide S5 into the rear slots.

- 7. Prior to gluing insure the S1 ribs are square to the building board. Next check that the assembly is square by measuring from corner to corner.
- 8. Once everything is square, glue all parts. Note: do not glue the leading edge of S4 and the trailing edge of S5 because the front, rear and bottom of the S2 ribs will be broken off later.
- 9. Using your hobby knife, carefully remove the jig tabs in front of S4 and behind S5. It is only necessary to remove 1/8" or so of the tabs - they will prevent the sheeting from laying flush along the edges.



- 10. Cut a 1/16" x 4" x 48" into two 23" pieces. Cut a 1/16" x 3" x 36" to 23". Cut the 1/16" x 3" x 23" piece into two lengthwise pieces. Join the 4" and 1.5" piece to create the top sheeting. Do the same with the remaining pieces to create the bottom sheeting.

11. Sheet the top of the stabilizer.

12. Remove the assembly from the building board and turn upside down.



- 13. Carefully break off the jibs from the ribs. Trim the sheeting at the leading edge, trailing edge and tips. Lightly sand the ribs as necessary.

14. Add hinge reinforcing blocks as necessary

15. Sheet the top of the stab assembly.

16. Trim the sheeting at the leading edge, trailing edge and tips and sand as necessary.

17. Cut a piece of 1/4" x 3/8" x 36" to use as a leading edge. Glue to the leading edge of the stab. Sand ends flush with the ribs. Sand the leading edge to shape.

Fuselage/Wing Mounting



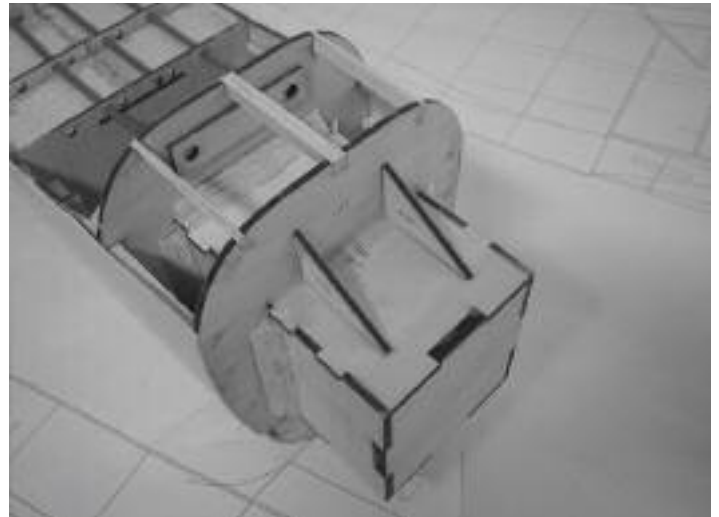
1. Attach the horizontal stab to the L and R fuselages using four 1/4 - 20 nylon bolts.
2. Test fit the wing to the fuselage saddles and trim the trailing edge of the wing as necessary to fit. (The wing trailing edge may be 1/16 to 1/8" too long - we design for this. It's better than being too short!).



3. With the H. stab attached, align the wing to both fuselages, both laterally and by squaring to the fuse. Mark the wing location and temporarily secure the wing to the fuselage (tape it, weight it down, or my personal favorite, just hold it in place and wonder later why the wing is crooked!).



4. Slide F34 Dowel Alignment Plates against F2B on both fuselages and epoxy in place.



5. The firewall assembly is designed to slide back and forth to adjust for your specific engine/mount combination. The firewall box also has 1 degree down thrust built in. Pieces for the left firewall box are marked with an L and pieces for the right are marked with an R. Build them in the following manner:

6. A few preparations will make building this assembly much easier. Test fit the side pieces and firewall to determine how everything goes together. The side pieces are notched differently and marked as to location so there is only one possible way to assemble them. The firewall will fit in any direction. Cut four pieces of 3/8 tri-stock to fit in the inside corners of the box, have several pieces of tape ready, and definitely use 15 or 30 minute epoxy to glue everything together (5 minute epoxy was tried, ended in a gooey mess!).

7. Do not glue the pieces separately, assemble all the pieces before the glue sets. Start by epoxying F29 Top and F30 Right Side to each other, and epoxying the firewall into the slots in F29 and F30. Add the tri-stock to F29 and F30. Next epoxy F31 Bottom to the assembly and add the tri-stock. Tape everything together as you go. Finally epoxy F32 Left Side in place, add the tri-stock and tape everything securely. Wipe away the excess epoxy.
8. Now to make sure everything is square. Slide the firewall assembly (just the very end, not the whole thing!) into the hole in F1 and leave it there to let the epoxy set.
9. When dry, remove the firewall and sand the edges and sides to remove any excess glue and to smooth the assembly.
10. Test fit the firewall and sand as necessary to allow the firewall to slide into place. You want a fit that is not sloppy, but does not require beating on the firewall to make it fit.
11. Assemble your engine and motor mount. Slide the firewall into the fuselage, set the engine/mount on the firewall and adjust the firewall until the distance from F1 to the prop flange is 8.75 inches (this allows for the depth of the cowl plus .100 to .125 inches for spinner to cowl clearance). Mark the firewall location and mark the firewall inside of F2 if any is protruding past F2. Remove the firewall and measure and mark all around the firewall sides corresponding to the mark you made. Cut and sand the firewall sides to match (shortening the firewall will make installing and accessing the fuel tank and servos easier).
12. Pre-cut six pieces of tri-stock to 3". Glue one of them to the forward inside edge of F2 (you can't access this area after sliding the firewall in) so that it will contact but not interfere with the firewall.
13. Again using 15 or 30 minute epoxy, add epoxy to the previously installed tri-stock, and slide the firewall in place. Re-measure and adjust the firewall as necessary. Now epoxy the firewall in place and add the tri-stock to the remaining corners around F2. Add epoxy to the firewall and the front of F1. Add the remaining tri-stock to the sides of the firewall. Epoxy two F33s to the top of the firewall/F1 and two F33s to the bottom.
14. Repeat for the other firewall box.



15. Double check the wing alignment to insure both fuselages are straight. Drill and tap the 1/4-20 wing bolt mounting holes on both fuselages.

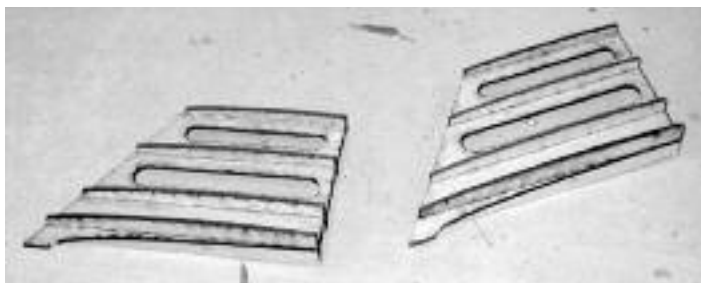
Note: Remember that the Holddown plate in the wing is about 1" forward of the trailing edge and is 1" wide. Measure this against the fuselage holddown plate to determine where the bolts will locate.



16. Remove fuse from wing. Finish sheeting the lower front of the fuse with 1/16" sheet. Trim and sand the sheeting.
17. Slide some wax paper between the wing leading edge and the fuselages. Attach the wing to both fuselages.
18. Test fit W28 to the wing leading edge at F2. Trim as necessary to achieve a fit so that W28 is 1/16" below the fuse sheeting. Glue W28 to the wing.
19. Glue the W29 Fillets together. Fit and glue to W28 and the wing.

Vertical Tail Assembly

Before beginning the following steps, it is best to unbolt the horizontal stab until the vertical tails are mounted in place. Note: you will need to loosen the fuselage/wing bolts in order to remove the stab.



1. Lay V1 on the board. Align V2 thru V5 with the engraved lines on V1 and glue in place.
2. Turn the Vertical Stab over and align another set of V2 thru V5 ribs with the ribs on the opposite side and glue in place.
3. Repeat steps 1 and 2 for the remaining vertical stab.
4. Align the V6 Vertical Spars so that the notch in the base faces opposite on each stab, making a left and right piece. Glue each V6 to its respective assembly.
5. Align and glue V7 to the stab leading edge and glue. Repeat for the other stab.
6. Lightly sand the surfaces if needed to remove any high spots.



8. Trim the edge of the sheeting to match the bottom of V1 and test fit the stab to the plane and sand as necessary for a good fit. Repeat for the other stab.

9. Epoxy the vertical stab assembly to the F42 stab saddle. Although not necessary, it's a good idea to bolt the horizontal stabilizer in place after the epoxy is dry and leave it in place until the epoxy is cured. This will reduce any stress points between the horizontal



10. Edge glue two pieces of 1/16" x 4" x 4" sheeting. Mark a line to follow the sheeting on the outside of the vertical stab area.

11. Trim the sheeting along this line and test for a good fit.

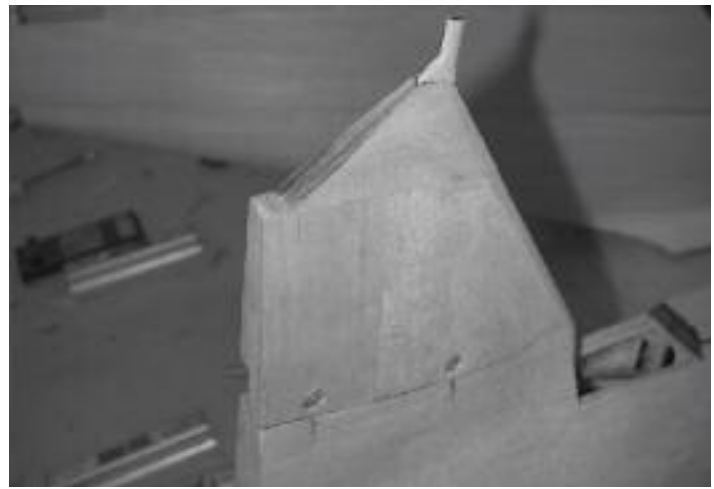
12. Mark the horizontal bolt locations so you will be able to find them after sheeting the remainder of the stab.

13. Hint: Once you get one sheet to fit properly, trace that sheet onto another sheet for the other stab sheeting.

14. Sheet the outside of each stab. Trim and sand the sheet at the leading edge, trailing edge and at V5. While sanding the trailing



15. Cut four pieces of 1/4" x 1/4" balsa to 4.5". Glue two of these side by side to the front of the stab against V7. Repeat for the other



16. Trim and sand the leading edge at V5 and F17. Disassemble the aircraft at this time.

17. Test fit the two V8s by sandwiching the V9 fin post into the engraved slots. Trim as necessary (different wood densities makes it impossible to engrave the pieces to a specific depth all the time - some may be a bit shallower). Glue the two V8s together but do not glue V9 yet. Repeat for the other stab.

18. Align the V8s to the fin top and glue in place. The V8s will align with the leading edge and there will be a "notch" at the trailing edge.

19. Fit the balsa fuse block to the notch in the fuse and glue in place. Trim and sand this block and finish contouring the upper fuselage (if you haven't already) to match the fuse contour and sand the leading edge.

20. Sand the V8s to match the stab camber.

21. Glue V9 into the Notch in the V8s.

Final Assembly



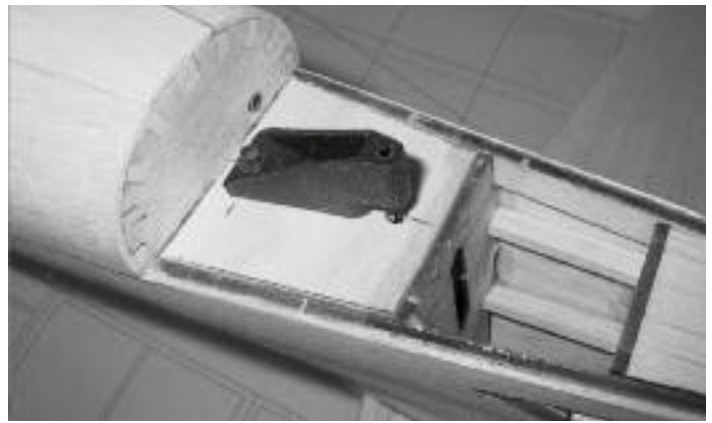
1. Tape a piece of wax paper to the wing so that it covers the wing/fuselage area. Mount the wing to the fuselage.
2. Create the wing fillet by first test fitting F39 to the fuse side. F39 has a straight side and a curved side. The curved side fits against the fuselage - trim this side to achieve a good fit. F39 should lay flat on the wing and the trailing edge should be even with the trailing edge of the wing. Glue F39 to the fuselage following the wing saddle contour.
3. Place F40 at a 45 degree angle to F39 even with the trailing edge and glue to the fuselage and F39.
4. Test fit F41 to the fuselage at the wing trailing edge trim as necessary for a good fit. Glue F41 to the fuselage and to F39.
5. Repeat Steps 1 thru 4 for the opposite side.



6. Remove the wing. Complete the wing saddles by filling the gaps with lightweight filler, then sanding the filler to a curved contour. As shown in the picture, F40 will not be completely covered with filler.

Repeat for other fuselage.

Hints and tips on fillers: Many materials may be used as fillers, such as hobby filler, lightweight spackle (this is what hobby filler is, just a different package), epoxy and micro-balloons, just to name a few. Hobby filler/spackle is usually water-based and will take forever to dry if applied too thick, plus it will shrink. If you use it, build up the fillet with 4 or 5 layers with light sanding in between. If you glass the fuse, be wary that the filler will absorb a lot of the resin. If you use resin/micro-balloons, here's a tip: Bondo is basically the same thing, just cheaper, but the consistency must be altered to make it lighter. Mix micro-balloons into the bondo before adding the hardener. Make it the consistency of a really thick paste, and you'll be surprised! It's very light and easy to sand.



7. Test fit F36 into the bay in the aft fuse behind F17B and trim as necessary to make it fit.
8. Locate and mark the position of your tailwheel bracket - the tailwheel wire should be about 1.8" from the front of F36. Locate and drill the mounting holes and install the mount.
9. Epoxy F36 to the aft fuse. It should fit in the bay even with the crutch.
10. Create a tailwheel pushrod and clevis. Attach a steering arm and insert the pushrod into the housing. Mount the tailwheel and



11. Two aft fuse blocks are provided - a left and right half. Test fit them to the fuse and hollow them out to clear the tailwheel and steering arm.

Hint: Only hollow the blocks out enough to clear the tailwheel mount before you glue them in place. The blocks will get very thin when you sand them, plus you'll be relieving the blocks to make the tailwheel cutout shape after shaping the outside of the blocks.

12. Remove the tailwheel (but not the mount). Glue the blocks to the aft fuse.



Cockpit Assembly - Left Fuselage

You will install the cockpit in the left fuselage only. On the full scale ME109Z, the right fuselage was used as a fuel tank so the cockpit was covered. Attach the enclosed ABS cover to the right fuselage in place of the cockpit and canopy. We use RC56 canopy glue to attach the cover before the plane is painted.

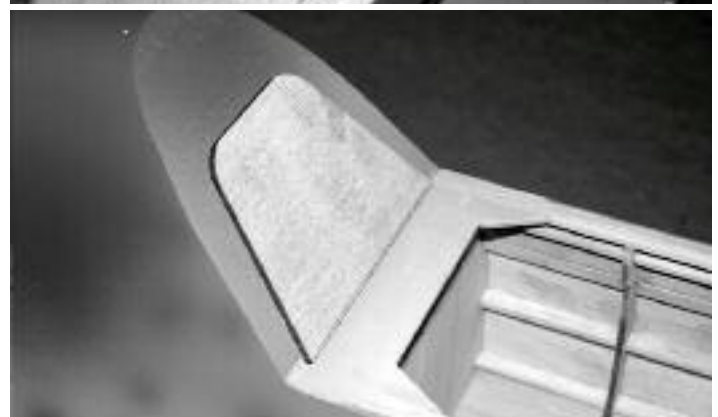
13. Trim and rough sand the blocks to the aft fuse shape. Follow the contour of the fin post and sand away part of the ply crutch to finish the shaping in this area. The fuse blocks will sand to a thin tip at the fin post.
14. Cut or grind out the area of the fuse blocks as shown to make the tailwheel cutout.
15. Use lightweight filler to fill any gaps and sand the area smooth.



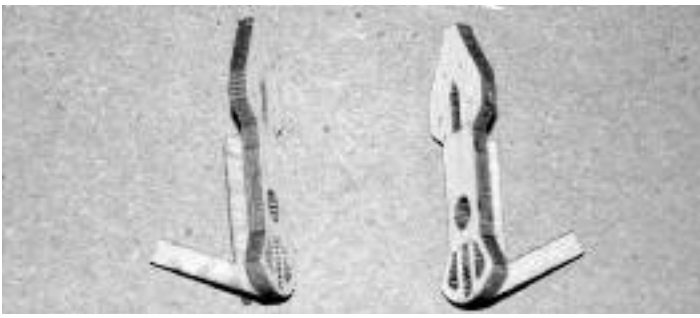
13. Mount your engine. We used Saito 1.00 on one of the prototypes. Inverted, the head will protrude from the bottom of the cowl about 2". This will also allow for adequate cooling.
14. Mount cowl using pieces of the included maple block. We used one block on the top of the firewall and 1 block on each side and bottom. Sand the blocks to match the contour of the firewall and add scrap balsa around the side of the fuselage so the cowl sits flush with the fuselage sides. You can tap the maple blocks so that nylon bolts can be treaded. We found that 6-32 nylon bolts have less tendency to vibrate loose than metal bolts.
15. Measure location for exhaust stacks. Glue stacks to cowl and fuse, cut to separate cowl.
16. Assemble and attach the plastic supercharger inlet to the left side of the fuselage as shown on the plans.
17. Cut and fit the rear half of the oil cooler to the bottom of the fuselage. This should match the front half molded with the cowl. Glue in place.
18. Repeat the above steps for the other fuselage.



1. Glue two C3s to the sides of C2. Glue C4 to the top of C2 - make a box. This is the cannon cover.
2. Glue this assembly to the cockpit floor and against the F4 bulkhead.



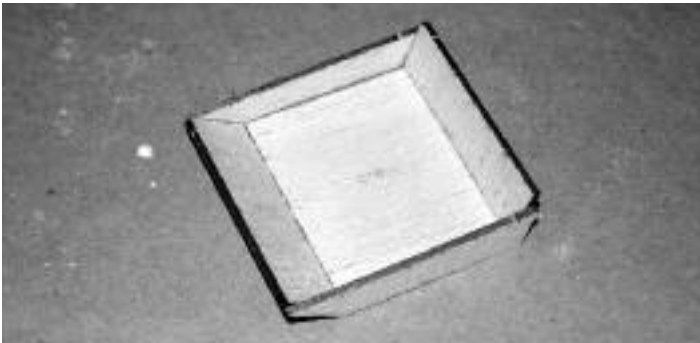
3. Glue C8 to the cockpit floor with the "circle" facing aft.
4. Glue the C30 radio access hatch to the angled rear deck.
5. Paint the cockpit now with RLM02 (gray-green) or light gray.



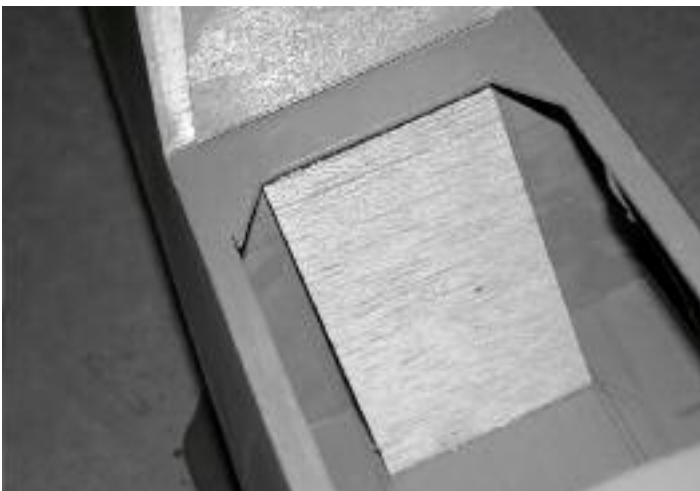
6. Glue the C6 rudder pedals to the C5 pedal braces. Paint these RLM66 or dark gray.

7. Glue the rudder pedals to the cockpit floor.

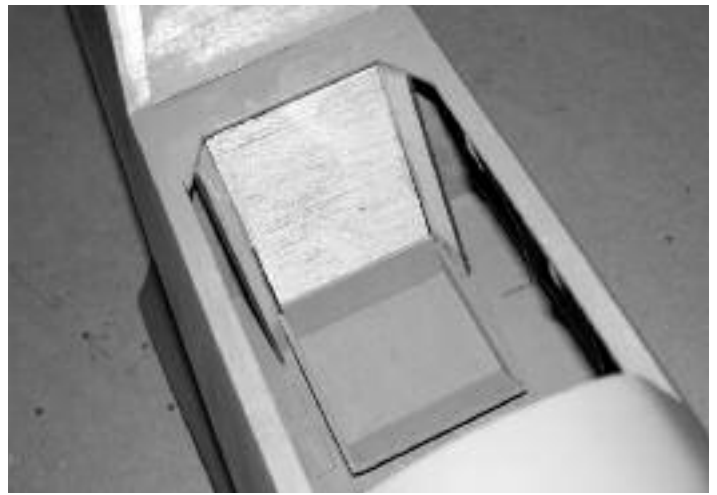
8. Paint the C7 rudder actuator silver. Glue C7 to the cockpit floor so



9. Assemble the seat by gluing the C15 sides to the C16 bottom. Glue C17 to the front of the seat (the shallow angle). Glue C18 to the Back. C18 will protrude above the seat pan. Paint the seat RLM02 or RLM66.

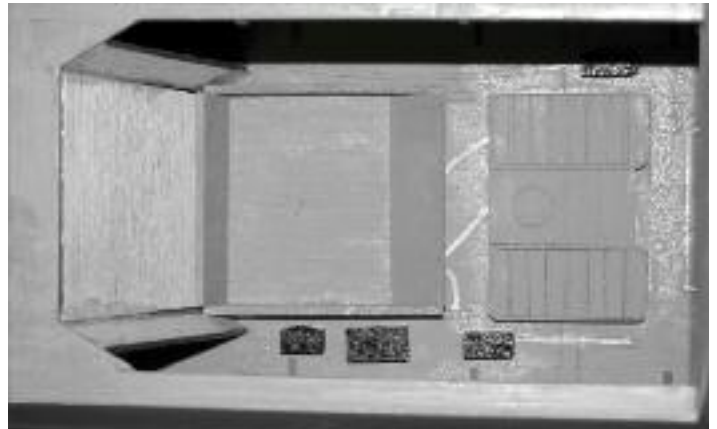


10. Glue the C13 seat back into the cockpit. It fits under the rear up and rests on the floor.



11. Glue the seat to the floor against the seat back.

12. Fit the C14 seat back sides to the seat back at an angle that matches the engraving on the floor. You may need to sand slightly for a good fit. Paint the seat back RLM02



13. Paint C9, C10, C11, and C12 black. Glue C9 to the left side of the cockpit floor. Glue C10, C11, C12 to the right side of the floor.



Step 15

Step 14



Step 15

14. Glue C35 to the center of one of the C21 trim wheels. Glue the remaining C21 Trim wheel to C35. Paint this assembly black. Glue this assembly to the left sidewall as shown in the photo.



15. Glue C20 to C19. Paint this assembly dark blue or black. Glue to the right sidewall.

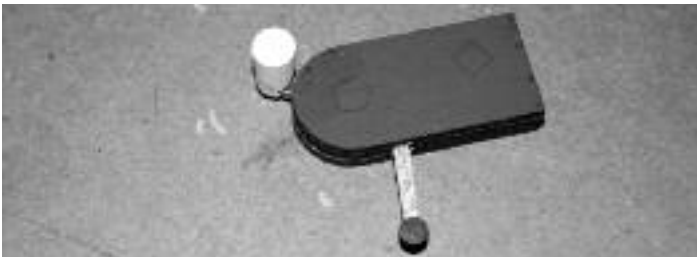


16. Paint the C22, C23 and C24 instrument panels RLM66 with black instrument bezels and white, silver and red details.

17. Assemble the instrument panel per the enclosed instructions.

18. Glue the C22 panel to bulkhead F6 on the right sidewall.

19. Glue the C24 panel to the C23 panel

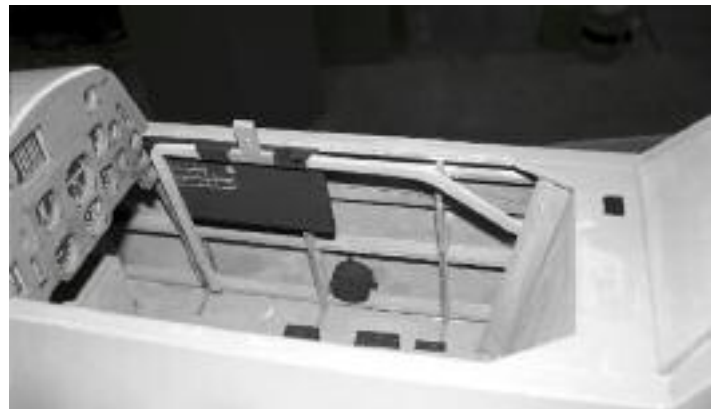


21. Glue C26 on top of C25. Glue C27 on top of C26 to make the throttle quadrant.

22. Cut a piece of 3/8" dowel to act as a throttle. Glue to C26.



24. Glue the throttle quadrant to the left sidewall against the F5 bulkhead under the instrument panel.



25. Paint the C29 circuit breaker panel black with silver details. Glue to the right sidewall.

26. Paint the C36 fuel tube yellow with black and silver details. Glue to the right sidewall against the circuit breaker panel.



27. Cut a 3" long piece of 1/4" dowel (or scrap plastic pushrod). Insert into the hole in C33 and Glue

28. Sand C33 to a taper so that it is cone-shaped.

29. Paint the control stick RLM66 with a black hand grip. Paint C34 tan or brown. Glue the stick onto the circle on C8.

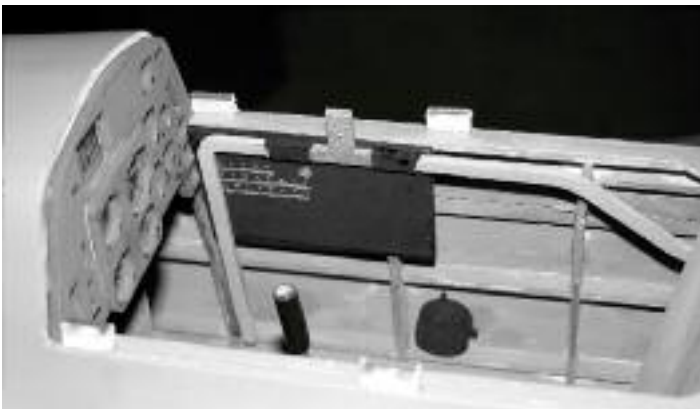


30. Glue C32 to the top edge of C31 at the angle shown on the plans. Paint this RLM66.

31. Paint C33 headrest black. Glue to C31 to complete the armor bulkhead.

32. Glue the armor bulkhead to the aft edge of the rear shelf at the angle shown on the plans.

33. Glue the plywood radio mast in place on the fuselage.



34. Trim, paint and attach the canopy.

Note: We used small blocks and wood screws to hold the canopy in place.



1. Hinge the rudders using your choice of hinges.

2. Connect the rudders and test fit the elevator in place. Deflect both rudders so both are fully deflected inboard towards the elevator.

3. Cut or sand the ends of the elevator as necessary so it will move at full deflection without contacting the rudders.

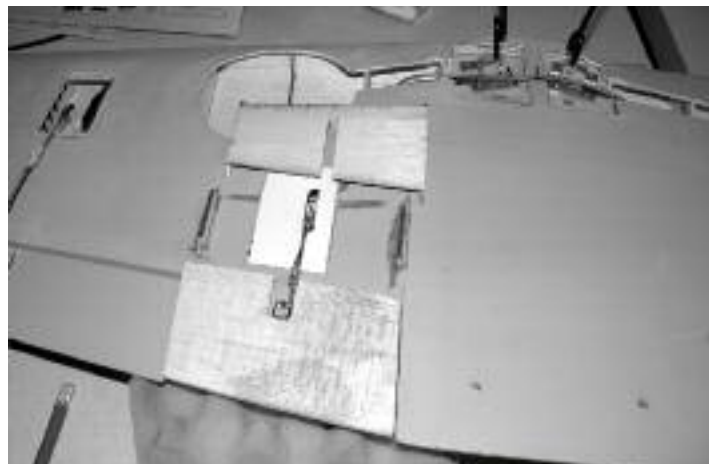
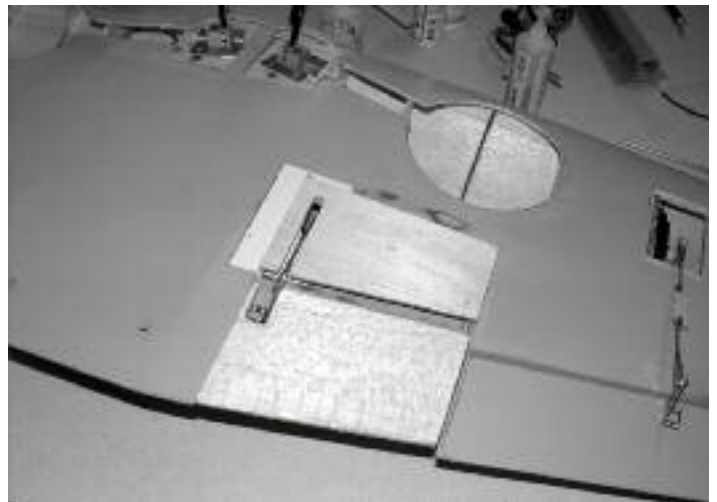
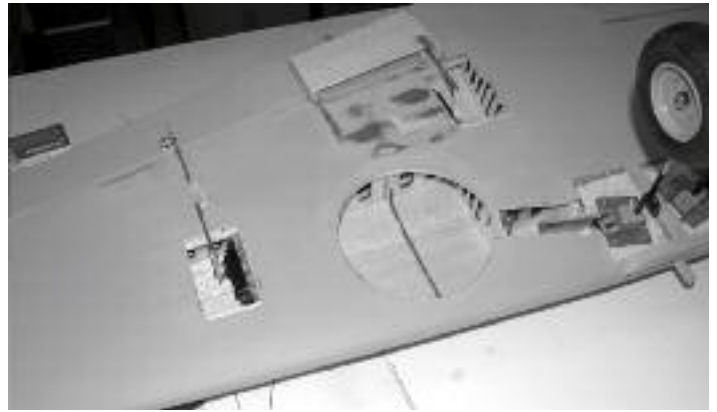
4. Hinge and test fit ailerons.

5. Bevel leading edge of all control surfaces so that you have enough deflection for proper flight.

6. Add scrap balsa to reinforce the control horn mounting areas on each control surface and sand flush with the ribs.

7. Hinge and test fit flaps.

8.. The control surfaces are now ready to be covered with the film or fabric of your choice. **DO NOT SHEET THE CONTROL SURFACES!!** (except the flaps)



Note: We made the radiators removable so that we could still have access to the flap servos. Plywood frames were mounted to the wing and the radiator pieces were attached to the frames with wood screws.

You can also hide the linkages as shown in the plans. The kit includes plastic for making servo hatches for the flaps and ailerons.

9. The radiator frame pieces are marked right and left. Start by sorting the left and right pieces. Starting with the left side, glue the W30L to the longer side edge of W33.

10. Glue W31L to the opposite side of W33.

11. Glue W32 between W30L and W31L at the scribed lines.

12. Cut the extensions from W30L and W31L at the angled scribed line. Save these pieces, they will be used for the rear half of the radiator.

13. Align the radiator assembly to the wing trailing edge at the flap spar. Glue in place.

Note: We recommend that you use epoxy when attaching the radiators to the wing.

14. Glue the previously cut arms to the edges of W34.

15. Bevel the rear edge of W34 to match the taper of the W30L and W31L arms.

16. Trial fit the radiator to the flap. Trim the forward portion as necessary to allow for full deflection of the flap.

17. Glue in place.

18. Repeat for the remaining radiator.



19. Locate the servo for the center flap and connect as shown.

This completes the airframe assembly. The items remaining, such as covering, painting, engine installation, radio component installation, and hooking up the control surfaces are builder's choice, and there are so many options that it would be impossible to cover them. The specifics of the aircraft pictured are as follows:

Retract installation:

I opted to not cut the wheel well openings until after painting the aircraft to avoid overspray in the wheel wells. The openings may be cut at any time, however. Mount and hook up the retracts and install the gear leg with the wheel installed. Manually retract the gear and mark the wheel location, and cut the well openings carefully. Remove the excess support ribs now and finish paint the wheel well. The tail wheel steering should be hooked up at this time.



Gear doors:

Pre-cut gear doors are provided and are laser-cut. They can be attached to the gear legs using brackets enclosed. Attach them to the gear door with thick CA as shown. Center the gear door over the cut-out in the wing and attach the bracket to the gear door.

Covering and painting:

This model was covered with .5 ounce per sq. Yard fiberglass cloth and fiberglass resin. I do recommend the fiberglass finish due to its increased strength - not structurally, but resistance to minor hangar rash. The finish paint was urethane primer, followed by the top coat. The Federal Standard colors are noted on the 3-views, but as a note, it is very difficult to match FS colors with commercially available R/C paints. I used Testors enamel paints, over the urethane primer, and after applying the decals, applied an overall urethane flat clear finish for fuel proofing.

You can also use .5 - .75 oz. fiberglass cloth with a water-base polyurethane as long as you prep the wood with a cellulose-base sanding sealer. Failure to properly seal the wood will result in warped sheeting. This method makes for a very lightweight finish with little sanding.

Radio installation:

Mount the servos and run the pushrods. Note that we recommend dual elevator servos, and provide mounting locations for them. Next, balance the airplane with everything but the receiver and battery installed. The balance point is biased slightly nose-heavy, so try not to go too much farther forward than the location shown. Determine the battery and receiver location based on the balance requirements, to lessen any extra weight, add any servo extensions needed, and mount the battery and receiver.

Flying:

None of the prototypes weighed over 14 pounds, though the weight range specified allows for more due to individual variations. Be sure to double check the gear alignment before flying the plane. We made the outboard gear a little longer than the inboard gear in order to make alignment easier. I do recommend using dual rates on the ailerons and elevators. Both pitch and roll modes get more sensitive at higher speeds. The ME109Z will perform all the usual maneuvers, with no bad characteristics. Flap usage presents no unusual handling characteristics. The flaps do not cause any large pitch changes when deployed, just a slight nose down moment that is easily controlled with elevator, or can be programmed in flap/elevator mixing. Don't get too slow with the flaps out, because at extremely slow speeds the ailerons require large inputs to maintain control. This characteristic was not present at higher speeds. Landing are very gentle with no tip stalls. For a smooth landing just cut the power and let the plane settle in. 3-point landings are no problem.