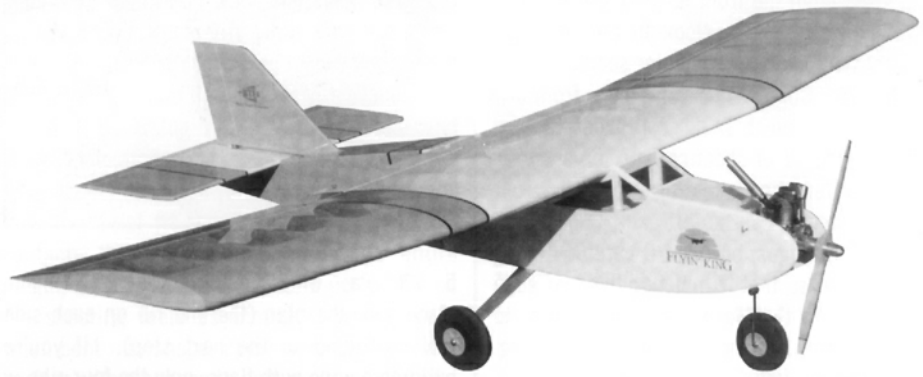
FLYIN' KING *INSTRUCTION BOOK*



INTRODUCTION

by Bruce Tharpe

DESIGN GOALS - Every airplane, whether it's full-scale or model, is designed for a purpose. At first glance the Flyin' King may appear to be a trainer, but in fact it was designed primarily to serve as a versatile utility aircraft. Knowing the aircraft's purpose may help you, as the builder, understand some of the reasons behind the design. To be a good load-hauler, this airplane was given a lot of wing area and big, effective flaps. The ailerons are extra large so they will remain effective even at very low airspeeds. A huge cabin provides the room to accept all types of payloads. The fin was kept short to help avoid the towline when used as a sailplane tug.

I fully realize that despite its ability to perform many tasks, most modelers will use their Flyin' King to relax and enjoy some easy sport flying. That's just fine by me! The ultimate goal of any BTE design is to provide the builder with a model that's both fun to build and fun to fly. Speaking of flying....

FLYING THE FLYIN' KING - Let's get right to the good stuff! Picture your newly completed Flyin' King taxiing out for its maiden flight. You advance the throttle, nudge a little right rudder, and it's off the ground. A few circles around the field to trim it out and you're ready to try some simple aerobatics. Loops, rolls, and stall turns all come pretty easy. Hmmm, she doesn't want to snap roll, but it spins okay. Hey, this thing does great tailslides! It's really pretty lively at full throttle; let's see what happens when we pull the left stick back about halfway. Now this is a little more graceful. There's something very majestic about a big model airplane doing lazy circles in the sky. It flies slower, but just as well, at 1/3 throttle. Do your first landing without flaps and you'll find it lands pretty much like a trainer. Go on up again, higher this time and play with the flaps. Yeah, it flies even slower! At this speed, it takes a lot more aileron control to turn. Start high for your first full-flap landing. Point the nose down and watch how steeply it descends without picking up any speed. Those flaps give you a ton of lift and a ton of drag as well. Flare it out, set it down, taxi back, raise the flaps, cut the engine, and prepare to be assaulted by your flying buddies who all want a turn!

ABOUT THE FLAPS - The Flyin' King may be built without flaps, but they are treated on the plans and in the instructions as standard equipment. Without the flaps, you'll save a little building time and a little weight, but you'll miss out on the additional fun that flaps can provide. Another thing that flaps provide to some degree on almost any design is known as "pitch trim change". When flaps are deployed on the Flyin' King, it wants to nose up drastically. You can literally do a loop using flaps alone! Fortunately, this is easy to trim out with the elevator using any computer radio or an aftermarket channel mixer. Simply set up your radio so when you lower the flaps, the elevator automatically compensates with a little "down" trim. This way, you can use your flaps without ever having to worry about a pitch trim change. Aren't electronics great?

LET US HEAR FROM YOU! If you have any questions or problems with your kit, please call us at 541-582-1708. We'd love to see a photo or two of you and your finished model. If you enjoy building and flying your BTE Flyin' King, be sure to spread the word. *THANKS!*

CHOOSING AN ENGINE - The recommended engine range for the Flyin' King is as follows:

.60 - .75 2-Stroke
.80 - .91 4-Stroke

Any engine in these ranges will work fine for relaxed sport flying. If you plan on hauling loads, pick an engine at the top end. Please use an effective muffler on all of your models. Many flying sites get shut down each year because a neighbor became annoyed at the noise. Don't let this happen to your club! Always use a propeller in the range specified by the engine manufacturer.

RADIO REQUIREMENTS - If you build your Flyin' King without flaps, all you will need is a simple four-channel radio and five standard servos. With flaps, you'll need at least a five-channel radio and six standard servos. A variety of servo lead extensions will come in handy for hooking up the ailerons and flaps. As discussed in "About the Flaps", you will also need some means to automatically couple the elevator to the flaps. Most computer radios can do this easily. If you don't have a computer radio, there are several companies that sell stand-alone channel mixers that simply plug-in between the servos and receiver. Be sure to use a radio system that transmits on a frequency approved for use in model aircraft.

GLUES - The Flyin' King can be assembled almost entirely using cyanoacrylate adhesives (abbreviated throughout the book as "CA"). Use thin CA on tight-fitting balsa or to tack glue an assembly. Use medium CA on lite-ply, or on joints that have a small gap. Thick CA (sometimes called "slow") is good for larger gaps or for applications where you need a few seconds to position the parts. When using thin or medium CA, the parts should already be in contact and positioned perfectly before application of the glue.

There are several places in the book where the use of epoxy, yellow glue (aliphatic resin), and flexible white glue are specified. Epoxy is generally used in high-stress areas like the firewall and wing center joint. Yellow glue is nice to use on joints that will require sanding. Flexible white glue is good for adhering to plastics, like the windshield and side windows.

Whatever glue you use, don't be stingy with it! The overall strength of every model airplane depends on properly bonded joints. Let's build!

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WING ASSEMBLY

Good flight performance starts with a straight, warp-free wing. A true building board that is not bowed or twisted is necessary for accurate construction. Pin the wing plan to your building board and protect it with a layer of waxed paper.

The Flyin' King wing is built in three sections - a flat center section and two outer panels. You need to decide now if you wish to build the wing with flaps. Without flaps, the wing will be a little lighter and a little easier to build; but with flaps, you will be able to unleash the design's entire potential and enjoy the Flyin' King's amazing low-speed performance.

A check-off box has been provided for every step in the manual to help you keep track of your work. If a step has two boxes, you must perform the step twice, once for the left side and again for the right.

BUILDING THE CENTER WING PANEL

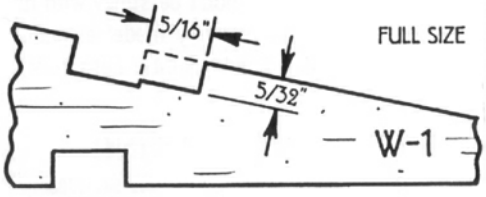
1. ❒ a. Nine sheets of 3/32" x 4" x 36" balsa are provided in the kit. Select the six sheets that are the easiest to bend for leading edge sheeting. (The three hardest sheets will be used for aileron and flap top sheeting). Now select four of these six leading edge sheets and cut them to a length of 23" (for the outer panels). The leftover 13" pieces will be used for center sheeting and wing joint sheeting.

❒ b. Drill two 1/4" diameter holes in each wing rib, one ahead of the main spars and one aft. The actual placement isn't critical; these holes will allow the transfer of hot air during covering (helps prevent "ballooning").

NOTE: If you are building the wing <u>with</u> flaps, do step 2. Otherwise, skip to step 3.

2. ❒ a. Prepare ten W-1 wing ribs by cutting each of them into two pieces. Cut the front piece to match the shape of the W-2 ribs, and cut the rear piece to match the W-3 ribs. You can do this by cutting each rib individually over the "Cross-Section at Flap" diagram on the wing plan, or you can use an existing W-2 rib and W-3 rib as cutting guides.

❒ b. The four remaining W-1 wing ribs need to be notched for the flap torque rod block as shown in this diagram:



❒ c. Pin the 3/32" x 1" x 36" balsa bottom trailing edge sheeting in place on the plan. Just align the front edge of the sheeting with the line on the plan (look for the callout on the right-hand side of the center section).

❒ d. Cut a 6-1/2" long piece from one of the three hardest 3/32" x 4" balsa sheets. This small piece of sheeting will serve as the bottom center wing sheeting aft of the rear spar. For now it can be left extra long on the left and right edges, but trim it carefully along the rear edge so that it matches the rear edge of the wing on the plans. Use yellow glue to attach this piece to the trailing edge sheeting, and pin it down flat.

❒ e. Use a pencil and a straightedge to draw the rib locations on the bottom center wing sheeting. Small marks are drawn on the plan to help align the straightedge.

NOTE: If you are building the wing <u>without</u> flaps, do step 3. Otherwise, skip to step 4.

3. ❒ a. Prepare two W-2 wing ribs by cutting them from two W-1 ribs provided in the kit. You can do this by cutting each rib individually over the "Cross-Section at Flap" diagram on the wing plan, or you can use an existing W-2 rib as a cutting guide.

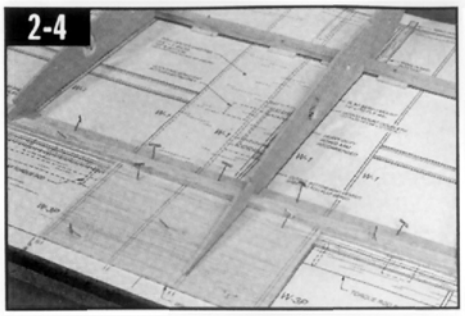
❒ b. Make the bottom trailing edge sheeting by gluing a piece of 3/32" x 1" x 36" balsa to a piece of 3/32" x 3" x 36" balsa (see the "Optional No-Flap Center Section" diagram on the wing plan. You may have to trim the edges of the sheets to make a good joint. Use yellow glue and allow to dry.

❒ c. Pin the bottom trailing edge sheeting to the plans, aligning the rear edge of the sheet with the rear edge of the wing plan. The exact position of the sheet's front edge is not critical.

❒ d. Use a pencil and straightedge to draw the rib positions on the bottom trailing edge sheeting. Small marks are provided on the plan to help align the straightedge.

4. ❒ a. The bottom main spar must be spaced up 3/32" from the building board. Cut eleven temporary spacers, each about an inch square, from a piece of 3/32" x 1" x 36" balsa, Position the spacers on the plan between the rib locations. Pin the 1/4" x 1/2" x 36" spruce bottom main wing spar over the plan, on top of the spacers. Place the pins carefully so they won't interfere with the ribs or shear webs which are to be added later.

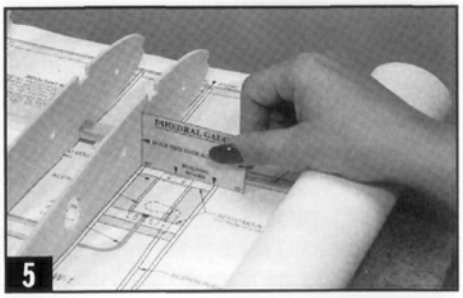
❒ b. Glue the 3/16" x 3/8" x 36" balsa bottom rear wing spar to the trailing edge sheeting. Use a few wing ribs as spacers to help position the rear spar accurately.



5. ❒ a. Glue the ten center W-1 ribs in place over the plan (the end rib on each side will be added in the next step). If you're building a wing with flaps, only the four ribs in the center are full-length.

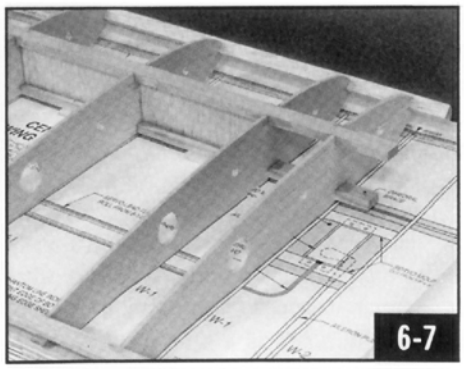
❒ b. Carefully cut the dihedral gauge from the printed "Tools 'N Stuff" sheet.

❒ c. Glue the last two W-1 ribs in place (one on each end) using the dihedral gauge to set them each at the proper angle.



6. ❒ Add nine 3/32" balsa shear webs between the ten center W-1 wing ribs. Be sure to center each web on the bottom main spar so when the top spar is added later, it will form a perfect I-beam. The shear webs are precision cut in height, but the length must be trimmed to fit snugly between the ribs. For maximum wing strength, the webs must be glued to the spar AND the ribs. Do not add webs to the last rib bay on each end, because that's where the dihedral braces will be positioned later.

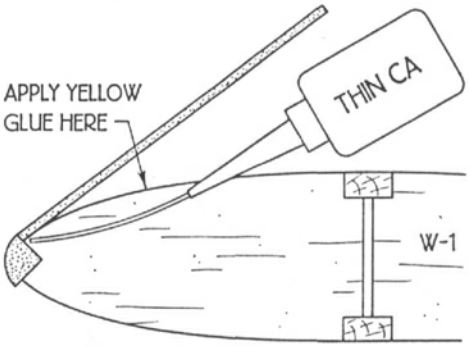
7. ❒ Glue the following items into place:
- 1/4" x 1/2" x 36" spruce top main wing spar.
- 3/16" x 3/8" x 36" balsa top rear wing spar.
- Pre-shaped 3/8" x 3/8" x 36" leading edge.



8. ❒ a. Remove any pins that are located under the area where the top sheeting will be installed. You don't want any surprises later on when you try to lift your wing from the building board! If necessary, re-pin the wing in unsheeted areas to hold it firmly in place.

❒ b. Using a long straightedge and sharp knife, trim one of the 36"-long leading edge sheets (selected in step **1a**) to a width of 3-3/4". Trial fit the sheet to make sure it contacts the leading edge along its entire length, sanding if neccesary for a perfect fit. If the sheeting feels as though it might crack when bent into shape, apply water to the outer surface with a sponge to help it curve naturally.

❒ c. Glue the leading edge sheeting in place using yellow glue or a combination of yellow glue and CA. If you use all yellow glue, you will have to pin and tape the sheeting to the leading edge and the spar. Or you can try the following "pin-free" procedure. First, apply yellow glue to the top edges of all of the ribs. Next, hold the sheeting firmly against the leading edge and glue them together using thin CA. The trick here is to apply the CA from the bottom, using a long applicator tube on the CA bottle. Spray the CA with accelerator to be certain it's dry. Finally, roll the sheeting onto the ribs and CA the rear edge to the spar. Starting at the center and work your way outboard gluing small sections at a time until the sheeting is completely glued in place.



9. ❒ The rear edge of the bottom center wing sheeting must be beveled in order to provide a solid gluing surface for the wing bolt plate. This "overlap" area, once glued, provides a lot of strength and toughness to the trailing edge. To do this step, temporarily pin a strip of wood to the building board parallel to the trailing edge, but leave a 3/32" gap. Now, apply masking tape to your sanding block as shown in the photo. The idea is to sand the sheeting with the exposed portion of sandpaper without sanding the ribs, using the strip of wood as a guide for your sanding block. (Note: for a non-flapped wing, you'll be sanding the full 36" length of the bottom trailing edge sheeting.) Continue sanding until the beveled area is flush with the top of the ribs.

10. ❒ a. Locate the 3/8" x 1-3/8" x 6" tapered balsa trailing edge filler, then cut it into three pieces to fit between the four center W-1 ribs at the trailing edge. Glue the filler pieces in place so that the top of the filler is even with the top edge of the ribs.

❒ b. Glue the 3/32" plywood wing bolt plate in place. Be sure to align the rear edge of the wing bolt plate with the trailing edge.

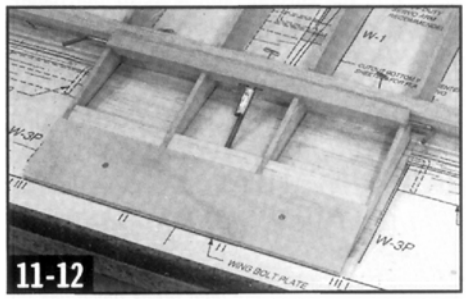
NOTE: If you are building the wing <u>with</u> flaps, do 11-12. Otherwise, skip to step 13.

11. ❒ a. Trim the 1/4" x 5/16" x 6-3/16" grooved basswood torque rod block to the exact length required for it to sit in the four notches with no overhang on either end.

❒ b. Assemble the flap torque rod as shown in the "Flap Torque Rod Assembly Diagram" on the wing plan. First, cut 3/4" from the threaded end off of **one** of the torque rods. Next, carefully glue the brass torque rod bearings into the basswood torque rod block. Finally, bind the torque rods together with 18" of copper wire (included in kit) and solder.

❒ c. Notch the basswood at the center to allow the torque rod to swing freely.

❒ d. Notice that the top of the torque rod block should extend 3/32" above the top surface of the rear spar, so that it will be even with the top trailing edge sheeting. Carefully glue the block to the rear spar and the ribs.



12. ❒ a. Glue the 3/32" x 1" x 36" balsa top trailing edge sheet in place. The back edge of the sheeting should be even with (or slightly overhanging) the back edge of the rear spar.

❒ b. Sheet the top section of the wing between the torque rod block and the wing bolt plate using 3/32" x 4" balsa.

NOTE: If you are building the wing <u>without</u> flaps, do step 13. Otherwise, skip to step 14.

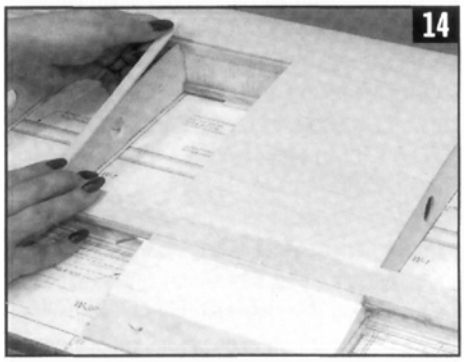
13. ❒ a. Glue two W-3P lite-ply aileron ribs in place as shown in the "Optional No-Flap Center Wing Panel Diagram" on the wing plans.

❒ b. The 3/32" x 4" x 36" balsa top trailing edge sheeting must be notched to fit snugly around the wing bolt plate. Once it fits, glue the sheeting in place. Slow CA or epoxy is recommended for the trailing edge joint.

14. ❒ a. Remove any pins that are located under the area where the top center sheeting and top wing joint sheeting will be installed.

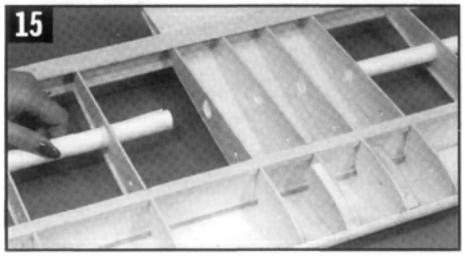
❒ b. Sheet the top wing center and wing joint areas with 3/32" x 4" balsa. Yellow glue is recommended for this step because it makes the joints easier to sand. Pin or tape the sheeting in place and allow it to dry.

❒ c. Add 3/32" x 3/8" balsa capstrips to the tops of the remaining W-1 ribs.



15. ❒ a. When dry, unpin the wing panel from the building board and glue the two 3/8" balsa wing dowel supports into place.

❒ b. Two sheets of 8-1/2" x 14" paper are provided to serve as servo lead tubes. Simply roll a sheet to form a tight 14" tube, slide the tube through the 3/4" rib holes, let the tube unwind against the edges of the holes, then glue it in place. Repeat for the other side.



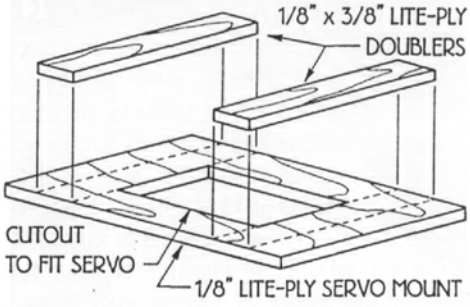
16. ❒ **This is Important!** Go back over every joint in the wing right now using medium CA glue, especially if you've been using thin CA to "tack" things together. When finished, you should be able to see a small build-up of glue on both sides of every joint. Remember that the strength of any wing is determined by the integrity of its glue joints.

17. ❒ a. Pin the wing upside down to the building board, keeping pins away from where sheeting will be added later. Support the elevated trailing edge with a scrap stick of balsa (a 3/8" x 3/4" stabilizer frame stick will work nicely for this step). Use plenty of pins here so there's no chance of the trailing edge lifting when you're pressing the leading edge sheeting in place later. Avoid twisting the wing panel! That could lead to a built-in warp.

❒ b. Trim the bottom leading edge sheeting to a width of 3-3/4" and glue it in place just as you did the top. Keep in mind that you won't be able to re-glue these joints, so use plenty of glue the first time.

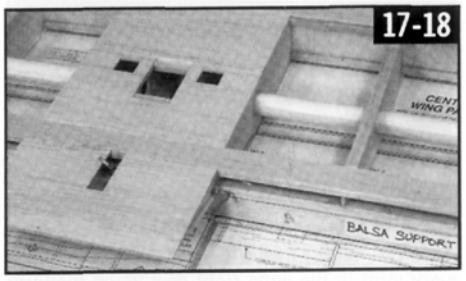
NOTE: If you are building the wing <u>with</u> flaps, do step 18. Otherwise, skip to step 19.

18. ❒ a. Construct a flap servo mount as shown in the diagram below, then glue it in place 3" aft of the main spar. The surface of the mount should be flush with the rib edges.



❒ b. A cutout must be made in the 3/32" x 4" balsa bottom wing center sheeting before it's glued in place. The cutout should be 5/16" longer at both the front and rear than the servo hole in the mount, to allow the servo to sit directly on the lite-ply mount. Glue the bottom wing center sheeting in place.

❒ c. Make a 1/2" x 1-1/2" cutout in the bottom trailing edge sheeting to clear the threaded end of the torque rod. Also, cut two servo lead exit holes as shown on the plans.



NOTE: If you are building the wing <u>without</u> flaps, do step 19. Otherwise, skip to step 20.

19. ❒ Add the bottom wing center sheeting, again using 3/32" balsa and yellow glue. Cut two servo lead exit holes as shown on the plan.

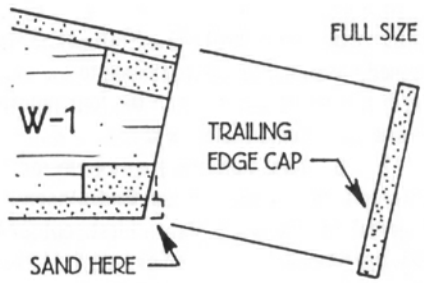
20. ❒ a. Glue only the aft part of the bottom wing joint sheeting (2 places). Leaving the area next to the main spar exposed will allow access to the dihedral brace when the panels are joined later.

❒ b. Add the bottom capstrips. When dry, remove the wing panel from the board.

NOTE: If you are building the wing <u>with</u> flaps, do step 21. Otherwise, skip to step 22.

21. ❒ a. Use a sanding block to sand the trailing edge of the wing in the flap areas. When done properly, you should primarily be sanding the bottom rear spar and sheeting, using the top rear spar and rib ends as guides. Stop sanding when you reach the rib ends.

❒ b. Locate two 3/32" x 1" x 36" balsa sheets and cut pieces from both of them that are just long enough to cap the trailing edge. Save the remaining pieces to cap the outer panels (be careful - there's not much extra here!). Glue the trailing edge caps in place.



22. ❒ Sand the entire center wing panel smooth. Our recommended procedure is to start with 80- or 100-grit sandpaper, focusing primarily on the glue joints and high spots. Follow up with 150-grit and 220-grit until all of the scratches from the coarser sandpaper are removed. Avoid excessive sanding on the leading edge sheeting, which could result in a "ripple" effect at each wing rib. Also trim and sand the leading edge, spars, and sheeting flush with the ribs at both ends of the panel. When sanding the ends, use 80-grit paper and a long sanding block for best results.

BUILDING THE LEFT & RIGHT OUTER WING PANELS

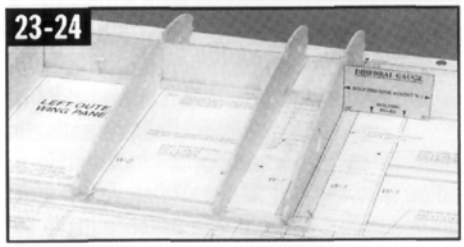
The outer wing panels are built pretty much like the center wing panel, so much of the detail has been left out of this portion of the instructions.

23. ❒ Select four 3/16" x 3/8" x 36" balsa sticks and cut a 23" piece from each of them to be used as rear wing spars. The leftover pieces should be saved for use in the stabilizer.

24. ❒❒ a. Pin the 1/4" x 1/2" x 24" balsa bottom main wing spar in place over the plans (no spacers). Use a few wing ribs to accurately position the 3/16" x 3/8" x 22" balsa bottom rear wing spar, and pin the spar in place.

❒❒ b. Glue the six W-2 ribs in place, then glue a W-1 rib at the inboard end using the dihedral gauge to set it at the proper angle.

❒❒ c. Install five shear webs between the W-2 ribs. Again, the inboard rib bay is left open for the dihedral brace to be added later.



25. ❒❒ Glue these items on top of the panel:
- 1/4" x 1/2" x 24" balsa top main wing spar.
- 3/16" x 3/8" x 23" balsa top rear wing spar.
- Pre-shaped 3/8" x 3/8" x 24" leading edge.
- 3/32" x 3-3/4" x 23" balsa L.E. sheeting.
- 3/32" x 1" x 23" balsa trailing edge sheeting.
- 3/32" x 4" balsa wing joint sheeting.
- 3/32" x 3/8" balsa capstrips.

26. ❒❒ a. When dry, remove the outer wing panel from the building board and go over all the glue joints again with medium CA.

❒❒ b. Pin the wing panel upside down on the building board, making sure the trailing edge is supported and the panel is not twisted.

❒❒ c. Glue these items on the bottom:
- 3/32" x 3-3/4" x 23" balsa L.E. sheeting.
- 3/32" x 1" x 23" balsa trailing edge sheeting.
- 3/32" x 4" balsa wing joint sheeting *(rear portion only! The front will be added later).*
- 3/32" x 3/8" balsa capstrips.

27. ❒❒ a. When dry, remove the wing panel and use a long sanding block (a 22" sanding bar is ideal) to sand the trailing edge. When done properly, you should primarily be sanding the bottom rear spar and sheeting, using the top rear spar and rib ends as guides. Stop sanding when you reach the rib ends.

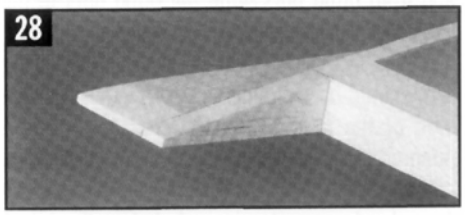
❒❒ b. Glue the 3/32" x 1" trailing edge cap (leftover from step 21) in place.

28. ❒❒ a. Sand the entire outer wing panel smooth. Also trim and sand the leading edge, spars, and sheeting flush with the ribs at both ends of the panel.

❒❒ b. Glue the front end of the 3/8" balsa wingtip support to the trailing edge cap. The outer edge of the wingtip support should be even with the outer edge of the wing panel.

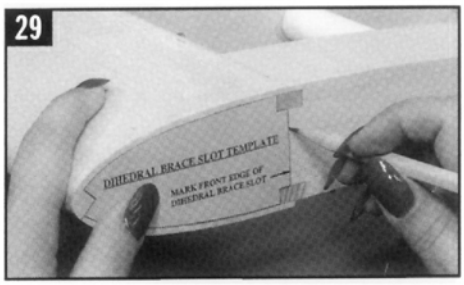
☐☐ c. Glue the 5/16" balsa wingtip to the outer wing panel. The wingtip should be centered on the leading edge at the front and also centered on the point of the wingtip support at the rear.

☐☐ d. When dry, sand the wingtip and the wingtip support to match the upper and lower contour of the airfoil.



JOINING THE WING PANELS

29. ☐ Cut the Dihedral Brace Slot Template out of the printed "Tools 'N Stuff" sheet. Use this template to draw the front edge of the slot, then draw another line 3/32" behind the first line to represent the rear edge of the slot. Do this in four places (each end of the center wing panel and the inboard end of each outer panel).

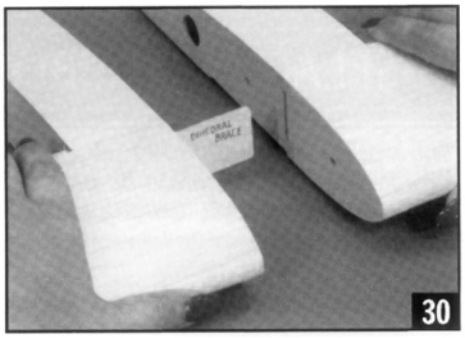


30. ☐☐ a. Carefully cut the dihedral brace slots with a sharp knife. Be sure to remove any glue build-up at the top & bottom of each slot.

☐☐ b. Trial fit the dihedral brace with two wing panels to make sure it fits between the spars and allows the panels to make solid contact. The proper dihedral angle of 4° per panel will be automatically set by the dihedral braces. Your main goal is to create a solid wood-to-wood joint with no gaps. Trim or sand the dihedral brace or wing panel ends if necessary for a proper fit. (Please refer to the "Dihedral Diagram" on the wing plan.)

☐☐ c. Apply epoxy to both end ribs and to the edges of the dihedral brace, then slide them all together. Use slow-drying epoxy if you want plenty of time to work, or 5-minute epoxy if you're feeling brave. Tape or pin the wing panels together, making certain that the leading and trailing edges are aligned, and allow to dry.

☐☐ d. Double check through the bottom of the wing that the dihedral brace is firmly glued to the ribs and spars. If necessary, apply some more epoxy to any dry spots.



31. ☐☐ a. Construct an aileron servo mount exactly as shown in step 18a.

☐☐ b. Glue the servo mount assembly into place. The surface of the mount should be flush with the bottom edges of the ribs, and its front should be glued to the balsa main spar.

☐☐ c. Cut the final piece of wing joint sheeting for the outer panel from 3/32" x 4" balsa. Once this sheet has been trimmed to fit, cut a servo hole that's the same width as the hole in the mount. The length of the hole in the sheeting (from front to rear) should be 5/16" longer at each end than the hole in the mount, allowing the servo to sit directly on the lite-ply.

32. ☐☐ a. Add the final piece of 3/32" balsa wing joint sheeting to the center panel. When dry, sand the bottom sheeting smooth.

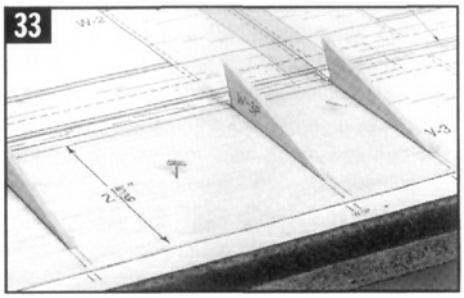
☐☐ b. Wrap the wing joint from the trailing edge, all the way around the leading edge and back using a 28"-long piece of 1"-wide fiberglass tape. The easiest way to do this is to mist one side of the fiberglass tape with a spray adhesive (such as 3M "77"), stick the tape in place on the wing, and saturate it with thin CA (watch out for fumes!). Epoxy can also be used for this step. When dry, trim off the loose ends of the fiberglass tape at the trailing edge.

BUILDING THE AILERONS

33. ☐☐ a. Locate two 3/32" x 3" x 36" balsa sheets and cut them to a length of 22" to serve as the aileron bottom sheeting. The leftover 14" pieces will be used either for flap bottom sheeting or in the fuselage.

☐☐ b. Pin the bottom sheeting to the aileron plan so that the rear edge of the sheet is aligned with the wing trailing edge line. Now draw a straight line on the sheeting that's exactly 2-15/16" from the trailing edge. Also draw all of the rib locations using the small marks on the plan as guides.

☐☐ c. Glue eight 3/32" balsa W-3 aileron ribs and one 1/8" lite-ply W-3P aileron rib onto the sheeting. Align the bottom front corner of each rib with the long straight line.

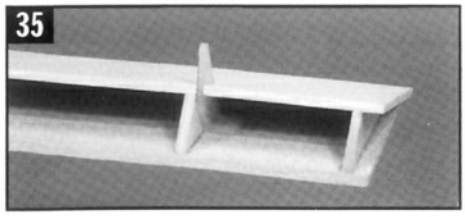


34. ☐☐ a. Bevel the trailing edge of the bottom sheeting as described in step 9.

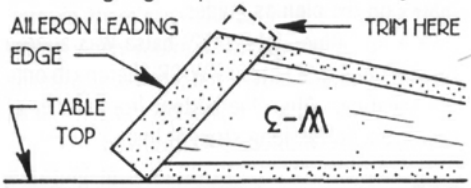
☐☐ b. Before sheeting the top of the aileron, remove all the pins except for a few at the front edge of the bottom sheeting. Now you can sheet the top of the aileron with a 3/32" x 4" x 22" piece of balsa cut from the remaining stock. Slow CA or epoxy is recommended for the joint where the sheets come together because it will result in a hard, strong trailing edge. Pin through both top and bottom sheets at the trailing edge and allow to dry.

35. ☐☐ a. Unpin the aileron, flip it upside down, and let the front edge hang out over the edge of the table. Sand away the excess top and bottom sheeting at the front using a long sanding block. (You can trim the excess with a knife first, just be careful not to trim too much!) Stop sanding when you get to the front edge of the W-3 ribs.

☐☐ b. Cut a small slot next to the W-3P rib for the nylon aileron control horn. Refer to the "Cross-Section at Aileron Servo" diagram on the wing plans for the proper position of the control horn. Placing the horn aft of the hinge line results in aileron differential (more "up" than "down") which smoothes roll response. Discard the small mounting plate, then use lots of epoxy to glue the horn in place; it should be totally coated with glue inside the aileron.



36. ❒❒ Pin the aileron upside down leaving the front clear of pins. Cut a 1/4" x 1" x 22" balsa aileron leading edge from a 36" stick (save the scrap for the flaps). Apply glue to the edges of the aileron sheeting and ribs, then pin the leading edge in place and allow to dry.



37. ❒❒ When dry, carve and sand the excess leading edge material being careful not to damage the control horn. Also trim off all of the excess material at each end of the aileron.

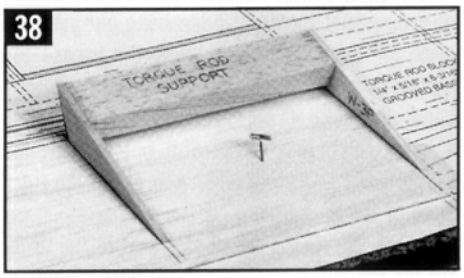
BUILDING THE FLAPS

The flaps are built just like the ailerons, so only simple instruction are given here. Obviously, if you are building the wing without flaps, you can skip this section and go on to the fuselage.

38. ❒❒ a. Pin the bottom flap sheeting to the plan, aligning its rear edge with the trailing edge line. Draw a line on the sheeting 2-15/16" from the trailing edge. Draw the rib lines.

❒❒ b. Glue five balsa W-3 ribs and one lite-ply W-3P rib in their proper positions.

❒❒ c. Glue a 3/8" x 3/4" x 3-3/4" balsa torque rod support between the W-3P and W-3 ribs. The top of the support should be even with the top of the ribs and the front should be even with the top front corner of the ribs.



39. ❒❒ a. Bevel the trailing edge of the bottom sheeting, then glue the 3/32" x 4" x 14" balsa top flap sheeting in place.

❒❒ b. Unpin the flap, then sand the sheeting and torque rod support at the front of the flap until they are flush with the front edge of the W-3 ribs.

❒❒ c. Pin the flap upside-down, then glue on the 1/4" x 1" x 14" balsa flap leading edge (leftover from step 36). When dry, unpin the flap and give it a final sanding.

❒❒ d. Accurately mark the proper location of the flap torque rod on the flap leading edge. Drill and slot the flap to accept the flap torque rod wire.

FUSELAGE ASSEMBLY

Several parts that are used in the fuselage require some preparation before assembly. It's best to have your engine, engine mount, fuel tank, and radio system on hand for some of the following steps.

PREPARING THE FUSELAGE PARTS FOR ASSEMBLY

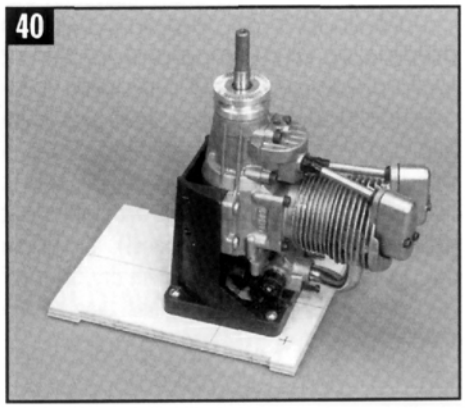
40. ❒ a. Using the "Cross-Section at F-1" drawing on the fuselage plan, draw the center line and thrust line on the front of the 1/4" plywood firewall, F-1. Be sure the pre-beveled bottom edge of F-1 is facing up for this step.

❒ b. Place your engine mount (not included in the kit) on F-1, and align it on the lines you just drew. While holding the engine mount in place, mark the locations of the four mounting holes. Remove the mount, then drill at each mark with a 3/16" drill bit.

❒ c. Hammer four 6-32 blind nuts into the back of F-1 at the mounting holes. Bolt the engine mount onto F-1 using four 6-32 x 3/4" machine screws. Tighten all four screws, then apply medium CA around the edges of the blind nuts. Avoid getting glue in the threads!

❒ d. Place your engine on the mount and mark the location of the engine mounting holes. Drill (and tap, if necessary) for your engine mounting bolts (these are also not in the kit but they usually come with the mount).

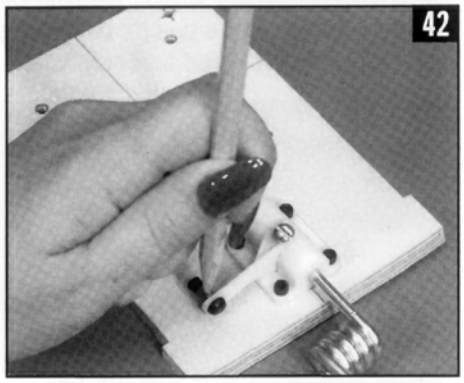
❒ e. Temporarily bolt the engine to its mount, then mark where the throttle pushrod should pass through F-1. Remove the engine and mount, then drill at the mark with a 9/64" diameter drill bit.



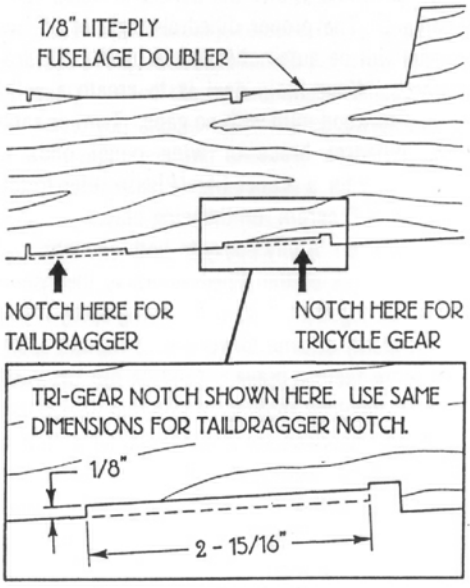
41. ❒ While holding the aluminum main landing gear in place (centered side-to-side, front edges even) on the 1/4" plywood landing gear mount, mark the location of the four mounting holes. Remove the gear, drill 3/16" holes at the marks, then hammer and glue four 6-32 blind nuts in the top of the mount.

42. ❒ a. If you're building the tricycle gear version, install the nylon nose wheel bearing in the position shown on the plans (you may want to do this step even if you are building the model as a taildragger, just in case you decide to change over to tricycle gear in the future). Drill four 5/32" dia. holes, bolt the bearing in place with four 4-40 x 1/2" socket-head bolts and 4-40 blind nuts, glue the blind nuts to the back of F-1, then remove the bearing.

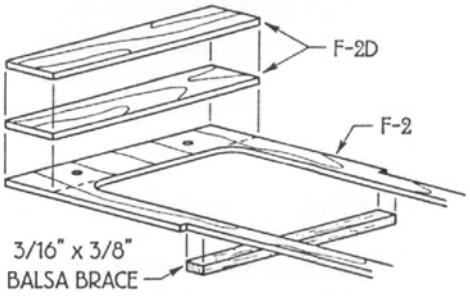
❒ b. The nylon nose wheel steering arm should be installed so that it extends to the side of the model opposite from the throttle pushrod (look ahead to the section on "Servos and Pushrods", page 9, for more information.) A pushrod connector is included in the kit to connect the flexible cable nosewheel pushrod to the nylon steering arm. Snap the pushrod connector onto the outer hole of the steering arm, then slide the arm and nose wheel strut onto the bearing. Mark F-1 through the hole in the connector, remove all of the nose wheel parts, and drill a 9/64" hole at the mark.



43. ❒ Use a sharp knife to notch the lite-ply fuselage doublers for the landing gear mount. The location of the notch depends on whether you are building a tri-gear or taildragger model. Use this diagram for proper notch placement.



44. ❒ Glue two F-2D doublers onto former F-2 as shown in this diagram. When dry, drill through all three layers at the two pilot holes in F-2 using a 1/4" drill bit. Also, glue a temporary 3/16" x 3/8" balsa brace to F-2 to help stiffen the former during assembly.

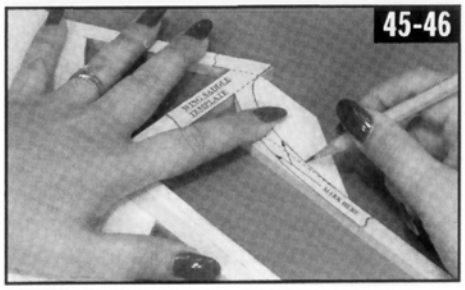


BASIC FUSELAGE ASSEMBLY

45. ❒❒ Build a fuselage side using the five precision-cut 5/16" balsa side pieces (SIDE-1 through SIDE-5) and 5/16" square balsa sticks. Refer to the "Fuselage Frame Assembly Diagram" at the bottom of the fuselage plans for a suggested assembly sequence. Carefully select the hardest balsa sticks for the longerons (top and bottom of the frame). Take your time and try to make precise wood joints.

46. ❒❒ a. When dry, sand both sides of the frame smooth. Trim the top and bottom sticks at the rear of the frame, and trim the stick at the rear of the wing saddle.

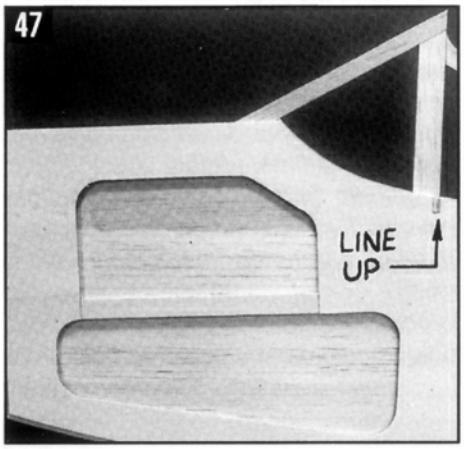
❒❒ b. Cut the Wing Saddle Template from the "Tools 'N Stuff" sheet, and use it to mark the front contour of the wing saddle on each fuselage side. Carefully carve and sand the wing saddle using your marks as a guide. When finished, harden the remaining portion of SIDE-5 by soaking it with thin CA.



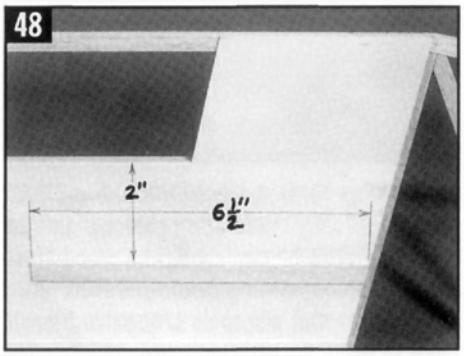
47. ❒ a. Due to the possible stretching of the plan during the reproduction process, the 1/8" lite-ply fuselage doubler may not line up perfectly all the way around with the balsa side. When gluing the doubler in place, it's most important to line up the rear edge of the F-2 notch with the back edge of SIDE-4. Use slow CA or epoxy to glue a doubler to each fuselage side. Avoid the classic mistake of making two left sides or two rights! You need one of each.

❒ b. There are two sticks on each frame that should now be sanded to match the contour of the fuselage doubler. One is at the front end and the other is in the window area.

❒ c. Cut a fuel tank rail support from a 1/8" x 3/8" x 12" lite-ply strip and glue it to the side as shown in the photo.

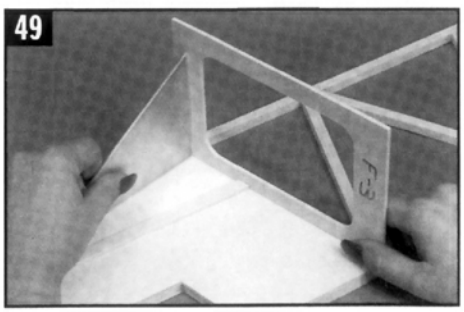


48. ❒ Cut another piece of 1/8" x 3/8" lite-ply to serve as a servo rail support and glue it to the doubler as shown in this photo.



49. ❒ a. Spot glue F-2 (with F-2Ds facing forward) and F-3 to one of the fuselage sides using a square to make sure they are at 90°. The top of F-3 should be even with the top of the fuselage frame (F-3 is symmetrical top to bottom - it can't be glued in upside down).

❒ b. Spot glue the other side to the formers, making certain that the sides are aligned with each other. Verify this by setting the assembly over the top view on the plans; the bottom edge of each frame should sit squarely on the building board. When satisfied, firmly glue F-2 and F-3 to the sides.

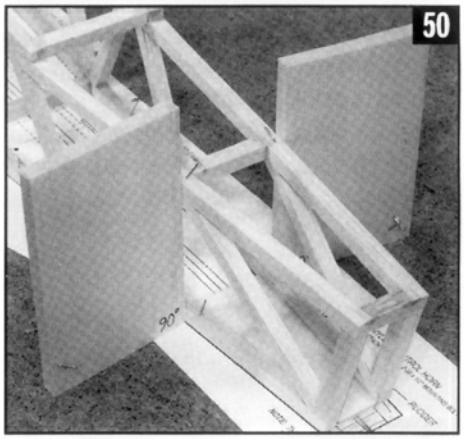


50. ❒ a. Five equal-length crossbraces are located in the cabin area. Three of them have locating notches in the doublers, one is at the wing saddle center, and one is just behind F-3 at the top. Cut five 5/16" sq. x 4-3/8" balsa crossbraces and firmly glue them in place. The cabin area is now a fairly strong, square box.

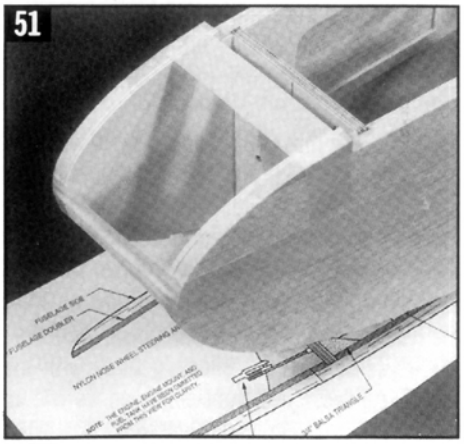
❒ b. Pin the fuselage assembly over the fuselage top view on the plan. Pin only the area between F-2 and F-3, leaving the sides aft of F-3 free to move.

❒ c. Pull the fuselage sides together at the rear and glue them to the 1/8" lite-ply tailwheel mount. The tailwheel mount is used whether or not you plan on actually installing a tailwheel. Make sure the tailwheel mount is centered on the top view centerline and use temporary braces to keep the sides vertical.

❒ d. Add the remaining 5/16" sq. balsa crossbraces to the aft fuselage (5 on top, 4 on bottom). When dry, unpin the fuselage from the building board and reglue all of the fuselage joints with medium CA.

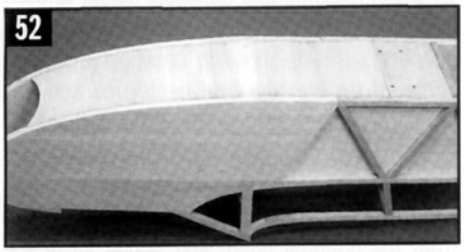


51. ❒ Epoxy F-1 in place. To help pull the sides together at the front, run a piece of tape from one "cheek" to the other. Before the glue dries, hold the fuselage over the top view on the plans to be sure there's equal curvature on both sides when viewed from above. Also check your fuselage from the front for any unwanted twisting.



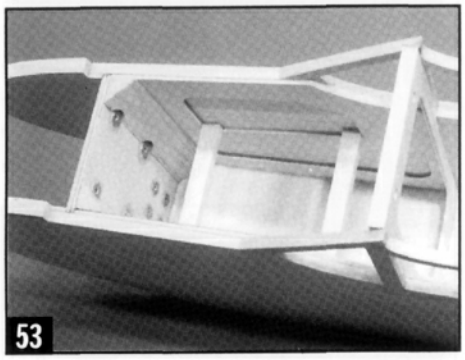
52. ❒ a. Epoxy the landing gear mount in place. Be careful here! The holes for the landing gear must be towards the front of the model whether it's tricycle gear or taildragger.

❒ b. The 1/8" lite-ply fuselage bottom is installed in one piece if you are building a tricycle gear model. (If it's a taildragger, the fuselage bottom must be cut into two pieces before installation. Cut the rear portion to fit snugly between the landing gear mount and the crossbrace; the front portion should now fit in front of the landing gear mount.) Glue the fuselage bottom in place using medium CA.



53. ❒ a. Cut braces for the landing gear mount and F-1 from 3/4" balsa triangle stock. Notch the braces to clear any blind nuts, then glue them firmly in place. Redrill the throttle cable and nosewheel steering holes.

❒ b. Cut two fuel tank supports from 5/16" x 1/2" balsa and glue them in position.



54. ❒ This is a good time to position the fuel tank. A 16 oz. tank will require some foam rubber padding to raise it as high as possible in the fuselage. For longer flights, use up to a 24 oz. tank. With the tank positioned, mark F-1 where the fuel lines will come through. Drill at the marks with a drill bit that's the same diameter as the fuel line you intend to use.

55. ❒ The model's nose is sheeted with two pieces of 5/16" x 3" x 5" balsa installed cross-grain. Start with the rear piece which must be carefully notched at the corners to fit between the windshield frame uprights. When satisfied with the fit, glue the rear piece in place. Trim the front sheet to fit, glue it in place, then sand the edges of the nose sheeting flush with the fuselage sides. The front edge can be left as is or neatly trimmed (see photo 63).

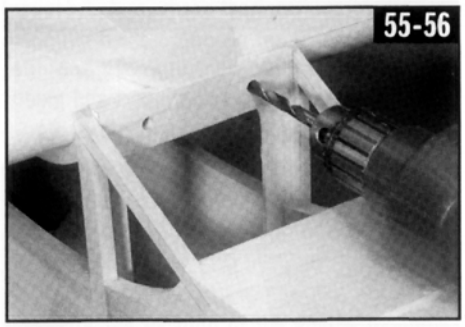
MOUNTING THE WING TO THE FUSELAGE

NOTE: The wing must be finished through step 30 before proceeding.

56. ❒ a. Trial fit the wing to the fuselage. It should sit flat on the wing saddle sticks, but you may have to trim the SIDE-5 wing saddle piece slightly for a perfect fit. Align the wing carefully, making sure it's centered and square to the fuselage when viewed from above, then tape and pin it firmly in place.

❒ b. Drill two wing dowel holes thru the wing leading edge and the wing dowel supports using the holes in F-2 as a guide.

❒ c. Remove the wing, then epoxy the two 1/4" x 3" birch wing dowels into their holes, leaving them extended in front of the leading edge about 3/8". Use plenty of glue!

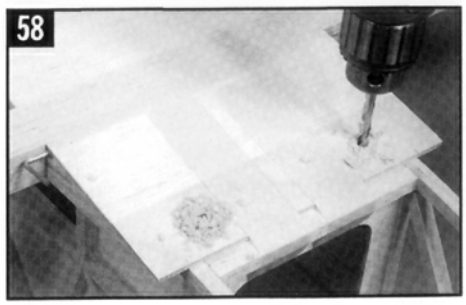


57. ❒ a. Glue the two 3/4" sq. x 1-1/2" basswood wing hold-down blocks in the fuselage. The blocks should be glued flush with the top of the wing saddle and F-3.

❒ b. Cut pieces of 3/4" balsa triangle stock to brace the wing hold-down blocks. The braces should be glued both underneath and in front of the blocks (look ahead to photo 63-64).

58. ❒ a. Put the wing back on the fuselage and give them a final alignment check. When satisfied, tape the wing down so it can't move.

❒ b. Drill all the way through the wing and the wing hold-down blocks with a 13/64" drill bit. Use the two pilot holes in the wing bolt plate as starting points. It's important to keep the drill perpendicular to the top of the wing so that the heads of the wing bolts will sit flush on the plywood bolt plate.



59. ❒ a. Remove the wing, then cut rock-hard threads in the wing hold-down blocks using the following procedure. First, soak the wood inside the holes with thin CA. When the CA has fully cured, tap the holes with a 1/4-20 tap and follow up with another coat of thin CA. Finally, clean up the threads by re-tapping.

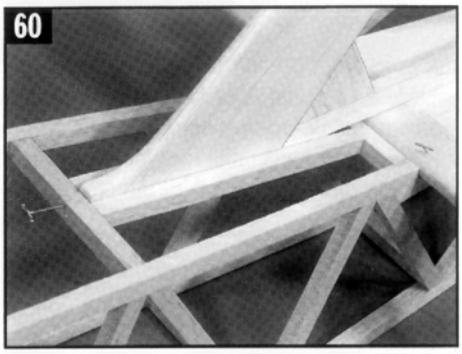
❒ b. Re-drill through the holes in the wing with a 1/4" drill bit to allow passage of the two 1/4-20 x 1-1/2" nylon wing bolts.

FINISHING UP THE FUSELAGE

NOTE: The completed Fin and Stabilizer are needed for the next couple of steps.

60. ❒ a. Bolt the wing in place, and pin the stabilizer and fin into their proper positions on the fuselage. (You've probably done this already just to see what it looks like, right?) There are two small slits in the stabilizer center to help you start making the hole for the fin post. You'll probably have to enlarge the the hole slightly for a perfect fit. Double check the general alignment of the fin, stabilizer, and wing as viewed from above and from the rear. When satisfied, pin the fin leading edge to the crossbrace so it can't move.

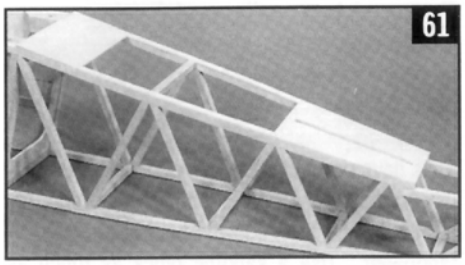
❒ b. Position a 5/16" sq. balsa stick along each side of the fin leading edge at the base. Glue the ends of the sticks only to the crossbraces - don't glue them to the fin!



61. ❒ a. Remove the fin. Sheet the area in front of the stabilizer with a couple of pieces of 3/32" x 3" balsa, cross-grained. Be careful not to glue the stabilizer! When dry, remove the stabilizer and cut out the slot for the fin front using a sharp knife.

❒ b. Add another piece of 3/32" x 3" balsa, cross-grained, to the top of the fuselage just aft of the wing.

❒ c. Finish off the top of the fuselage by adding two 3/32" x 3/8" balsa strips to the top of the fuselage frame between the sheets that were added in parts a. and b. of this step. When dry, sand the edges flush with the fuselage frame.



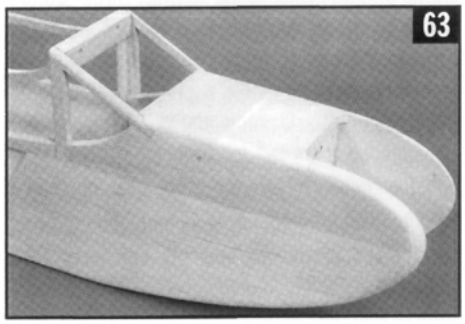
62. ❒ a. If you're building the tricycle gear version, the fuselage bottom will need a hole for the nose wheel strut. It may be helpful to re-mount the nose wheel bearing to help you mark where the strut should pass through the bottom. Remove the bearing, then drill a 1/4" hole at the mark.

❒ b. If you plan on using a four-stroke engine, drill a hole in the fuselage bottom for the breather line. Route the breather line so it won't interfere with the nose wheel steering.

❒ c. Remove the temporary F-2 brace.

63. ❒ a. The fuselage is now ready for final sanding. Round off all the corners except for the wing saddle area and where the stabilizer sits. If necessary, remount your engine temporarily, then notch or drill the fuselage "cheeks" to clear your engine's muffler and allow easy access to the needle valve(s).

❒ b. The top of F-2/F-2D needs to be beveled to match the slope of the windshield. You can get close using a Dremel sanding drum then finish it off with a sanding block. Protect the balsa side pieces with temporary strips of masking tape while sanding.

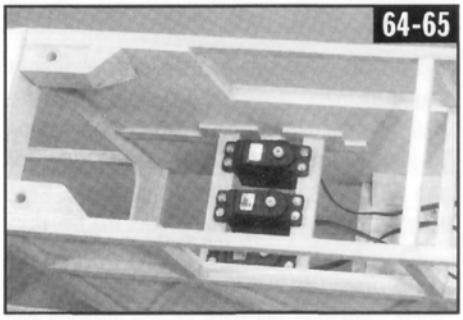


SERVOS AND PUSHRODS

Traditional balsa pushrods are supplied with this kit because they are light, stiff, and easy to build. Yes, the rudder pushrod does have a "kink" in it where it exits the fuselage, which many modelers consider a definite no-no. We consider it acceptable for this model because a) the Flyin' King is a slow-flying airplane, b) the bent rod is a heavy-duty 4-40 type, and c) it's just a stinkin' rudder! The more critical elevator pushrod is perfectly straight. The servos are positioned towards the rear of the wing opening to keep the pushrods short and to leave the front part of the cabin clear for payloads.

64. ❒ Cut two 4-3/8" servo rails from the 1/4" x 1/2" x 9" basswood stick provided in the kit. Position the rails on the lite-ply strips that were installed earlier, spacing them apart about 1/16" more than the width of your servos. Glue the rails in place, then secure each end with a 1/8" lite-ply servo rail bracket (four places).

65. ❒ The final arrangement of the servos on the servo rails depends on your engine and landing gear choices. First, the throttle servo should go on the same side of the model as the throttle control arm on your engine's carburetor. Second, the rudder servo should go on the opposite side if you are building a tri-gear model. If you're building a taildragger, put the rudder servo in the center. Finally, put the elevator servo in whatever position is leftover! The servo arrangement shown on the plan is just one possible layout.



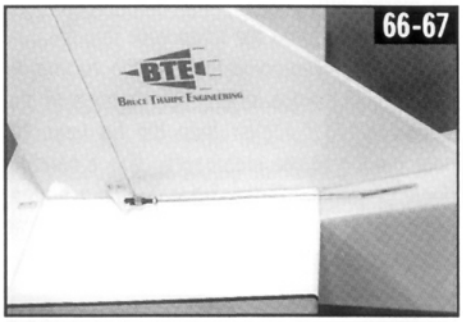
66. ❒ a. The rudder pushrod exit hole can go on either side of the fin. If you are building the tri-gear version, locate the hole on the same side of the model as the rudder servo. If it's a taildragger, place the hole on the side opposite the elevator servo in order to keep some distance between the two balsa pushrods.

❒ b. Temporarily bolt a control horn to the rudder and elevator. Pin or tape the stabilizer, elevator, fin, and rudder into their proper positions on the rear of the fuselage.

67. ❒ a. Start construction on the rudder pushrod at the control surface end by carefully bending the 4-40 x 12" threaded rod as shown on the plan. Drill a 3/32" hole through the 3/8" x 3/8" x 20" balsa rudder pushrod stick 3" from one end. Insert the small 90° bend in the threaded rod into the hole in the pushrod stick and glue them together. Wrap the assembly with heavy thread or fishing line, and smear the entire wrapped area with epoxy or medium CA.

❒ b. Cut the 12" length of 1/16" music wire supplied in the kit into two 6" lengths (one for the rudder pushrod, one for the elevator pushrod). Make a "Z" bend at one end of the 6" wire and a 1/4"-long 90° bend at the other end. If you don't like "Z" bends, you can use solder clevises or ball links instead (not included).

❒ c. The final, critical step is to mark the location of the front drill hole in the pushrod stick. To do this, feed the pushrod through the fuselage and attach it to the control surface using a 4-40 clevis. Cut off the front end of the balsa stick 2" aft of the servo arm. Now slip the "Z" bend into the servo arm and place the servo arm on the servo in its neutral position. Neutralize the control surface, then mark the drill hole location on the pushrod. Remove the pushrod, drill a 1/16" hole at the mark, clean the wire, and glue it in place. Wrap with thread, coat with glue and it's done!



68. ❒ a. Make the elevator pushrod just like the rudder pushrod, but this time use a 4-40 x 8" threaded rod and 28"-long balsa stick.

❒ b. Trial fit both pushrods in the fuselage. The pushrods shouldn't rub on each other or any part of the fuselage structure. When satisfied, remove the pushrods and tail.

TAIL ASSEMBLY

FIN AND RUDDER

69. ❒ a. Build the fin in this order:
- Pre-cut 5/16" balsa fin front.
- 5/16" x 1/2" balsa fin trailing edge.
- 5/16" x 1/2" balsa fin base and top.
- Pre-cut 5/16" balsa fin gusset.
- 5/16" sq. balsa diagonals.

❒ b. When dry, remove the fin from the building board and go over each joint with another application of medium CA.

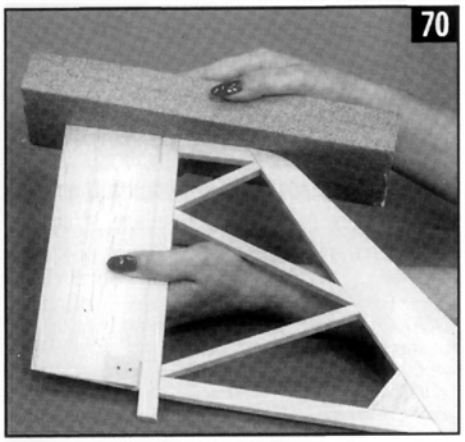
❒ c. Sand both sides of the fin with a sanding block. You'll find that 80-grit sandpaper will cut through the glue joints faster and better than trying to finesse them with finer grit sandpaper. Once the joints are smooth, re-sand with 150-grit sandpaper.

70. ❒ a. One side of the pre-tapered balsa rudder requires sanding to make it smooth.

❒ b. The 1/16" plywood control horn pad can be glued to either side of the rudder, depending on your particular radio installation. (Read steps 64-65 for more information.) Once that's been decided, imbed the the plywood pad into the balsa rudder. Cut part of the control horn pad to match the rudder's bottom edge.

❒ c. Choose a nylon control horn that allows the mounting flange to point towards the top of the rudder. Position the horn on the pad, mark through the mounting holes, then drill at the marks with a 3/32" drill bit. Harden the wood in and around the holes with thin CA.

❒ d. Temporarily tape the rudder to the back of the fin so that the bottom of the rudder is 1/16" higher than the fin base (to clear the top of the stabilizer). Use a sanding block to round off the front and top edges. Sanding the fin and rudder at the same time insures that they will "flow" together at the tip.



STABILIZER AND ELEVATOR

71. ❒ Build the stabilizer in this order:

- 3/8" x 3/4" balsa stabilizer leading edge.
  Cut to exact length, save scrap for tip.
- 3/16" x 3/8" balsa leading edge brace.
  Bevel each end as shown on the plans.
- Pre-cut 3/8" balsa stabilizer center pieces.
  Glue them along center line and at L.E. brace.
- 3/16" x 3/8" balsa trailing edge brace.
  Bevel each end as shown on the plans.
- 3/8" x 3/4" balsa stabilizer trailing edge.
  Cut from 36" piece, save scrap for tip.

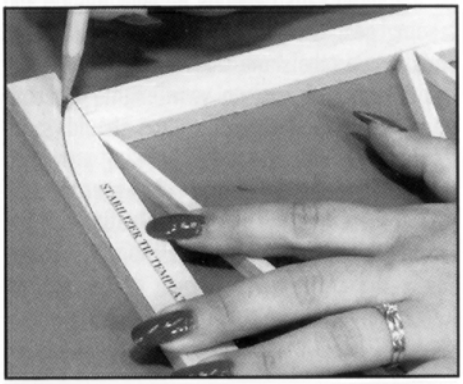
Note: At this point, the trailing edge position may not match the plans exactly, which is okay. Just be certain it's parallel to the lines on the plan and focus on making perfect wood joints.

- 3/8" x 3/4" balsa stabilizer tips.
  Use leftovers from stabilizer L.E. and T.E.
- 3/16" x 3/8" balsa diagonals.
  Some are leftover from rear wing spars.

72. ❒ a. When dry, unpin the stabilizer structure and go over every joint with another application of medium CA.

❒ b. Sand the top and bottom of the stabilizer with a sanding block.

❒ c. Cut the "Stabilizer Tip" template from the "Tools 'N Stuff" sheet and use it to draw the proper contour on both stabilizer tips. Carve and sand the tips to shape.



73. ❒ a. One side of the elevator must be sanded to make it perfectly smooth. Glue the 1/16" plywood control horn pad to the elevator. The pad should be centered side-to-side and even with the beveled edge at the front. Sand the front edge of the pad to match the bevel.

❒ b. The elevator control horn should be the opposite type as was used for the rudder. Position the horn on the plywood pad so that the upright portion (that attaches to the pushrod) is at the center of the elevator. Mark through the two mounting holes, drill at each mark with a 3/32" drill bit, then harden the wood in and around the holes with thin CA.

❒ c. Temporarily tape the elevator to the back of the stabilizer, then use a sanding block to round off all of the edges.

COVERING

At this point, some modelers may prefer to glue the tail surfaces to the fuselage, then cover. Others prefer to cover all of the pieces separately before hinging and final assembly, which is the procedure we recommend.

The Flyin' King prototypes were covered with Monokote, but any type of material (plastic film or fabric) may be used. The following tips assume the use of a plastic film. You'll need at least four 6-foot rolls of material to cover this airplane. Always read the manufacturer's instructions provided with the covering. They know what they're talking about!

The secret to a really great finish is proper surface preparation. Spend some quality time with your model and sanding block now, and you'll be rewarded with a smooth finish that you can be proud of. At this point, all of the parts have probably been sanded well with 150-grit sandpaper. To really smooth the wood, re-sand with 220-grit followed by 360- or 400-grit sandpaper. Use a sanding block as much as possible - save the free-hand sanding for tough spots like the fin leading edge. Be sure to blow off or vacuum all of the sanding dust, then wipe the structure lightly with a tack rag before you begin covering.

The fuselage requires some extra preparation. The engine compartment must be fuel-proofed prior to covering. Two coats of polyester fiber-glass resin, sanded after each coat, is our preferred method. Some modelers like to use epoxy resin or several coats of dope. Whatever you use, follow it up with a couple coats of fuel-proof paint that matches your covering material. Give some thought to how you plan on installing the windows (see step 74). If you plan on cutting an inset or adding a recessed "shelf", you should probably do that now. Since the cabin area is so visible, you should also take the time to paint the interior. Oh, and don't forget to dab the front of the wing dowels with paint for that finishing touch!

Once the fuselage has been prepared, it's an easy structure to cover. Start with the bottom, then the sides, and finish with the top. The photo model was done using three colors (white, yellow, and blue). Before applying them to the model, pieces of covering were cut precisely, positioned on a piece of glass with their edges overlapping about 1/4", then the overlaps were ironed together carefully. It's a lot of extra work, but it's more striking than a single, solid color.

Start the wing at the tips. Cover each wingtip with two pieces of covering (bottom then top). Now you can cover each wing panel starting with the bottom. Run the material around the leading and trailing edges so that the top piece can overlap, placing the seams on the bottom where they can't be seen easily. Wait until the top and bottom pieces have both been sealed completely around their edges before shrinking the large open areas between the ribs.

The tail surfaces, ailerons, and flaps should each be covered with two pieces, first the bottom then the top. Solid parts like the rudder and elevator should be ironed outward from the center to avoid trapping air bubbles.

FINAL ASSEMBLY

74. ❒ The clear windows on the Flyin' King can be installed several different ways. Here are four options (there's probably more!):
Easiest - Simply bypass the clear plastic in the kit and cover the window openings with clear plastic iron-on film. Simple, and light.
Easy - Cut the window material provided in the kit slightly oversize and glue it right to the outer surface of the fuselage. (The plastic is protected on each side with a thin film that must be peeled away before gluing.) You could do the side windows in a single piece. The edges can be hidden somewhat with tape, but the bulges will be obvious. Simple and sturdy.
Not So Easy - Cut a small recess, or inset, all the way around each window just deep enough to allow the clear plastic to sit flush with the outer surface of the fuselage. This would be tedious with a knife and razor blade, but much easier with a Dremel attachment made just for this purpose. After covering, glue the clear windows in place with flexible white glue, then hide the edges with tape or paint.
Toughest - Build a recessed "shelf" inside each window opening using some scrap 1/16" or 3/32" balsa. The edge of the shelves should be inset from the side about 1/32" so the the clear plastic windows will install flush.

75. ❒ a. General instructions for installing Easy Hinges can be found on the back of the hinge package. You must use *thin* CA (the fresher, the better) so it wicks properly into the hinge and into the surrounding wood. Now is a good time to cut the slots (right through the covering material) in the tail surfaces. You could install and glue the hinges now or wait until after the fin and stabilizer have been glued to the fuselage, whichever you prefer.

❒ b. Hinging the ailerons are a little tricky because you need to measure carefully to properly locate the slots in the rear of the wing. Keep your knife parallel with the upper surface when cutting the slots in the both the wing and the ailerons. Each aileron uses four hinges.

❒ c. The flaps are hinged just like the ailerons, with the following exception: Before sliding a flap onto its hinges sticking out of the wing trailing edge, apply some epoxy to the slot and hole for the torque rod. Insert a scrap of wax paper between the torque rod and the wing, then slide the flap in place. Allow the epoxy to dry, remove the wax paper, then apply thin CA to the Easy Hinges.

76. ❒ a. The stabilizer and fuselage need a firm wood-to-wood joint, which means the covering material must be removed from the stabilizer where it contacts the fuselage. To do this, position the stabilizer accurately on the fuselage and check its alignment from above and behind the model. The wing should be bolted in place so you can visually confirm that the stabilizer isn't tilted or skewed. Now use a very sharp knife to carefully and slowly cut through the covering material on the stabilizer at the sides of the fuselage, trying not to cut into the balsa itself. Remove the stabilizer and peel away the covering between the knife cuts, exposing the bare wood beneath.

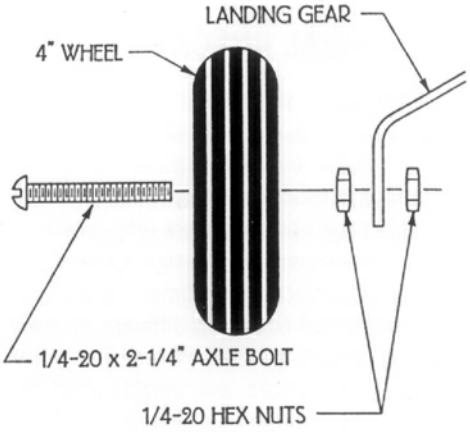
❒ b. Glue the stabilizer to the fuselage using plenty of five-minute epoxy. Wipe away any excess epoxy with alcohol and double check the alignment before the glue dries.

77. ❒ a. Before gluing in the fin, you must carefully cut away the covering material from the top of the stabilizer where the fin makes contact, and also from the front of the fin where it slides into the fuselage slot.

❒ b. Use epoxy to glue the fin to the fuselage and stabilizer. Before the glue dries, be certain the fin is 90° to the stabilizer.

❒ c. Add a couple of inch-long braces cut from 5/16" square balsa, one on each side of the fin post underneath the stabilizer.

78. ❒ Bolt two wheels (4" dia. for tri-gear, 4" to 6" dia. for taildragger) on the aluminum landing gear using the hardware shown in the drawing below. The wheel hubs will probably need to be drilled with a 1/4" dia. drill bit to accept the axle bolt. A drop of CA on the inboard nut will help prevent loosening due to vibration. Extra-long axle bolts are provided in the kit to accept all types of wheels - they can be shortened with a Dremel cutoff wheel after installation. Once the wheels have been attached, bolt the landing gear to the fuselage with four 6-32 x 1/2" machine screws.



Note: If you are building the tricycle gear version, do step 79. Taildragger builders should skip it and install a tailwheel assembly of their choice now, using instructions supplied with the tailwheel assembly.

79. ❒ a. Bolt the nose gear bearing on the front of F-1 using four 4-40 x 1/2" socket head bolts. Attach a 4" dia. nose wheel to the nose wheel strut using two 5/32" wheel collars, one on each side of the wheel. Assemble the nose wheel strut and steering arm on the bearing, adjusting the strut up or down as necessary to make the stabilizer parallel with the ground. This allows the wing to have a very slight positive incidence in relation to the runway, which will result in nice, smooth takeoffs.

❒ b. When the nose wheel is straight, the steering arm should be angled away from F-1 about 15°. Tighten the 6-32 x 1/4" set screw in the steering arm, then loosen it and remove the strut. There should be a mark in the strut where the screw made contact. File a flat spot at the mark and re-assemble the nose gear. The flat spot will help prevent the steering arm from twisting on the strut.

❒ c. Route the nose wheel steering pushrod through F-1 to the rudder servo. To prevent unwanted flexing, the outer nylon housing should be glued to the structure at both ends and at F-2. (Drill or notch F-2 to allow smooth passage for the housing.) Attach the flexible steel cable to the servo with a 2-56 solder clevis, and to the steering arm with the pushrod connector (installed in step 42b).

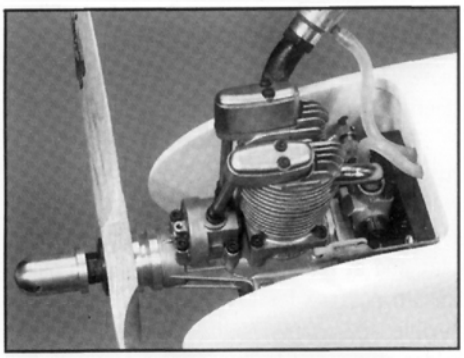
ENGINE AND FUEL TANK INSTALLATION

FUEL TANK - Your fuel tank was prepared for installation in step 54. The easiest way to get it in place is to slide two long lengths of fuel tubing through the holes in the firewall so you can connect them to the tank outside of the fuselage. Now slide the tank through F-2 while pulling forward gently on the fuel lines. When properly installed, you should be able to blow through one fuel line and feel it coming out the other. If not, the fuel lines are probably kinked and you need to try again. Use foam rubber padding under the tank to raise it as high in the fuselage as possible.

The Flyin' King doesn't have a fuel tank hatch for several reasons, the primary one being the strength derived from a boxed-in nose section. If you are careful with the fuel tank construction and installation, you'll probably never even need to remove it.

THROTTLE PUSHROD - Slide the 24" nylon throttle pushrod housing through the hole in the firewall until the end is about 2" from the servo arm. Notch F-2 to allow the housing to flow smoothly towards the servo, keeping bends to a minimum. Solder the 2-56 solder clevis to the flexible steel pushrod cable, slide the cable into the housing from the rear, and hook up the clevis to the servo arm. If necessary, make a scrap balsa standoff to support the aft end of the housing. Glue the housing at both ends and F-2. Remove the cable and set it aside for now.

ENGINE AND ENGINE MOUNT - Since these were prepared in step 40, simply bolt your engine mount to the firewall, then bolt your engine to the mount. Now you can hook up the throttle cable to the carburetor control arm using an adjustable connector of your choice (a simple hookup for four-stroke engines is shown on the plans). You'll probably need to shorten both the throttle cable and its housing.

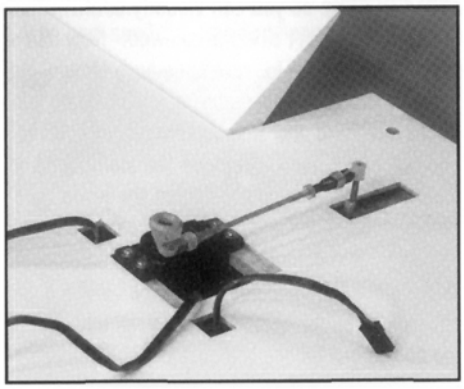


The engine shown here is a Saito .80, which is a good choice for the Flyin' King. Notice that the 14 x 6 wood prop is locked on by both the prop nut supplied with the engine and a high-quality, rounded Tru-Turn prop nut.

RADIO INSTALLATION

Actually, you've already done quite a bit of radio installation. Install your rudder and elevator pushrods and make sure the servo arm retaining screws are in place. At the control surface end, tighten a 4-40 jam nut against each clevis to eliminate any slop in the threads.

The aileron and flap servos can now be screwed in place on the wing. Make pushrods from 4-40 threaded rods and solder clevises as shown on the plan. The next photo shows the flap servo installation. To minimize slop in the system, put the nylon flap torque rod connector close to the end of the torque rod and use a long, heavy-duty servo arm to provide enough throw for full flap deflection. You may find it helpful to number or color code the servo leads to avoid confusion when hooking them up to the extensions from the receiver. Notice the fuel line "keepers" on both clevises - they should be installed on every clevis in the model. Ideally, your transmitter will have a proportional sliding arm (like a trim lever) on the fifth channel that you can use for the flaps. If not, you can get by with a two- or three-position switch.



Now all that's left is the receiver, battery pack, and switch. Bolt the wing onto the fuselage, then set your receiver and battery on the outside of the model in the positions shown on the plans. Check the balance by lifting the model with your fingertips about 4-1/2" behind the leading edge. If the model seems nose heavy, you should place the battery and receiver aft of F-2. If it seems tail heavy, move them both forward of F-2. The idea is to use your radio equipment to acheive proper balance rather than lead weights. As you get used to the model, you may elect to shift the balance point aft by moving these components. Protect your receiver and battery by wrapping them both separately with foam rubber. Secure them in the fuselage with scrap pieces of wood.

Mount the switch on the fuselage side opposite the engine exhaust. Make certain the charging jack is accessible, but tucked away enough to keep it out of the control linkages. Route the antenna clear from other wires. It can be routed externally, or internally through a plastic tube installed inside the fuselage.

FINAL CHECKOUT

❒ **BALANCE** - Your model must balance in the range between 4" and 5" behind the leading edge. If necessary, add weight to the nose or tail until the model hangs level while balancing it on your fingertips somewhere in the specified range. It's impossible to design a model that will balance perfectly every time. Every model (and every model builder) is different, so every individual model must be checked for proper balance. Make sure any weights used for balancing are securely fastened to the airframe.

❒ **ALIGNMENT** - The general alignment of the fuselage, wing, tail, and engine down thrust has already been set during construction. You can, however, check your wing and tail carefully for unwanted warps. Adjust the control surfaces (rudder, elevator, flaps and ailerons) so that they are in their streamlined, neutral positions with the trim levers on your transmitter centered. Also, check the engine alignment by viewing from above. Left thrust is a no-no, but a degree or two of right thrust is acceptable (some modelers like to add a touch of right thrust to help counteract the engine's torque).

❒ **CONTROL THROWS** - Adjust the amount of control surface deflection to the amounts shown below. These are fairly mild settings - most pilots will probably want to increase the movements after the first few flights to improve the airplane's aerobatic capability.

RECOMMENDED CONTROL THROWS

ELEVATOR: 1/2" UP, 1/2" DOWN
RUDDER: 5/8" LEFT, 5/8" RIGHT
AILERONS: 5/8" UP, 7/16" DOWN

DOWN ELEVATOR WITH FULL FLAPS: 1/4"

Automatic "down" elevator compensation must be used to counteract the "nose-up" tendency of the model when the flaps are deployed.

❒ **RADIO** - Make a final check of the radio installation. Make double sure that all of the servo arm retaining screws are in place, the jam nuts are really "jammed" against the clevises, and the control linkages don't bind or interfere with each other. Triple check that all of the control surfaces are moving in the right direction! Perform a radio range check as specified by the manufacturer's instructions.

❒ **ENGINE** - For general sport flying, engine reliability is much more important than peak performance. Take the time to break-in your engine properly on a test stand and don't allow yourself to be satisfied until you obtain a slow, solid idle and a reliable transition to full power. You may very well spend more time flying your Flyin' King at reduced throttle settings than you may think. It's simply a lot more fun to fly a model airplane when you're not worrying about your engine quitting!

If your model is warp-free, balanced properly, has a good radio and reliable engine, then a successful maiden flight is virtually assured. Have an experienced pilot test fly and trim your model if you're unsure of your own ability to do so. Pick a nice day, fly safe, and enjoy your new Flyin' King! ◆