



# Biplane

## RC-37 INSTRUCTION MANUAL

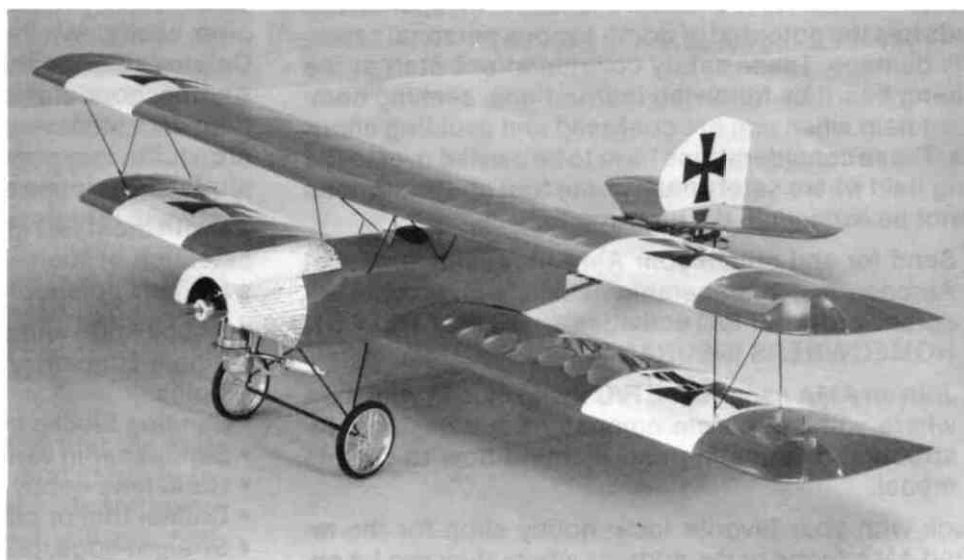
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### INTRODUCTION

The Elder Biplane is the third design based on the popular Elder-series of models. This design is a direct result of popular demand and it surely is the largest model of the three. Your Elder Biplane packs a huge wing area of 1492 square inches, that's 10.3 square feet of lifting surface! This means that when the model is built within the expected weight range of 7-1/2-8-1/2 pounds, the resulting wing loading range would be 11.6 - 13.1 ounces per square foot! It also means that if you went with the heaviest engine available and went crazy in the detailing and finishing aspects of this model and managed to get the weight up to 10 pounds, the wing loading would still only be 15.4 ounces per square foot!

All of the above allows your Elder Biplane to be powered by a very wide range of engines. This design has been tested quite successfully using 2-stroke engines as small as .45 and on up to .75's. For 4-stroke work, we suggest engine sizes of .60 to .90 in displacement. Like its smaller counterparts, the real "kick" of this design is its extremely realistic flight characteristics. Slow fly-bys are breathtaking without the fear of losing aileron authority. Landings and take-offs are absolutely effortless. In the air your Elder Biplane is fully capable of some of the most realistic aerobatics you've ever seen! You can expect beautiful loops, stall turns and snap rolls, all at speeds that actually allow you to watch the airplane instead of a "blur".

Your Elder Biplane is a rugged design that will operate



very nicely out of dirt, grass or paved flying fields. The unique, shock-absorbing landing gear, proto-typical of the Elders era, really works to smooth out even the bumpiest of fields. With its thick airfoil section and generous wing area, your Elder Biplane will not tend to build-up excessive airspeed. This characteristic keeps the relative inertia low and means that crash damage is kept to a minimum.

Like other Elders, the Elder Biplane lends itself to all kinds of detailing, if you're so inclined. For the beginner, nothing fancy is needed; just fly it and enjoy. For the builder with an imagination, the Elder Biplane can be detailed to such a degree that other pilots at your field will swear the airplane is a scale model! In the COVERING & FINISHING section of these instructions there are some ideas for detailing that might be of interest, please take the time to read them.



TOP FLITE MODELS INC.

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Earlier we touched on engine recommendations. Your Elder Biplane kit contains a high-quality filled nylon motor mount that will work with some of the engine suggestions or this design, but not all. If the engine choice for *your* Elder Biplane will not work with this mount, it might be necessary to visit your local retail hobby shop to obtain the correct motor mount for *your* engine.

#### IMPORTANT NOTE:

TOP FLITE MODELS, INC. Would certainly recommend the Elder Biplane as a first R/C powered aircraft. However, if you are a beginner to the sport of R/C flying, we would *urge* you to seek and use experienced assistance in constructing and flying this airplane. Again, if you are new to this hobby, consider this:

Flying this or any other radio-controlled model aircraft is a PRIVILEGE and not a RIGHT and this privilege begins with the utmost safety considerations to others and yourself as well. An R/C model airplane in inexperienced hands has the potential of doing serious personal or property damage. These safety considerations start at the building board by following instructions, seeking competent help when you are confused and avoiding short-cuts. These considerations have to be carried over to the flying field where safety must come first and limitations cannot be exceeded. We urge you to:

1. Send for and obtain your AMA (Academy of Model Aeronautics) membership which will provide insurance for your R/C activities — DO NOT RELY ON HOMEOWNERS INSURANCE.
2. Join an AMA sanctioned R/C flying club in your area where you can obtain competent, professional instruction in trimming and learning how to fly this model.

Check with your favorite local hobby shop for the required AMA forms or the address where they can be obtained.

#### WARNING!!!

A radio controlled model is not a "toy." Care and caution must be taken in properly building the model, as well as in the installation and use of the radio control device. It is important to follow all directions as to the construction of this kit as well as installation and use of the engine and radio gear. The advice and assistance of a well experienced builder and pilot is highly recommended. Don't take chances! Improper building, operation, or flying of this model could result in serious bodily injury to others, yourself, or property damage.

#### PRE-CONSTRUCTION NOTES

The Elder Biplane, like other Top Flite kits employs the use of die-cut wood to ease the task of construction, parts fit and identification. The dies used for this kit have been rigorously checked for absolute accuracy

and should provide you with excellent fit. Die-cut parts should be carefully removed from their sheets by first lightly sanding the *back* of each sheet of parts and then carefully removing each part. Use a light garnet paper for the sanding and keep a sharp hobby knife with an X-acto #11 blade, or equivalent, handy for assistance in removing any parts that might not have completely cut-through by the dies. Parts which oppose one another and must be precisely uniform—such as fuselage sides, ribs, etc.—should be carefully "matched" after their removal from the part sheets. Matching is the process of holding the opposing pieces together with either pins, tape or spot gluing and lightly sanding the edges of the parts until they are identical. A sanding block with light garnet paper is most useful for this and other phases of construction.

Your building surface should be at least large enough to accommodate the wing panels. This surface should be as absolutely flat as possible and yet be able to accept pins easily. We have found that a product such as Celotex fiber board works quite well for this purpose. Another good surface can be found in most well-stocked hardware stores—a 2'x4' fiberboard ceiling tile. These are quite inexpensive and can be used for several airplanes before needing replacement.

As with most R/C kits that are constructed from wood, a selection of tools - most of which can be found in the average workshop - are a must to do the job correctly:

- Hobby knife and sharp #11 blades
- Single-edge razor blades
- T-pins
- Sanding blocks in assorted sizes
- Sandpaper in various grits
- Hand-held hobby saw, such as an X-acto
- Dremel tool or power drill and assorted drill bits
- Straight-edge, preferably metal, at least 36" long
- 90" triangle
- Soldering iron, flux (silver) and solder
- Carbide cut-off wheel for wire cutting
- Small power jig-saw, such as a Moto-Saw
- Razor plane
- Tapes, such as masking and cellophane

Our Elders were constructed using a variety of common hobby adhesives including 5-minute epoxy, cyano-acrylates, and 1-hour epoxy. Since all of us have our own construction techniques and favorite adhesives, stick with the ones you are familiar with and prefer. However, in certain areas there will be callouts for certain types of adhesives, and we urge you to try not to substitute since doing so could possibly cause problems structurally.

The last thing we should touch on before we begin actual construction is the sequence in which the Elder is assembled. The sequence given to you in this booklet has proven to be the most straight-forward and provides the finished components in the order in which you will need them to progress to the next assembly phase. Try to stick with the building order presented here to avoid mistakes.

Spread the plans out on your work surface, cover them with a clear plastic material, such as the backing from a roll of MonoKote® or plastic wrap and commence construction.

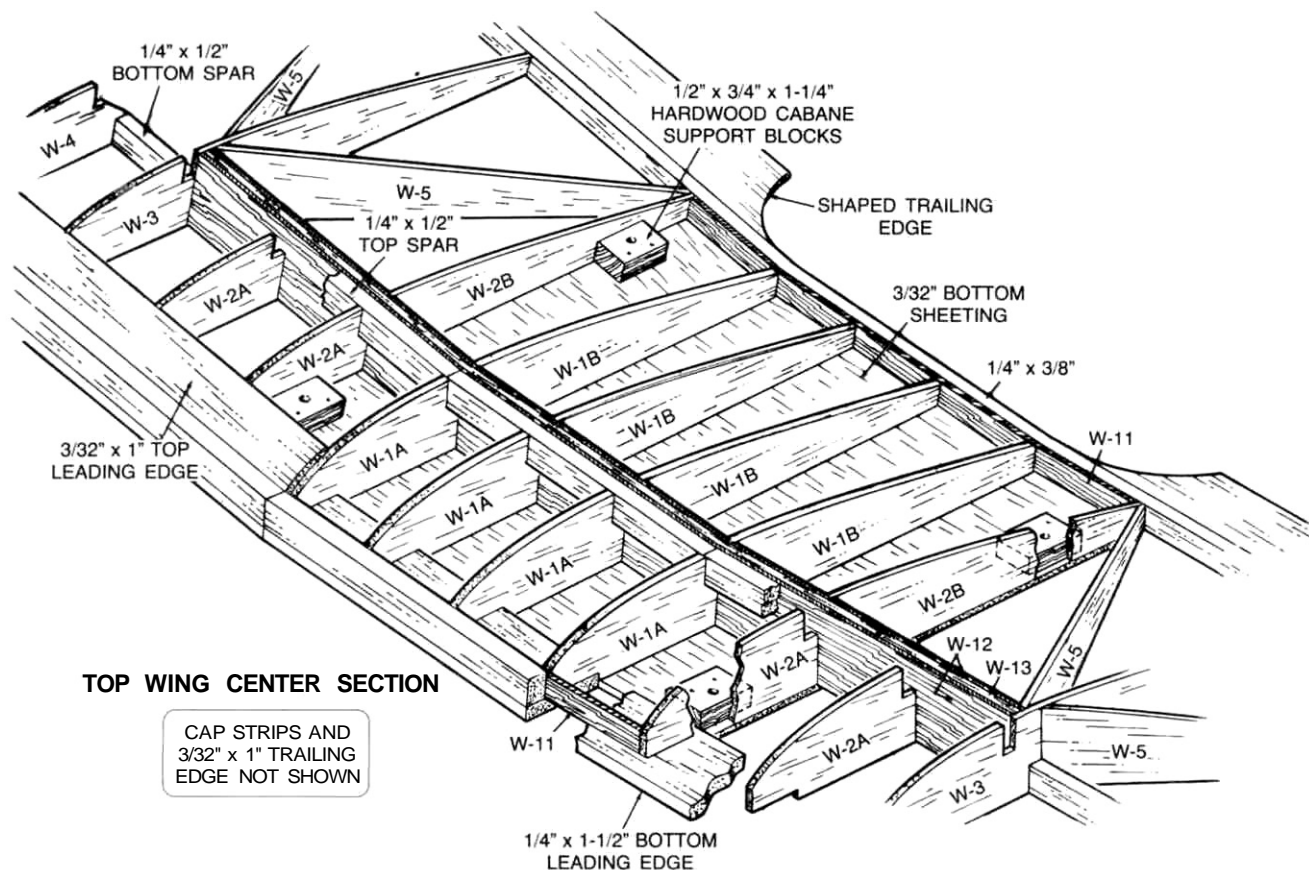
## UPPER WING ASSEMBLY

Wing construction for your Elder Biplane consists of building three separate pieces for each wing; the two panels and the center section. Note that the upperwing panels will be joined to the upper center section in the following sequence, *without* the top, inboard ends sheeted. This sheeting will be done in the FINAL ASSEMBLY section of the manual. In this and other building sequences, be certain that you are working on a *flat* work surface. Carefully join the plans for the TOP LEFT WING and the TOP RIGHT WING, Plan Sheets 5 and 6, at the center line provided and accurately secure with tape. This provides the full wing plan on which to work. The wing will be built directly over the plans, so cover them with MonoKote backing or clear food wrap.

1. Start with the center section first. Locate the die-cut sheets containing parts W-11 (2, ply), W-12 (2, ply), W-13 (1, balsa), 4W-1A's and 4W-1B's. Remove these parts from their sheets and clean up any rough edges before assembly.
2. Using the plans as a guide; measure, cut and butt-glue the 1/4" x 1-1/2" lower leading edge, 3/32" balsa sheet and the 3/32" x 1" trailing edge that makes up the bottom of the center section. Note grain direction of these pieces. Measure, cut and glue in

place the 3/8" x 1/2" upper leading edge. Glue one of the W-11 ply dihedral braces in place against the inside surface of the leading edge—be sure that it's centered. Glue the outer W-1A half-ribs in place against the rear face of the dihedral brace, lined-up with the edges of the bottom sheeting at right angles to your work surface. Now glue the two remaining W-1A's in place, using the "tick" mark locations on the plan.

3. As shown, the main dihedral brace system is a composite made by laminating the two W-12's (ply) to each side of W-13, which results in a 1/4" thick part—do this now. Glue the completed dihedral brace in place to the bottom sheeting and up against the rear edges of the four W-1A's. Be sure this part is centered.
4. From your kit box, locate a piece of 1/4" x 1/2" spar stock and cut two 5" lengths. Glue one of these pieces in the top rear slots in the W-1A's and against the top forward face of the center dihedral brace. Glue the other on the bottom sheeting against the bottom rear face of the dihedral brace.
5. Now glue the four W-1B rear half-ribs in place behind the main dihedral brace. Glue the remaining W-11 (ply) dihedral brace in place on the bottom sheeting and against the rear edges of the four W-1B's. Locate the 1/4" x 3/8" trailing edge material in your kit box and cut a 5" length. This is now glued in place against the rear face of the rear W-11 brace and to the bottom sheeting.



6. Internally, the center section is done and all that remains is the addition of the top  $\frac{3}{32}$ " balsa sheeting—note grain. From the sheeting stock provided, cut, fit and glue the sheeting in place. When dry, remove the center section from your work surface. Use your sanding block to smooth it's outer W-1A and W-1B sides for mating to the outer wing panels. The top, bottom and leading edge can now also be sanded to shape. Set this assembly aside for now.
7. In this step we want to prepare each of the required components—the top and bottom spars, the  $\frac{3}{8}$ " x  $\frac{1}{2}$ " front L.E. and the rear  $\frac{1}{4}$ " x  $\frac{3}{8}$ " T.E.—with the proper dihedral angle at their inboard ends. The cross-section of the wing that is shown on the plans is ideal for this purpose. Simply lay, for instance, the bottom  $\frac{1}{4}$ " x  $\frac{1}{2}$ " balsa spar in place over this drawing. Note that the outboard end is cut at 90 degs.; but that the inboard end must be cut at an angle to achieve the required  $\frac{3}{4}$ " per panel dihedral angle. Make two of these bottom spars. Now repeat this process with the top spars, the leading edges and the trailing edges (note that the length of the leading edges is developed from the top view of the wing plan). The inboard edges of the  $\frac{1}{4}$ " x  $1\frac{1}{2}$ " lower leading edges should be first cut at 90 degs. and then slightly chamfered to match the needed dihedral angle.
8. Start construction by first pinning the  $\frac{1}{4}$ " x  $1\frac{1}{2}$ " lower leading edges in place, directly over the plans. Note that the inboard edges of these two parts terminate at the out edges of the two outboard W-1A's. Now pin the  $\frac{3}{32}$ " x 1" bottom trailing edge planking in place. Glue the  $\frac{1}{4}$ " x  $\frac{3}{8}$ " trailing edges in place on the top, rear of the  $\frac{3}{32}$ " trailing edge bottom sheet. From your kit box locate two 28" lengths of the tapered  $1\frac{1}{2}$ " wide trailing stock. Note on the plans that the inboard ends of the tapered trailing edges have been scalloped to blend into the center sections, using the plans as a guide, do this now. Glue the tapered trailing edges in place—pin securely. From the  $\frac{3}{32}$ " x  $\frac{1}{4}$ " x 36" stock provided, cut, fit and glue each of the bottom capstrips in place—pin to secure. Using the  $\frac{3}{32}$ " sheet balsa provided, measure, cut and glue the inboard bottom wing sheeting in place—note grain direction. Locate the two required W-6 wingtips, clean their edges and glue in place. The bottom  $\frac{1}{4}$ " x  $\frac{1}{2}$ " spars (angled ends inboard) are now glued in place to the bottom wing sheet and capstrips. Now glue all required W-2A, W-2B, W-3 and W-4 ribs in place, making sure they are vertical to the work surface—DO NOT glue W-3P's in place yet.
9. From your kit box locate the die-cut sheet containing the four "light ply" W-3P wing ribs. Both the upper and lower wings use two of these special ribs for attachment of the interplane struts. Note that each of these ribs have indentions on them for location and placement of the nylon mini horns, used for attachment of the interplane struts. On the upper wing, the location of these horns is shown on the lower left side of plan sheet #5. Route or cut a slot between the two lower sets of front and rear indentions to allow the base of the mini horn to fit. As long as you're doing this now, go ahead and cut the slots required for these ribs for the bottom wing—these are the top front and rear set of indentions. Once the ribs have been properly slotted, place the two required for the bottom wing back in your kit box for later assembly. The two appropriate W-3P ribs for the top wing are ready for installation. First, cut, fit and glue in place the  $\frac{3}{32}$ " x  $\frac{1}{4}$ " lengths of capstrip stock shown on the plans as fitting directly beneath each of the mini horn locations. Glue W-3P's in place.
10. Locate and remove 14 W-5 rear angled ribs from their die-cut sheets. Note on the plans that the forward ends of these ribs are chamfered to fit against the W-3 rib sheets and that their placement does not interfere with the placement of the top spar slots. Also note that the innermost W-5 rib must be trimmed slightly so as not to interfere with the placement of the main dihedral brace. Glue W-5's in place. Glue all of the wingtip braces (W-7, W-8, W-9, W-10, and W-15) in place on the W-6 wingtips. Note that W-7, W-9 and W-10 need to have their inboard ends chamfered with a sanding block to fit flush to the outer face of W-3.
11. From your hardwood parts bag, locate the four  $\frac{1}{2}$ " x  $\frac{5}{8}$ " x  $1\frac{1}{2}$ " cabane support blocks. These are now epoxied in place as shown on the plans, against the inboard faces of W-2A and W-2B and to the bottom  $\frac{3}{32}$ " bottom center wing sheeting—we suggest the use of a 1-3 hour-type epoxy for this step.
12. Now take the center section which was assembled earlier and fit it to one of the wing panels. Tilt it until the two arms of the W-11 ply dihedral braces fit flush to the front and rear bottom sheeting and the center brace assembly is correctly positioned against the bottom spar. Check this fit to be sure all components fit nicely. Trim as needed to get proper fit. Prop and/or pin this center section in this position as you will use it as a guide for the remaining wing panel parts. *Remember not to glue anything to the center section yet; it's only in place for spacing purposes.*
13. Glue the front  $\frac{3}{8}$ " x  $\frac{1}{2}$ " leading edge in place on top of the lower  $\frac{1}{4}$ " x  $1\frac{1}{2}$ " leading edge and against the front of each full and half rib (angled end inboard to fit against tilted center section). Glue the top  $\frac{1}{4}$ " x  $\frac{1}{2}$ " spar in place (angled end inboard). Cut, fit and glue the  $\frac{3}{32}$ " x V leading and trailing edge planking in place—pin or tape to hold. Remove the center section from the wing panel and repeat the above steps on the remaining panel.
14. Cut, fit and glue all top  $\frac{3}{32}$ " x  $\frac{1}{4}$ " capstrips in place on all of the ribs and half ribs.
15. Remove the wing panels from the work surface. Inspect them for any dried globs of glue, remove

these with a #11 X-acto knife. Tape or hold the two wing panels together with the bottoms of each facing the other—align carefully. Use your sanding block to now shape the forward wingtips identically with each other and the curves shown on the plans. With the exception of the inboard ends, use your sanding block to carefully 'match' the wing panels, leading edges, tips and trailing edges. Separate the panels and use a sanding block with light paper over all of the panel's surfaces to smooth them for later covering.

16. Firmly pin and/or weight the center section over your protected work surface and epoxy the left and right wing panels in place to it, with the tips of each panel supported off the work surface by 3/4" to impart the correct dihedral. Do not use so much adhesive that it drips or runs but enough to adequately coat the parts required. Using a 1-3 hour type epoxy will give you plenty of time to position all of the components. Allow the structure to cure.

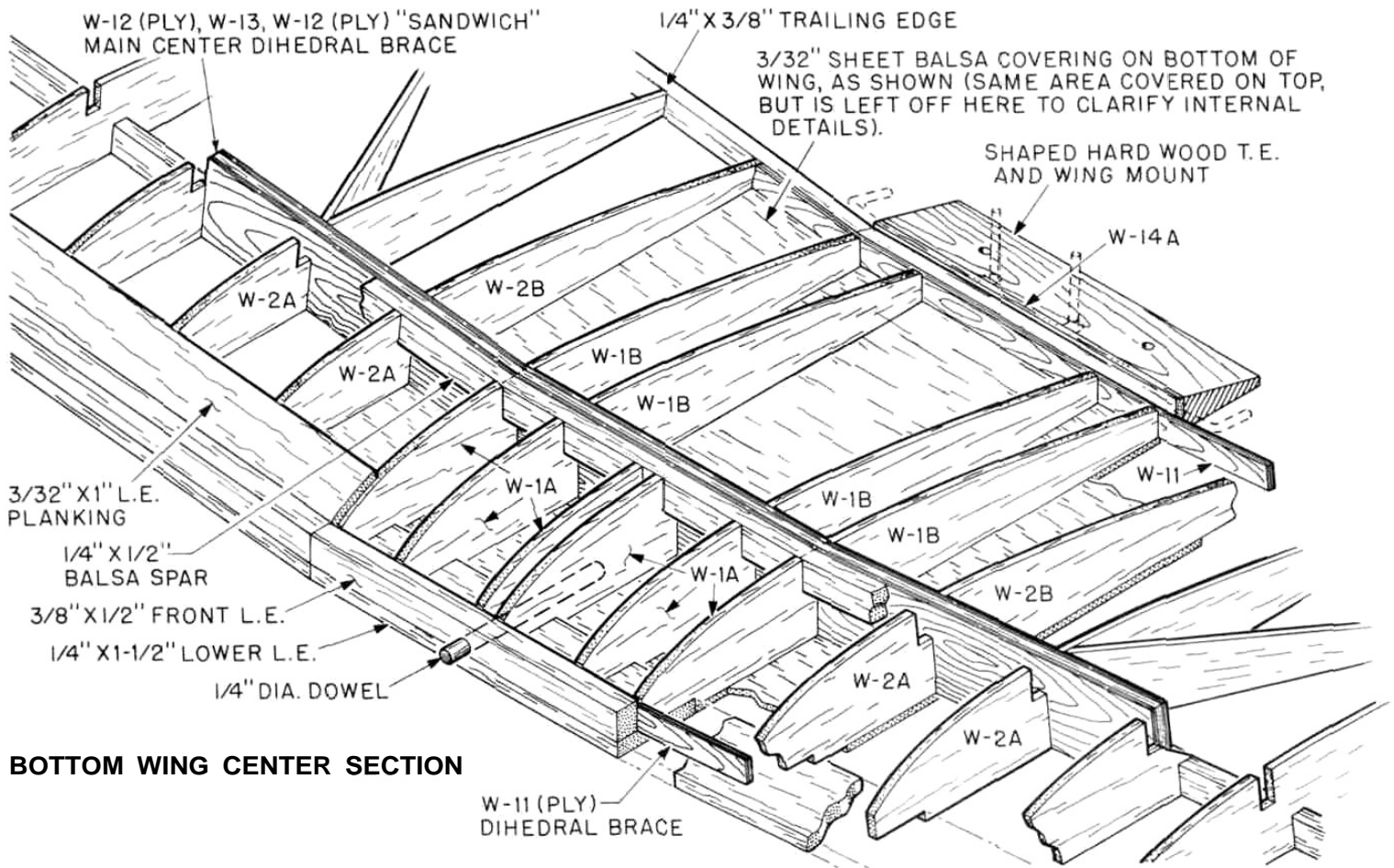
Remove the wing from your work surface and inspect your work. Do any touch-up sanding or filling as needed. The upper wing is now complete with the exception of the upper panel sheeting over the hardwood blocks.

2. Using the plans as a guide; measure, cut and butt-glue the 1/4" x 1-1/2" lower leading edge, 3/32" balsa sheet and the 3/32" x 1" trailing edge that make up the bottom of the center section. Note grain direction of these pieces. Measure, cut and glue in place the 3/8" x 1/2" upper leading edge. Glue one of the W-11 ply dihedral braces in place against the inside surface of the leading edge—be sure that it's centered. Glue the two outer W-1A's in place against the rear face of the dihedral brace, lined-up with the edges of the bottom sheeting at right angles to your work surface. Now glue two W-1A's in place just inboard of the outer ones—note "tick" marks on plans. The two remaining W-1A's are now glued in place, at the center of the structure, spaced 1/4" apart to allow later dowel insertion.
3. As shown, the main dihedral brace system is a composite made by laminating the two W-12's (ply) to each side of the W-13, which results in a 1/4" thick part—do this now. Glue the completed composite dihedral brace in place to the bottom sheeting and up against the rear edges of the six W-1A's. Be sure this part is centered.

## LOWER WING ASSEMBLY

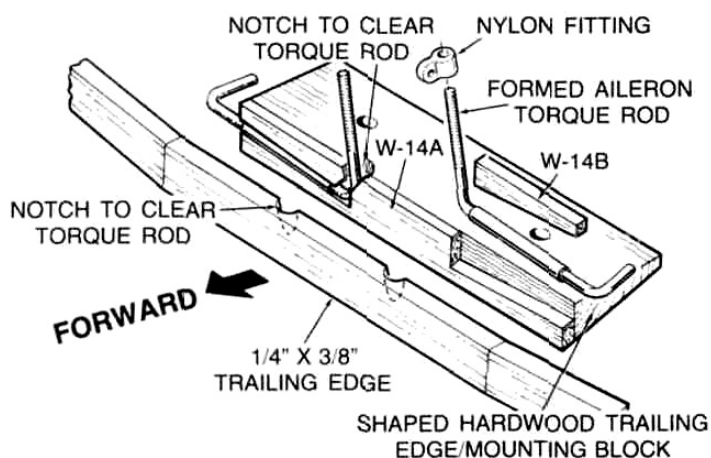
The lower wing for the Elder Biplane is *almost* identical in construction to that of the upper wing, just built. Part numbers and wood sizes are also the same. However, there are some differences, primarily in the center section structure and in part counts. Carefully join the plans for the BOTTOM LEFT WING and the BOTTOM RIGHT WING, Plan Sheets 3 and 4, at the center lines provided and accurately secure with tape. This provides the full wing plan on which to work. The lower wing, like the top, will be built directly over the plans, so cover them with a MonoKote backing or clear food wrap.

1. Start with the center section first. Locate the die-cut sheets containing parts W-11 (2, ply), W-12 (2, ply), W-13(1, balsa), 6W-1A's and 4W-1B's. Remove these parts from their sheets and clean up any rough edges before assembly.
2. From your kit box, locate a piece of 1/4" x 1/2" spar stock and cut two 5" lengths. Glue one of these pieces in the top rear slots in the W-1A's and against the top forward face of the center dihedral brace. Glue the other on the bottom sheeting against the bottom rear face of the dihedral brace.
3. Now glue the four W-1B rear half-ribs in place behind the main dihedral brace. Glue the remaining W-11 (ply) dihedral brace in place on the bottom sheeting and against the rear edges of the four W-1B's. Locate the 1/4" x 3/8" trailing edge material in your kit box and cut a 5" length. This is now glued in place against the rear face of the rear W-11 brace and to the bottom sheeting.



### BOTTOM WING CENTER SECTION

6. In this step you are going to assemble the 5" length of shaped hardwood trailing edge stock and the aileron torque tubes and wires to the wing center section. Also locate and remove from their die-cut sheets, parts W-14 and W-14B (due to the die-cut process, you have been provided with two sets of these parts, you will need only one set). Please refer to the detail drawing provided to understand the relationship of these parts.



Start by glueing W-14A to the front face of the tapered hardwood trailing edge piece. Make sure W-14A is centered and that the bottom edge of the part coincides with the bottom surface of the trailing edge piece. As shown, the trailing edge must be notched a little to allow rear movement of the threaded linkage arms. Do this now with either a rat-tail file or a Moto-Tool and router bit. Note that there is a *right* and a *left* aileron drive assembly. Hold one of these assemblies (it makes no difference which one) in place to the trailing edge/W-14A assembly in it's proper location. Apply glue to the rear face only of one of the tapered W-14B's (tapered end outboard) and glue it in position to the front face of the trailing edge, thus providing a "nest" for the aileron drive assembly. Repeat this process for the opposite side. Remove the aileron drive assemblies and use a sanding block to true-up each side of the trailing edge assembly (top and bottom) and each end. Insert the two aileron drive assemblies into their appropriate "nests" and hold this entire assembly to the trailing edge of the wing center section. Note that you now must slightly notch the center section's 1/4" x 3/8" trailing edge to allow forward movement of the threaded linkage arms—do this now. Remove the two aileron drive assemblies and use sandpaper to rough-up the surface of each of the assemblies' brass tubes. Mix a small amount of 1-3 hour epoxy and carefully glue only the torque rod

tubes into their appropriate locations—DO NOT GET GLUE ON THE WIRE TORQUE ROD ARMS. Carefully wipe off any excess glue. This completed assembly can now be carefully glued directly to the trailing edge of the center section and allowed to dry.

7. The center section, from about the center of W-13, back to the trailing edge can now be sheeted with 3/32" balsa—note grain direction. At the leading edge of the center section, cut, fit and glue in place a piece of 3/32" x 1" leading edge sheeting. For now, this completes the center section. You will add the last piece of top sheeting after the forward wing hold-down dowel is installed.
8. In this step we want to prepare each of the required components—the top and bottom spars, the 3/8" x 1/2" front L.E. and the rear 1/4" x 3/8" T.E.—with the proper dihedral angle at their inboard ends. The cross-section of the wing that is shown on the plans is ideal for this purpose. Simply lay, for instance, the bottom 1/4" x 1/2" balsa spar in place over this drawing. Note that the outboard end is cut at 90 degs.; but that the inboard end must be cut at an angle to achieve the required 3/4" per panel dihedral angle. Make two of these bottom spars. Now repeat this process with the top spars, the leading edges and the trailing edges (note that the length of the leading edges is developed from the top view of the wing plan). The inboard edges of the 1/4" x 1-1/2" lower leading edges should be first cut at 90 degs. and then slightly chamfered to match the needed dihedral angle.
9. Start construction by first pinning the 1/4" x 1-1/2" lower leading edges in place, directly over the plans. Note that the inboard edges of these two parts terminate at the outer edges of the two outboard W-1A's in the center section. Now pin the 3/32" x 1" bottom trailing edge planking in place. Glue the 1/4" x 3/8" trailing edges in place on the top, rear of the 3/32" trailing edge sheet. From the 3/32" x 1/4" x 36" stock provided, cut, fit and glue each of the bottom capstrips in place—pin to secure. Using the 3/32" sheet balsa provided, measure, cut and glue the inboard bottom wing sheeting in place—note grain direction. Locate the two remaining W-6 wingtips, clean their edges and glue in place. The bottom 1/4" x 1/2" spars (angled ends inboard) are now glued in place to the bottom wing sheet and capstrips. Now glue all required W-2A, W-2B, W-3, W-3P and W-4 ribs in place, making sure they are vertical to the work surface.
10. Locate and remove the remaining twelve W-5 rear angled ribs from their die-cut sheets. Note on the plans that the forward ends of these ribs are chamfered to fit against the W-3 rib sides and that their placement does not interfere with the placement of the top spar slots. Also note that the innermost W-5 rib must be trimmed slightly so as not to interfere with the placement of the main dihedral brace. Glue W-5's in place. Glue all of the wingtip braces (W-7, W-8, W-9, W-10, and W-15) in place on the W-6 wingtips. Note that W-7, W-9 and W-10 need to have their inboard ends chamfered with a sanding block to fit flush to the outer face of W-3.
11. Now take the center section which was assembled earlier and fit it to one of the wing panels. Tilt it until the two arms of the W-11 plydihedral braces fit flush to the front and rear bottom sheeting and the center brace assembly is correctly positioned against the bottom spar. Check this fit to be sure all components fit nicely. Trim if needed to get proper fit. Prop and/or pin this center section in this position as you will use it as a guide for the remaining wing panel parts. Remember *not* to glue anything to the center section yet; it's only in place for spacing purposes.
12. Glue the front 3/8" x 1/2" leading edge in place on top of the lower 1/4" x 1-1/2" leading edge and against the front of each full and half rib (angled end inboard to fit against tilted center section). Glue the top 1/4" x 1/2" spar in place (angled end inboard). Cut, fit and glue the 3/32" x 1" leading and trailing edge planking in place—pin or tape to hold. Remove the center section from the wing panel and repeat the above steps on the remaining panel.
13. Cut, fit and glue all top 3/32" x 1/4" capstrips in place on all of the ribs and half ribs.
14. Remove the wing panels from the work surface. Inspect them for any dried globs of glue, remove these with a #11 X-acto knife. Tape or hold the two wing panels together with the bottoms of each facing the other—align carefully. Use your sanding block to now shape the forward wingtips identically with each other and the curves shown on the plans. With the exception of the inboard ends, use your sanding block to carefully "match" the wing panels, leading edges, tips and trailing edges. Separate the panels and use a sanding block with light paper over all of the panel's surfaces to smooth them for later covering, after final assembly. The three lower wing components are now complete and should be set aside for later assembly.

## TAIL GROUP

The tail group of your Elder Biplane is built directly over the plans in a quite straight-forward manner. Note there are options open to you with these parts in terms of shape. The stab's gentle curves which terminate in sharp points at the trailing edge of the elevators give a certain "look," which can be changed by rounding the outboard trailing edges of the elevators. This "softens" the look of these shapes. The same thing can be done to the fin and rudder, top and bottom—looks nice. As shown, you can also scallop the trailing edges of the rudder and elevators to give yet another different look.

1. Start with the stab. Build directly over the plans which have been covered with the clear backing from MonoKote or food wrap. Position the two S-1



tips in place and the center S-2 as well; pin. From the 1/4" x 1/2" balsa stock provided, cut, fit and glue in place the two leading edges and the trailing edge. Using the same material, cut and glue in place the "cap" in front of S-2, thus completing the stab outline.

2. Cut, fit carefully and glue the 1/4" sq. balsa ribs (three per side) in place. Use short lengths of 1/4" x 1/2" stock to make the fillets—note grain direction.
3. From the 1/4" x 2-3/4" balsa stock provided, measure and cut the two elevators. Notch them as shown to accept the 1/4" dia. dowel elevator joiner. With the stab still in position on the work surface, pin the elevator halves in place. Protect the trailing edge of the stab with a strip of waxed paper and epoxy the dowel joiner in place in the notches—allow to set completely.
4. Remove the stab and elevators from the plans. Build the fin next in the same manner using the R-1 and R-2 die-cut pieces with 1/4" sq. and 1/4" x 1/2" balsa frames shown. Cut the rudder to shape from the remainder of the 1/4" x 2-3/4" balsa stock used for the elevators. Position the rudder in place to the back of the fin and glue R-3 in place to the leading edge of the rudder. Remove the parts from your building board.
5. Using the 3/32" x 1/4" balsa provided, cap strip both sides of the fin and stab assemblies as shown on the plans. Be sure, when capping the lower edge of the fin, to leave a distance of 3/32" from the bottom to allow the fin to fit into the slot between the two top S-3 caps. Glue the two S-3 caps to the upper surface of S-2, leaving a 1/4" gap at the centerline for the fin. Test-fit the fin in place on top of the stab. With the fin still in place, cut, fit and glue the forward 3/32" x 1/4" cap strip in place forward of the fin. Remove the fin.
6. The elevators, stab, fin and rudder are now final-sanded to shape. Start by using masking tape to mount the elevators to the stab. Use a sanding block to go over all of the outside surfaces to carefully match them. Lay the stab on a flat working surface, masking tape down, and use the sanding block to sand it flat. Use the sanding block to taper the elevators as shown on one side. Tape the stab/elevator hinge line, turn the stab over, remove the tape from this side, and repeat the process. The same method is used for the fin and rudder. Once complete, use sandpaper to round the leading edges. Set these parts aside for covering and assembly to the fuselage.

## FUSELAGE ASSEMBLY

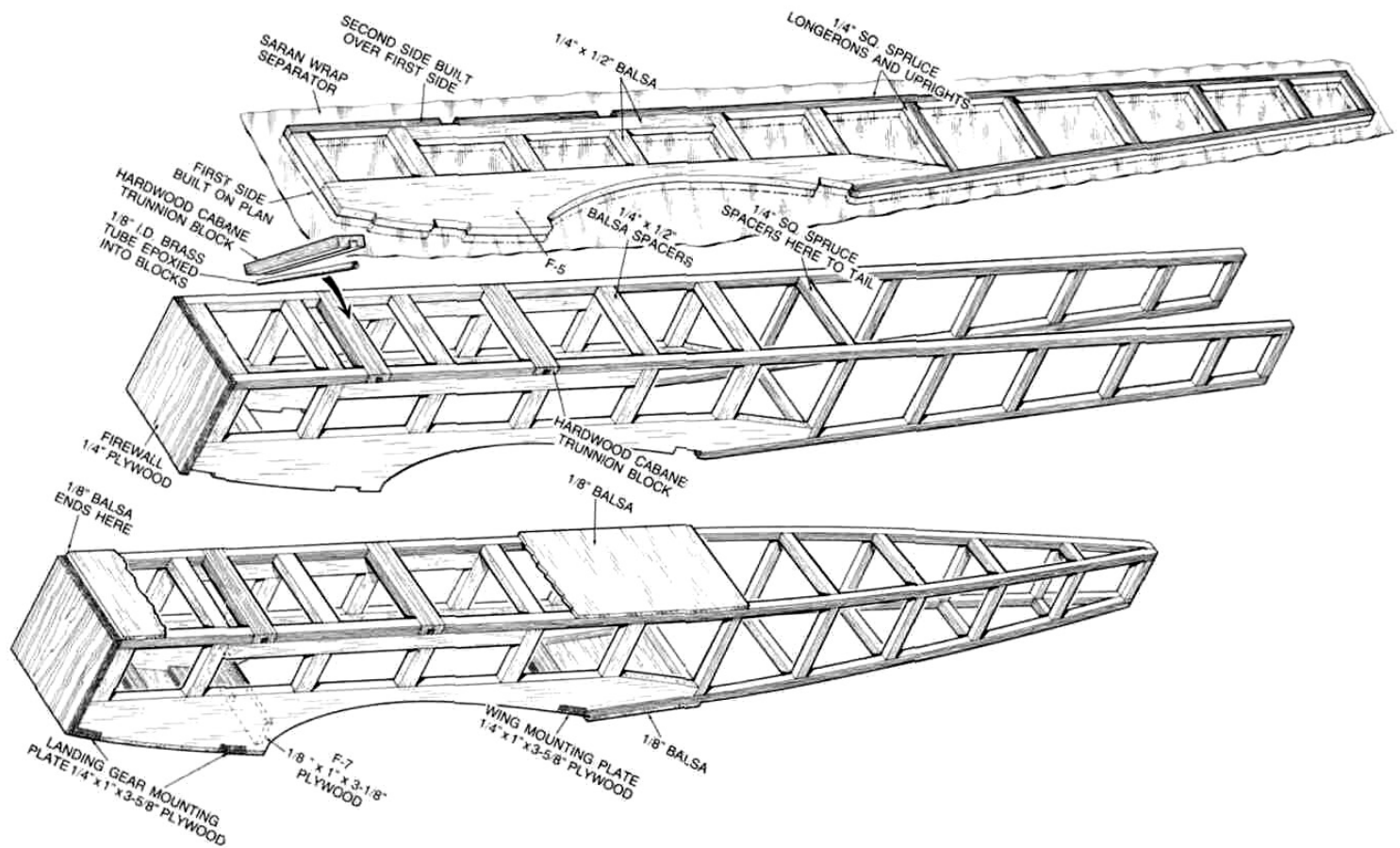
Before starting construction, study the plans, cross sections and illustrations to familiarize yourself with how the fuselage is assembled. Note that it really is nothing more than a basic "box" fuselage with semi-formers on the top and in the nose area to create the required rounded look. This simple and effective way of making a

fuselage can only be ruined in one way; building it crooked. This can be done by not making the fuselage side frames identical and/or mis-sizing the top and bottom cross braces. Another common error is to make improper joints. The Elder Biplane relies a great deal on the strength of its frame—take the time to make each and every joint required, fit as precisely as possible. Also note that the uprights and cross braces are a mix of both spruce and balsa. These are notated.

Join Plan Sheets 1 and 2 at the center lines provided. As shown, lay your straight edge along the top longeron to line-up the two drawings. Carefully tape the plans together. Now cut-out the Top View section and again using your straight edge, placed along the center line of both drawings, carefully tape in place. Since the side frames will be built directly over the plans, cover and protect them with either MonoKote backing or clear food wrap.

1. Locate and remove both F-5 die-cut fuselage doublers from their sheet. Pin or hold these parts together, aligning carefully, and use your sanding block to "match" their outer edges exactly. Pin one of the F-5's directly over its location on the plan. Measure, cut and pin in place the upper 1/4" x 1/2" balsa sub-longeron which fits between the F-6 and F-11 locations and directly beneath the top spruce longeron.
2. Note that the top 1/4" sq. spruce longeron is actually three separate lengths. There are two required gaps of 5/8" each to fit the slotted cabane trunnion blocks. Carefully cut these three lengths of spruce and glue them in place, over the plan, to the top surface of the 1/4" x 1/2" sub-longeron. Use crossed pins to accurately secure the rear end of this longeron to your work surface. Measure, cut and glue the bottom 1/4" sq. spruce longeron in place to the bottom of F-5 (note the angled cut at the bottom, front end of this longeron to accommodate the wing saddle). Again secure the rear end of this longeron to your work surface with crossed pins.
3. Cut, fit and glue in place the six (6) 1/4" x 1/2" balsa uprights, shown from A-A through C-C.
4. With the top and bottom spruce longerons securely and accurately positioned over the plans, cut, fit and glue in place the six (6) 1/4" sq. spruce uprights, starting at the rearmost tailpost and working forward. This completes the first fuselage side frame. Remove it from your work surface and use a sanding block to lightly sand each side of it smooth.
5. Reposition the frame onto your work surface and, as shown, cover it with protective backing from MonoKote or food wrap. The second, identical fuselage frame is now built directly over the bottom one. Again, take your time and carefully build this second frame exactly like its mate.





Remove the two completed frames from your work surface and again use your sanding block to lightly sand both sides of the newly completed frame. Pin and tape the two frames together and use your sanding block to make sure they are identical. From your kit box locate the three  $\frac{1}{4}$ " x 1" x  $3\frac{5}{8}$ " plywood blocks, the two  $\frac{1}{8}$ " I.D. x  $3\frac{3}{4}$ " brass cabane mounting tubes and the two slotted  $\frac{1}{4}$ " x  $\frac{5}{8}$ " x  $3\frac{5}{8}$ " cabane trunnion blocks. Use sandpaper to rough-up the two lengths of brass tubing and epoxy them into the slots of the cabane trunnion blocks, being sure to center them. Use at least 1-hour-type epoxy for this job.

Carefully position the two fuselage frames, upside down, over the top view of the plans. Block and/or pin as needed to hold them in place at right angles to your work surface. Take two of the  $\frac{1}{4}$ " x 1" x  $3\frac{5}{8}$ " ply blocks and epoxy them in place in the cut-outs provided at the forward end of F-5. Epoxy the third  $\frac{1}{4}$ " x 1" x  $3\frac{5}{8}$ " ply block into the slots at the rear of F-5, in the wing saddle. From the hardwood parts bag locate the  $\frac{1}{8}$ " x 1" x  $3\frac{1}{8}$ " ply F-7. Touch-up the ends of this part to fit nicely between the F-5's, at the very leading edge. Epoxy F-7 in place. Allow the epoxy to cure before removing structure from your work surface.

With the structure upright, epoxy the two cabane trunnion blocks, tubes already installed, in place in the gaps provided in the top spruce longerons. Use a slower curing epoxy (1-3 hour type) to give you the time to ensure that the structure, thus far, is truly

square. While waiting for the glue to cure, measure and cut the six required *identical* lengths of  $\frac{1}{4}$ " x  $\frac{1}{2}$ " balsa top and bottom cross braces and the three also identical lengths of  $\frac{1}{4}$ " sq. spruce top and bottom cross braces. Again, all nine of these cross braces are of identical length to fit exactly between the fuselage frames. Starting at the top front of the fuselage, glue all five of the top  $\frac{1}{4}$ " x  $\frac{1}{2}$ " cross braces in place, back to and including Section C-C (the plans show  $\frac{1}{4}$ " sq. material at this point, disregard and install the  $\frac{1}{4}$ " x  $\frac{1}{2}$ " brace). Behind Section C-C, at the location of the first vertical  $\frac{1}{4}$ " spruce upright, glue one of the  $\frac{1}{4}$ " sq. spruce cross braces in place. Turn the fuselage over and glue the remaining  $\frac{1}{4}$ " x  $\frac{1}{2}$ " cross brace in place at Section B-B and the remaining two  $\frac{1}{4}$ " sq. spruce cross braces at Section C-C and at the location of the first vertical upright. Use your sanding block to lightly go over all four sides of this structure.

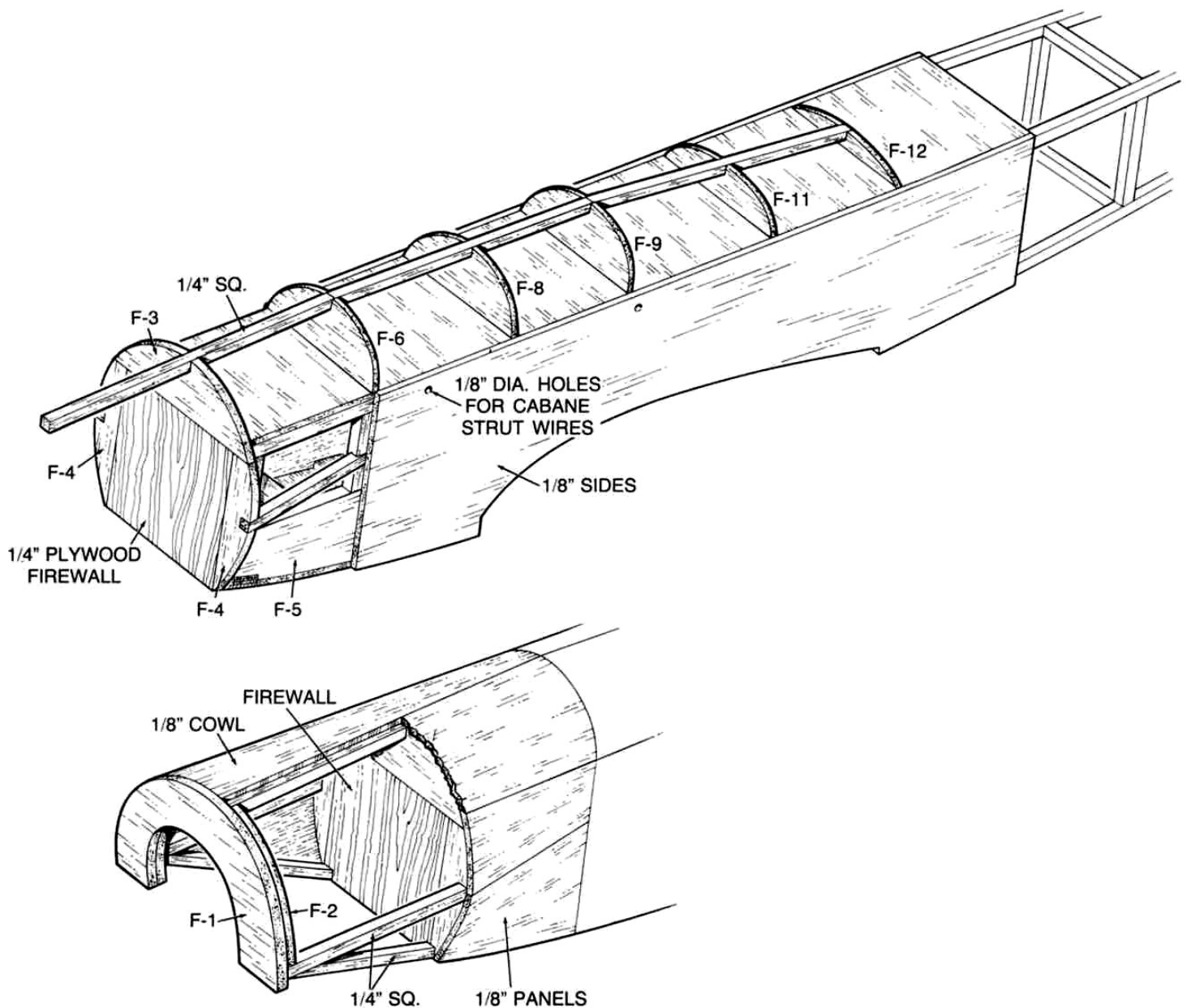
9. While we still have relatively good access to the inside of the fuselage, now is the time to drill the required  $\frac{1}{4}$ " dia. hole through F-7 and into the lower wing's center section. Accurately pin and/or tape the center section into the wing saddle. Use a  $\frac{1}{4}$ " drill bit and electric drill to drill a hole through F-7, the leading edge and the forward W-11 dihedral brace. Remove the center section and set it aside for now.
10. From your kit box, locate the  $\frac{1}{4}$ " x  $3\frac{3}{8}$ " x  $3\frac{3}{4}$ " ply firewall, the four 4-40 blind mounting nuts and the four 4-40 x  $\frac{7}{8}$ " R.H. bolts. You will also need the

molded fiber-filled motor mount. Using the plans and the motor mount, you must now carefully mark the location of the four mounting holes required for the mount. Using a drill and a 1/8" dia. bit, drill the four holes through the firewall. Now epoxy the 4-40 blind mounting nuts in place to the back of the firewall, into the holes just drilled—keeping adhesive out of the threads. Locate the motor mount to the front of the firewall and use the bolts to tighten it in place. Allow the glue to cure and remove the mount. The firewall is now epoxied in place to the front of the fuselage—align carefully and allow to cure.

11. Assemble the fuel tank that you plan to use. This design can use either 10 or 12 oz. fuel tanks. (We've shown a Du-Bro 12 oz. tank, mounted upright, on the plans.) Fit your tank into the nose of the fuselage assembly. You can see that the tank needs to be supported to sit level. Make up a couple of supports for the tank (two lengths of 1/4" x 1/2" balsa, between the two F-5's works well) and glue them in place, making sure the tank now rests level. In this way, when the fuselage is complete, the tank can be inserted from the lower wing opening into the nose and removed, if needed, with assurance that it is in place correctly. Now use a 3/16" dia. drill bit to make the two required holes through the firewall for the fuel tubing (we like and suggest a "two line system"; one fuel line for fuel feed and filling and the other for the pressure tap and overflow). Remove the tank.
12. Drill and tap the holes necessary in the motor mount to attach your engine (we like to use 4-40 Allen-head hardware for this purpose). Attach the motor mount to the firewall and the engine to the mount. By viewing from the front, determine the location of the throttle tube housing exit hole. This should be lined-up with the carb's throttle arm. Drill a 1/16" dia. hole through the firewall for this tube. Rough up the outer surface of the outer throttle tube housing and glue it in place in the firewall—about 3/16" of it should protrude out from the face of the firewall, the rest of it runs into the radio compartment. Be sure your tank still fits in place.
13. The servos shown on the plans are of average or standard configuration; yours may be different (taller, wider, etc.). The Elder Biplane will accept almost any radio system. In this step you are going to determine the location of the 1/4" x 1/2" balsa servo tray bearers. Remember that the servo tray is 1/8" thick ply. Lay one of the servos that you plan to use directly over the side of the fuselage, at the location shown on the plans and mark the location of these tray bearers. Cut, fit and glue in place the servo tray bearers, one on each side of the fuselage.
14. Using the 1/8" x 3" x 30" balsa sheet provided, the bottom nose of the fuselage, back to the rear face of F-7 is sheeted—note cross grain direction, typical throughout this step. Again, hold or tape the lower wing's center section in place in the F-5 wing saddle. The bottom rear of the fuselage is now sheeted from the trailing edge of the center section, back to the

point shown on the plans. The top of the fuselage is now sheeted, as shown on the plans and illustrations. As shown, do not sheet the top of the 1/4" ply firewall, this is the location of the top F-3 former. Use your sanding block to smooth the fuselage sides and sheeting just applied and to blend the bottom nose sheeting and landing gear mounting blocks to the smooth curve shown on the plans.

15. Using a pencil and triangle, hold the fuselage directly over the side view on the plans and mark the location of formers F-6, F-8, F-9, F-11 and F-12 directly onto the top 1/8" balsa sheeting. From your kit box, locate the two 1/8" x 6" x 21" balsa sheets that are the fuselage sides. Use a straight edge and an X-acto knife to true-up one of the long edges of each of these sheets. Now lay one of the sheets directly over the fuselage, aligning its trued-up edge with the top surface of the top 1/8" sheeting. Note that the forward end of the sheeting terminates at section B-B. With the side sheeting properly aligned, press it to the fuselage side at the tube ends of each of the cabane trunnion block locations. This should indent the sheeting with the slightly protruding tubing ends. Remove the sheeting and use a 1/8" dia. drill bit to make a hole through the sheeting at both indentations. Reposition the sheeting to the fuselage and use a pencil to carefully draw the bottom and rear fuselage side outlines onto the sheeting. Use your X-acto knife to remove the drawn outline. This fuselage side is now glued in place to the fuselage frame. Repeat process for the opposite side. Use your sanding block to true-up all edges and sides.
16. Locate and remove 1/4" die-cut parts F-3 (1) and F-4 (2). Stand the fuselage on its nose, firewall flat to your work surface. Glue the two F-4 formers in place to each side of the firewall and the F-3 former to the top of the firewall and the tops of the two F-4's. Use your sanding block to smooth the formers to the face of the firewall. Locate and remove formers F-6, F-8, F-9, F-11 and F-12 from their die-cut sheets. Using the location marks made earlier, glue each of these semi-formers in place to the top of the fuselage. Make sure they are centered and that they sit at right angles to the fuselage sheeting. (Note that there will be one extra F-6 former—it will not be needed.) From the stockwood in your kit box, locate a length of 1/4" sq. balsa. Measure, cut and fit the required length to fit into F-12 (at the rear), forward to and including the F-2 location—4-1/2" ahead of section A-A. Partially cut through and crack this longeron at the F-9 and F-6 former locations to obtain the right outline. Glue this longeron in place. Cut and fit the two required 1/4" sq. balsa stiffeners that fit into the F-4 formers and angle back to the second 1/4" x 1/2" upright (section B-B). Note that these two pieces fit only into one half of the width of F-4 and that they are notched to fit inside of the upright (see Top View).



17. You are now going to sheet the top turtle deck back from F-6 to the rear of the fuselage with the 1/8" x 3" x 30" balsa sheet provided. We suggest that you break this up into four areas; a left and a right from F-6 to F-9 and a left and a right from F-9 to the back of the fuselage. We also suggest starting at the center of the top longeron and working down. Wetting the wood with either water or a little ammonia will make the curves required quite easy. Also be sure to leave yourself a little "shelf" at the F-6 former for the forward sheeting and at the F-9 former for the rear sheeting. Take your time, trim and sand the sheeting for a good fit before glueing in place. A thick type CA glue is good here as it eliminates the need for pins.
18. Cut, fit and glue in place the two side cow/longerons which fit into the half-notches left in the F-4's and extend out to the F-2 location. (See illustrations and Top and Side view of the plans.) Locate and remove formers F-1 and F-2 from their die-cut sheet. Observe how F-2 sits in place when attached to the three 1/4"

sq. pieces extending out from the cowl. Viewed from the side and top, F-2 is parallel with the firewall. Use a ruler to be sure and trim the ends of the 1/4" sq. material as needed. Once satisfied, glue F-2 in place. Use your sanding block to lightly sand the forward face of F-2 smooth. Position F-1 in place against F-2. Note that doing this creates an approximate "shelf" of 1/8". This is to locate and glue the forward cowl sheeting in place. Glue F-1 to F-2. Last, glue the two required 1/4" sq. balsa pieces that fit from the bottom, outside corners of F-2 down to the bottom, outside corners of the F-4's. Bevel-cut each end of these to fit correctly.

19. Note the illustration in the lower left-hand corner of Plan Sheet 1. This gives the correct sequence for finish-sheeting the fuselage top and cowl. Again, wetting the various balsa sheeting pieces with water or a little ammonia helps the material to readily conform. Take your time to achieve accurate, gap-free fits before glueing these pieces in place. Thick CA

adhesive works very well here, eliminating the need for pins. If you've taken your time and fitted these pieces in place with a minimum of gaps, all that remains is sanding to shape.

20. Use your sanding block and coarse paper to now bevel the inside ends of the spruce fuselage framework at the tailpost—see Top View of plans. Once satisfied, carefully epoxy these ends together, providing equal bends to each side of the fuselage when viewed from the top. Also view the structure from the rear making sure everything is square. When satisfied, clamp securely and allow to cure. Accurately cut five (5) pairs of top and bottom 1/4" sq. spruce cross braces which will correspond, in location, to the exposed uprights. We suggest cutting these pieces at the same time, taking care to ensure that they are of equal length. With the tailpost joint fully cured, glue cross braces in place, working from the front to the back. Check each cross brace installation as you go, making sure the structure stays square.
21. The complete fuselage, including the exposed spruce framework should now be given a complete sanding. Any gaps, nicks or dings should be filled and sanded-off. Remove the two F-10 (ply) pushrod guides from their die-cut sheets. Use your sanding block to clean-up their edges and the slot. Once satisfied, glue F-10's in place to the outside of the vertical uprights, beneath the stabilizer location. The last thing to do is to make the cut-outs for the cockpit locations for your "pilots". At this point, you can choose to make the model a one or two "holer." With the exception of the cabane struts and some other details which will follow, your fuselage is complete.

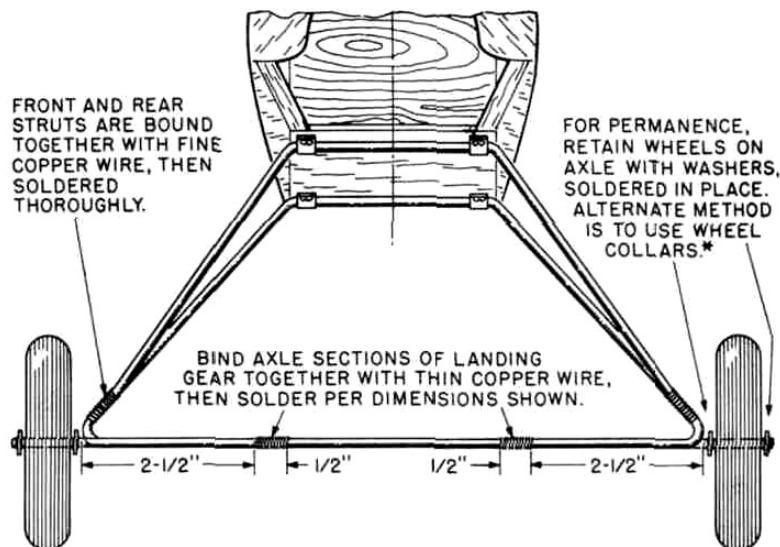
## WIRE PARTS ASSEMBLY

### I. LANDING GEAR

The pre-bent front and rear 1/8" dia. M.W. landing gear (L/G) forms must be joined together at the bottom,

towards the wheels. We recommend soft copper wire for firmly and neatly wrapping the two pieces together prior to soldering. We would highly recommend the use of HARRIS'S STAY-CLEAN FLUX and their silver solder for this operation. Although a soldering iron will work, with patience, these joints can be quickly and permanently made with the use of a small hobby-type gas torch.

1. Locate the position of the rear "cross-axle" wire to the bottom rear ply L/G plate on the fuselage bottom. While holding the wire in place, slip the two formed metal clips onto the wire. Use a pencil to mark the hole locations of these clips onto the ply base, then remove the wire and clips. Drill shallow, small-diameter "guide holes" for the clip's #2 x 3/8" screws. Now attach the landing gear wire to the fuselage with the clips and screws—do not over-tighten. Repeat this process with the *forward* landing gear wire.
2. Pull the two wire parts together until they touch. The two short bent 'arms' on the forward leg should line-up with the legs of the rear L/G wire. If needed, use pliers to adjust these arms until they fit neatly and uniformly.
3. Use soft copper wire to now neatly wrap the forward short arms to the rear L/G wire as shown in the illustration in the plans. Apply some STAY-CLEAN flux to the joint and solder. Repeat the process on the opposite side. Be neat and try to be sure that the joint is solid without a lot of excess solder. Once the joint has been made, clean with water to remove all flux and dry-off with a paper towel.
4. As shown, the crossed-axle landing gear system derives its ability to accept landing loads and shock from the two independent axle legs. These need to be joined at two points, each 2-1/2" in from the wheels. This distance has shown very good shock-absorbing ability for Elder Biplanes weighing 7-1/2 to 8-1/2 lbs. Join these axles by first measuring the 2-1/2" distance required, wrapping with soft wire (about 1/2") and soldering. Again, clean the solder joints completely with water and dry.



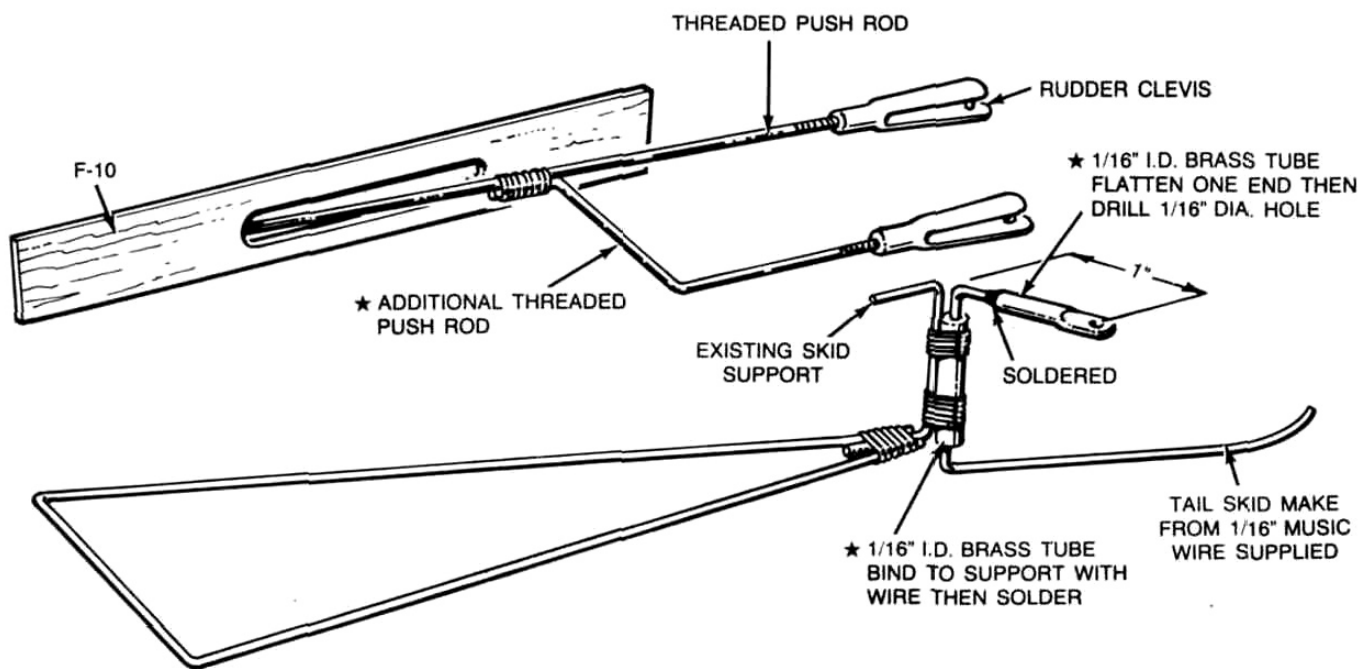
- 5 . The wheels can be retained in one of two ways. As shown, simply soldering 1/8" I.D. washers in place will do the job. A more realistic method is to fit the axle legs with lengths of 1/8" I.D. brass tubing, soldered in place. With the axle holes of the wheels drilled out to fit over these pieces of tubing, the wheels are slipped in place. Next, slip a washer over the tubing, against the wheel. Now drill a small diameter hole through the end of the brass tubing and insert a small cotter pin to retain wheel. Note that the length of the M.W. L/G axle should be shortened first, using a carbide cut-off wheel on your Moto-Tool.

## II. REARTAILSKID

- 1 . From your kit box, locate the 1/16" dia. x 22" length of M.W. and the 1/16" pre-bent skid support wire. Note the side and bottom view of this assembly, shown on Plan Sheet 2. Use the pattern to now bend the 22" length of M.W. to shape—easily done with pliers. Neatly wrap the rear tip of the skid with soft copper wire, apply flux and solder.
- 2 . Now tape the main skid wire assembly in place to the

bottom rear of the fuselage, at the cross brace, just behind D-D. Use tape to now locate the pre-bent skid support to the bottom, rear fuselage location shown. Use soft copper wire to neatly wrap the support wire to the tailskid, apply flux and solder. Remove the completed tailskid assembly from the fuselage. This assembly should be attached to the fuselage just prior to painting or staining the exposed spruce fuselage longerons, cross braces and uprights. We have used and suggest black carpet thread or fishing line for attachment.

- 3 . Should you wish to make this skid steerable, we've provided an illustration of how we did it. This assembly is essentially the same as the non-steerable one just made, except that the rear part of the skid is separate and is sleeved in a 1/16" I.D. length of brass tubing. An arm is bent, at right angles, at the top and another length of 1/16" I.D. tubing is soldered in place. The end of this piece of tubing is flattened and drilled with a hole to accept a nylon clevis. Now the rear part of the skid becomes steerable when a second threaded pushrod and nylon clevis are attached to the rudder pushrod. Note that the parts for this option are not supplied with your kit.



## STEERABLE TAIL SKID (OPTIONAL)

### III. INTERPLANE STRUTS

1. Your Elder Biplane requires the use of two interplane strut assemblies. The pattern for their assembly and the illustration showing the method of connection are on Plan Sheet 4, lower right-hand corner. Note that when complete, the two required strut assemblies will be "mirror-images" of one another, in other words a left and a right. The "Z-bends" on the bottom of the strut assemblies are first fitted into the holes in the mini-horns, from the outboard ends of the bottom wing and then rotated upwards. The top ends, with the threaded clevises, are then attached to the mini-horns protruding from the bottom of the top wing. Since threaded clevises are used, the length of these struts are fully adjustable for each side of the wings.
2. From your kit box, locate four of the .072 dia. x 12" threaded one-end pushrod wires and the single piece of 1/16" x 14" M.W. These are the parts required for the two interplane struts. From the 14" piece of M.W., cut two 7" lengths. Use a pair of pliers to bend the ends of each of these two pieces to the shape shown on the plans, which connects the two threaded one-end strut wires. Wrap each end with soft copper wire and solder. Cut the length of each strut as shown on the plans and use pliers to make the Z-bends at the bottom of each.

Later, when the model is assembled, you'll be adding the nylon clevises to each of the strut ends and attaching these assemblies for adjustment.

### IV. FUSELAGE CABANE STRUTS

1. From your kit box locate the four pre-bent cabane struts and the two pre-bent cabane strut braces. Note on the side and top views of the fuselage plans that the four cabane struts are meant to be inserted into the 1/8" I.D. brass tubes that have been built into the fuselage. Note that it may be necessary to adjust the length of these wires, at the end that inserts into the tubes. This length should be 1-3/4" to allow the left and right wires to be fully inserted. Any excess length should be removed with a carbide cut-off wheel and your Moto-Tool. Trial-fit each of the four pieces in place into the fuselage to be sure they insert all the way.
2. Carefully clean each of the wires with a bit of thinner to remove any oil or grease.
3. Insert one of the cabane struts into one of the fuselage's forward cabane tubes. Use tape to secure it in place, at right angles to the fuselage, as shown in the side view. Insert another cabane strut in the rear tube location, on the same side, again using tape to secure it vertically to the side view of the fuselage. Now hold one of the braces in place to these two parts, as shown on the plans. The fit and relationship should be what is shown. Once satisfied, carefully and neatly wrap the top, forward leg of the brace to the top, forward end of the front strut (a bit of tape can be used to hold the bottom,

rear end of the brace in place, while you're working) with soft copper wire. Apply a little flux and carefully solder this joint.

Now carefully slide the assembly out of the tubes about 1". Remove the tape from the bottom rear brace/strut joint. Wrap this joint with copper wire and solder.

Duplicate this procedure on the other side of the fuselage, being careful to make an exact opposite of the first strut/brace assembly. These two strut assemblies can now be set aside for later installation.

### FINAL ASSEMBLY

1. Locate one of the 1/4" dia. x 36" spruce dowels provided in your kit. Cut a 3" length. Mix a little 1-hour type epoxy and place some of this glue into the slot created by the two W-1A's in the lower wing's center section. Insert the dowel, through the leading edge, leaving 1/4" exposed. Add more glue to the top of the now-inserted dowel. Carefully install the center section in place to the fuselage, engaging the dowel into the hole in F-7. Center the structure to the fuselage and tape in place and allow to cure.
2. From your kit, locate four nylon mini-horns and four #2 x 3/8" R.H.W.S. screws. These horns are now screwed in place to the W-3P ribs in the two lower wing panels. It is easiest to do this if you first drill a 3/32" dia. hole through each of the horns and then screw them in place—do not overtighten.
3. Remove the center section from the fuselage once the glue has cured. From the 3/32" sheet balsa stock, finish sheeting the rest of the center section's top surface. Use your sanding block to smooth this top surface and to smooth the edges flush with the outer W-1A's and B's.
4. Firmly pin and/or weight the center section over your protected work surface and epoxy the left and right lower wing panels in place to it. Do not use so much adhesive that it drips or runs but enough to adequately coat the parts required. Prop each wingtip up 11/16" to achieve the correct dihedral and allow the structure to cure.
5. When the wing can be removed from your work surface, reposition it in place in the fuselage wing saddle. Turn the whole thing over and mark the location of the two required rear wing bolt holes onto the wing's hardwood trailing edge. With the wing firmly and squarely pinned and/or weighted on the fuselage, drill two 1/8" dia. holes through the bolt positions just marked. These two holes go all the way through the hardwood trailing edge and the ply wing mounting plate in the fuselage. Remove the wing from the fuselage. Now tap the two holes in the fuselage mounting plate with an 8-32 tap. Once the threads have been established, use a little *thin* CA adhesive to coat them and then run the tap through these threads again, several times; this toughens-up the threads. Now try the 8-32 nylon bolts supplied in

the now-tapped holes. They should work smoothly, without binding. Now use a 3/16" dia. bit and your power drill to open up the two holes in the trailing edge of the lower wing. This allows clearance for the two nylon wing hold-down bolts. Use a razor blade to trim the length of these bolts to 3/4".

6. From your kit box, locate the two remaining lengths of tapered trailing edge/aileron stock. Note on the cross section, shown at the lower left corner of Plan Sheet 3, that the right and left ailerons need to be beveled, top and bottom of the hinge line, to facilitate up and down movement. First carefully cut the ailerons to length, with about 1/32" clearance between the hardwood end of the center section and the aileron at the W-15 location. Use a small hobby plane and sanding block to bevel the leading edges of each aileron, as shown. Next, locate, mark and drill the 1/8" dia. hole in the inboard leading edge of each aileron that will engage the exposed torque rod ends. From the parts bag, locate the two 1/8" O.D. x 7/8" brass tubes. Rough-up their outer surfaces and insert them into these holes to a depth of about 1". Now use your MotoTool or X-acto knife to make a groove from these holes, inboard to the ends of the ailerons. These grooves will hold the torque rod arms and allow the ailerons to fit up to the wing's trailing edges. Test fit each aileron for correct fit and make any necessary adjustments.
7. Use a soft pencil to mark the location of each of the five (per side) aileron/wing hinges. Use a #11 X-acto blade to carefully and accurately slot the wing and its corresponding aileron for the nylon hinges. NOTE: The hinge line must line up with the torque rod arm for free, non-binding movement.
8. Temporarily mount the ailerons in place, hinged, to the lower wing. Sand the entire structure to final shape. Remove the ailerons and hinges and set them aside for final attachment after covering.
9. Using the plans and a soft pencil, carefully mark the positions of each of the four required 1/8" holes on the bottom sheeting of the top wing. These holes are required to engage and mount the top wing to the cabane strut assemblies.

Now bolt the lower wing to the fuselage and slip the left and right cabane strut wire assemblies into their tubes—use tape to retain these temporarily. Gently place the top wing onto the top of the cabane stubs, centering it as close as possible to the four pencil marks just made. The pencil marks may not line-up exactly, just do your best to get the stubs and marks as close as possible to one another.

Once the wing is in this position, you have some observations to make. First, when viewed from the top, the leading edges of both upper and lower wings *should* be parallel. If not, shift the top wing slightly to achieve this condition. Next, view the model from the front to determine that the top wing is centered (disregard any wing low condition for now) and adjust as needed to achieve this condition.

The last observation to make is the relationship of the tops of the wire cabane stubs to the 1/2" x 5/8" x 1-1/2" hardwood blocks, just above them. You want to be sure that the hole locations will be approximately those shown on the plans and cross sections. If some bending adjustments in one or more of the cabane strut arms needs to be made, now is the time.

Once all of the fore-going criteria has been met, uniformly press the top wing to the wire stub ends with the palm of your hand, to impress their locations into the balsa sheeting. Remove the upper wing, turn it over and use your power drill and a 1/8" dia. bit to drill the four holes through the bottom of the wing panels and each of the blocks, at right angles. Re-fit the wing in place to the cabane struts. Use the drill and 1/8" bit to make adjustments needed to allow the wing to accept the stubs. Take another look at the airframe to make sure everything is sitting squarely. Once you're satisfied, remove the top wing and remove the lower wing from the fuselage.

10. Lay the top wing upside down on your work surface and then mount the fuselage and cabane struts into the just-drilled holes. Locate the four required retaining straps and eight #2 x 3/8" wood screws. As shown on the plans, the balsa sheeting immediately beneath these straps and screws must be removed. Do this now with a #11 X-acto knife. Using the straps as a guide, mark the location of each of the screw holes. Drill eight 1/16" dia. "guide holes" for the screws. Use a screwdriver to now mount each of the four straps in place—don't over-tighten.

With this hardware in its location established, the top wing can now be removed from the cabane struts. The rest of the 3/32" balsa sheeting can be fitted and glued in place on the top, over the hardwood blocks. The wing should now be final-sanded preparatory to covering. Finally, using the instructions in FINAL ASSEMBLY step #2, mount the four nylon mini-horns in place to the W-3P ribs, making sure the ends of these protrude downwards, toward the bottom wing location—see cross section at bottom left of Plan Sheet 5.

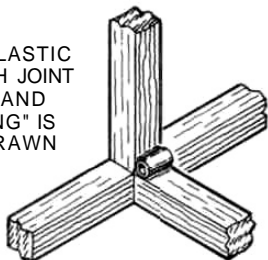
11. A 1/16" x 1/2" x 12" ply strip is provided for the fuselage frame "corner caps". These are shown on the top and bottom views of the fuselage and are cut to fit over each exposed spruce framework joint. The pattern drawing for these parts appears at the far right-hand side of Plan Sheet 2. Use the pattern and a pair of shears to make these caps. These are now carefully glued in place as shown. Use light sandpaper to smooth, prior to painting.
12. Using the locations shown on the plans, make the required hinge slots in the stabilizer and elevator with your #11 X-acto knife. Temporarily install the elevators in place to the stabilizer with a couple of hinges. Now make the two required hinge slots in the fin and rudder. As the plans show, a semi-circular opening, at the lower leading edge of the



rudder now needs to be made to allow clearance of the dowel elevator joiner and full movement of the rudder. With the rudder temporarily hinged to the fin, test-fit the fin into the stab slot to be sure there is no interference in the movement of the rudder and elevator dowel. Disassemble these parts.

As shown on the plans, we have used short lengths of scrap innerthrottlepushrod stock tubing to make the stab and fin flying wire brace points. These should be now glued in place in pre-drilled holes.

OPTIONAL DECORATION DETAIL-  
1/4" LENGTHS OF 3/32" OR 1/8" DIA. PLASTIC TUBING CAN BE EPOXIED INTO EACH JOINT BETWEEN A SPRUCE CROSS BRACE AND UPRIGHT (16 PLACES). LATER, "RIGGING" IS THREADED THROUGH EACH TUBE, DRAWN TIGHT AND EPOXIED IN PLACE.



Although we have been instructing you to sand the various components of your Elder Biplane as you were constructing them, take the time now to carefully re-check any structure which may require final touch-up sanding or filling. The difference between a good covering job and a great one tends to be about \$2.00 worth of sandpaper and the willingness to use it.

## COVERING & FINISH

Now that all of the various components of your Elder Biplane are completely assembled and sanded to their final shapes, you can turn your attention to covering. This is the point that can separate your model from anyone else's. You must decide what you want the finished airplane to look like. We have finished our prototypes in a wide variety of color schemes representing everything from an R.A.F. WWI fighter (in cream Monokote with red, white and blue Roundels and tail treatment) or a German WWI fighter (all red Monokote with black Iron Cross's on a white background) to civilian-type versions (dove gray fuselages, transparent blue wings and tail-group and chrome Monokote 'cowls')! Interestingly, no matter what color scheme we used, there was always a group of people at the flying site who would stand there looking at the Elder, arguing about what a real, full-scale aircraft it represented. Just remember that the Elder is not a scale-model, you're free to cover it in any configuration that strikes your fancy—it will look great!

Before covering, it is suggested that the final finish be applied to the open spruce fuselage structure. This can be done in several ways. There is a very good product on the market called Varathane that is sold through most well-stocked hardware and lumber supply outlets. This material is essentially clear and will leave the spruce about its same color, maybe a little darker, and somewhat shiny. It is resistant to spent fuel and quite durable in actual use. Epoxy paint, mixed to achieve a woodish brown color and brushed or sprayed, also works well. Take your time here, use light sandpaper to

go over the framework, smoothing it for the finish of your choice. When applying the finish, be sure that all of the exposed wood, *except* the top, rear stab glueing area, receives paint. We then used flat black paint (again, epoxy is great) to paint each of the ply 'joint caps'. This really makes the structure come to life!

Now for the covering itself. Use the directions that are supplied with each roll of Monokote and cover each of the various components separately; fuselage, wings, stab, elevators, fin and rudder. Some of you might have a problem with the wingtips of the Elder, if this is your first venture into the use of Monokote or your first R/C airplane. Here's a method that works quite well. First, cover the wing panels totally, starting with the bottoms first, including the wingtips. Then cover the tops of the wing panels out to and including the last outboard W-3 wing rib, but not the wingtips themselves. Next, cut an elongated triangular piece on Monokote to fit over the space between the forward W-3 rib and the forward W-7 wingtip former—keep edges straight, allow about 1/8" overlap and iron this piece in place. Move now to the next exposed triangular area between W-7 and W-8 and repeat the process. This method will provide a much easier covering situation for the newcomer and, if done carefully, gives you a nice looking, wrinkle-free wingtip. When covering the fuselage be sure that the bottom covering—the piece that you should apply first—overlaps into and on the firewall by about 1/4" at least.

Assuming that the airplane is now covered, turn your attention to fuel-proofing the engine compartment. We like to use and highly recommend a liberal coat of polyester resin. This material should be applied to all/exposed wood in the inside of the cowl area and over all of the Monokote seams that terminate in the cowl itself. This seals the wood as well as the Monokote seams and avoids "fuel creep" later on. Be sure to keep the resin out of the bolt holes in the firewall.

Use your X-acto knife to now clear-out all of the hinge slots in the ailerons, wing and tail group. Do the same thing for the wing hold-down bolt holes, the cockpit, the landing gear screw holes, etc.

Mount the lower wing to the fuselage with the nylon bolts. Place the stab in position on the top rear of the fuselage and sight down the front of the model to observe if the stab is sitting flat in relationship to the wing, without any tilt. Once satisfied, hold the stab firmly in place in the position that it is meant to be; square with the fuselage and aligned correctly with the wing when viewed from the top—make sure that it is exactly where you want it. Use a sharp pencil and, while holding the stab in place, trace the outline of the framework that is in contact with the bottom of the stab onto the stab itself. Remove the stab from the fuselage. Use your X-acto knife to now lightly cut-out the frame outline from the bottom of the stab's Monokote to expose the wood—this will be your glueing surface. The stab can now be mounted to the fuselage; we used a 'thick' CA adhesive for this.

Next, prepare the fin for mounting to the stab by making sure that all covering is removed from the bottom of it, leaving exposed wood. Be sure that the covering on the top of the stab is well-adhered to the center S-3's because you will be removing some of it, at the center, to accommodate the fin. Use your X-acto knife to remove the covering from the fin slot location, exposing the wood. Before glueing the fin to the stab, use a pin to make lots of small holes in the exposed wood of both the stab and fin bottom, these need not be deep. Use a slower drying adhesive (Titebond, 1-hour epoxy, etc) to now glue the fin in place on the stab. Use a length of light tape over the top of the fin and on each tip of the stab to hold the fin in place, at right angles, and allow to dry. Check periodically while this structure is drying to be sure that the fin has not shifted and is in place at right angles to the stab and on the centerline of the fuselage; we want everything "square". When this structure is dry, remove the tape. Thread a length of 20# fishing line (used for rigging thru-out, if desired) through the hole at the top of the fin and glue each of the line holes at each tip of the stab—carefully applied "thick" CA adhesive will work well. The fin should now be quite immobile on the stab.

Use 1-hour epoxy to now glue the hinges required into the trailing edges of the wings, stabilizer and rudder. Next, mount the elevators to their hinges followed by the rudder and ailerons. A little acetone or CA debonder on a clean paper towel can be used to clean-off any glue that has oozed out of the hinge slots.

Mount the landing gear assembly to the fuselage with the screws and clips provided. Mount the clips securely but do not over-tighten.

Now install the motor mount to the firewall. Use one or two washers behind the top two motor mount bolts to give about 2 to 3 degrees of down-thrust. Mount your engine to the motor mount. Cut two lengths of fuel tubing with sharp angles at one end. Insert the angled ends through the firewall and use a pair of long-nosed pliers to reach into the fuselage and pull them almost through the tank compartment. Trim the ends of the tubing and connect them to the appropriate tubes on your tank. Now pull the tubes back through the firewall while moving the tank into the fuselage. Trim the tubing to length and make the connections to your engine and pressure tap.

The two 1-1/8" x 2-3/4" windscreens are now trimmed to shape using the patterns provided on Plan Sheet 1. We suggest that you then press these to the surface to create a slight indentation and use an X-acto knife to create a "slot" into which they can be inserted. A small amount of CA glue will hold them nicely. If you're using pilot busts, these should be assembled, trimmed to fit in the cockpit openings and painted. They can then be epoxied in place.

At this point you might be considering detailing the model with a few "goodies". We have used a few items that were "off-the shelf" in most well-stocked hobby shops. Williams Bros. makes some nice 2-1/2" scale

machine gun kits which would work well with this model. These are available in WWI vintage, both British and German. To mount these, you would only have to epoxy a couple of dowels into the bottom of the gun(s) and glue directly to the top of the fuselage, ahead of the forward cockpit location. As shown on the plans, we also used Williams Bros, vintage-style wheels. The true spoked wheels, shown on the model depicted on your label, were obtained from our local hobby shop. Supply of these type of wheels varies greatly.

On a couple of our prototypes we detailed the cockpits with veneer instrument panels, vintage instruments, and black tubing which we slit and mounted around the cockpit openings. Detailing your Elder Biplane is a lot of fun and makes *your* model an individual.

With the exception of any additional detailing, painting, etc. that you might want to do, your model is now essentially finished, needing only the installation of the radio.

## RADIO INSTALLATION

The method of installing your radio in the Elder Biplane is shown on the plans. Note that we have provided you with a 1/8" x 2-7/8" x 4-7/8" ply servo tray. Use a pencil and straight edge to lay-out the positions of your servos on this tray. Note that we show the rudder and elevator servos at the rear, mounted side-by-side with the throttle servo just ahead, mounted sideways. Drill a 1/4" dia. hole into each of the servo pencil marks and use a Dremel saw or jigsaw to remove the servo cut-outs required (3). Test-fit the servos into the tray and the tray into the fuselage—it is meant to rest atop the two 1/4" x 1/2" balsa bearers that were built into the fuselage frame earlier. Note that the tray can be slid fore and aft a little to provide some C.G. change, if needed, later when it is permanently glued in place.

The receiver and battery pack are meant to be installed forward of the servo tray, as shown. These components should be installed using foam rubber. The receiver antenna on our prototypes was simply routed out through the fuselage, internally, and tied-off at the tailpost of the rear fuselage framework. The switch harness may be attached directly to the fuselage side, away from engine exhaust.

Next, make the rudder and elevator pushrods using the remaining lengths of the VA" dia. dowel provided. These will be cut to about 22" lengths. Locate the two 12", threaded on one-end, wire pushrods supplied in your kit. Cut 5" off each of these pushrods; leaving two 7", threaded one-end pieces. Save the 5" pieces and, as shown on the plans, attach the non-threaded ends of the 7" pieces to the ends of each dowel with epoxy and tightly-wrapped thread. Now attach the two remaining 5" wire lengths to the opposite ends of the dowels. From the inside of the fuselage, slip the pushrods in place through the rear of the frame and out the pushrod exit guides. Some *small* amount of bending of these control wires may be needed to provide free, unbinding movement. Avoid hard or abrupt bends.

Locate the two nylon horns provided for the elevator and rudder. Mark the locations of these on the rudder and elevator and drill the two required holes for each. Mount the horns. Thread two clevises onto each end of each pushrods and attach the clevises to the nylon horns. Now test the movement and action of the rudder and elevator by moving the pushrods by hand. It is essential that the movement be smooth, non-binding but not sloppy. Once you are satisfied, make the required "Z"-bends at the servo-end of the pushrods and make the connection to the rudder and elevator output arms.

Adjust the whole system for neutral and test the movement of the surface when actuated by your radio. The plans show the recommended movement of the rudder and elevator and this can be adjusted by moving the clevises in or out on the horns; "in" would be more movement or throw and "out" would be less.

Make the connection from the throttle servo to the engine by screwing at least  $1/4"$  of one of the 6", threaded one-end pushrods (three provided) into one end of the inner plastic tube provided. As shown on the plans, trim the length of this wire to suit your engine's requirements and give it a 'Z'-bend to attach the servo output arm. At the engine-end of this pushrod, thread at least  $1/4"$  of the 1" threaded stud into the inner pushrod tube and complete the connection with one of the clevises provided. As before, test the movement of the throttle -pushrod by radio to ensure free movement.

The aileron servo is now installed in the wing centersection. As shown on the plans, you need to make a cut-out in the top of the center section of the lower wing to fit your servo. Use the length of  $1/4" \times 3/8"$  basswood provided to make the two servo mounting rails—about  $1-1/4"$  long. Clear away the Monokote ahead and behind the servo cut-out and glue these rails in place. Mount your aileron servo with wood screws. Again, as shown on the plans, the connection between the servo and the aileron torque rods is made by using the two remaining 6" threaded one-end pushrods. Thread the nylon torque rod fittings in place on the exposed arms, thread the clevises onto the pushrods and connect them to the nylon fittings. Make the required 'Z'-bends to engage the servo's output arm and attach. Now adjust the clevises for neutral aileron with the radio on and the servo plugged into the receiver. Test the ailerons for free, non-binding movement.

Everyone tends to set-up the surface throws of a model to suit their particular style of flying. This is fine as long as you have a place to start. We recommend that you start with the surface throws that we indicate below and then adjust to suit. These movements are based on our prototype which weighed 7-1/2 to 8-1/2 pounds with average-weight radio gear;

RUDDER: 1" per side, 2" total

ELEVATOR: 7/8" up and down, 1-3/4" total

AILERONS: 3/8" up, 3/8" down, 3/4" total

CAUTION: After adjustment of your servos, be sure to reinstall the retaining screws that hold the output arms in place in your servos.

## PRE-FLIGHT INSTRUCTIONS

This section assumes the your Elder Biplane is completely done, covered, painted as needed, etc. We are now going to establish the correct C.G. (Center of Gravity). Start by completely assembling the airplane with all components in place.

Note on the fuselage Plan Sheet #1 that the C.G. is shown at a position of  $5-1/4"$  behind the leading edge of the *top wing*. Use a couple of slivers of masking tape to now mark this position on each wingtip of the top wing. Using a helper, suspend the model off the ground with fingers directly at the marked positions. The airplane should hang either level or slightly nose-down. This would mean that the C.G. is where it should be to provide you with a stable flying airplane. If, while suspended at the correct C.G. points, the model exhibits nose-down or tail-down characteristics then you have some rebalancing to do.

If the tail is hanging low, then you know that some of the equipment has to be moved forward. Remember, this balance point is always achieved *without* fuel in the tank—that's burn-off weight and cannot be counted. The easiest component to move also tends to be the heaviest; the battery pack. Depending on the pack's configuration, it can be placed beneath the fuel tank. If you still need more weight forward, the servo tray might have to be moved forward a little. If even more weight is needed (highly unlikely) then you might consider a larger airborne battery pack or adding lead weight in or around the nose area, beneath the tank. If you do have to add lead to achieve balance, don't worry, the Elder Biplane can carry a lot of weight and still deliver great flying performance. In all of this, *don't* attempt to fly the model in a tail-heavy condition!

If your model is nose-heavy, then try moving the battery pack to a position that achieves balance. We have found that it is fairly unlikely the your Elder Biplane will turn out nose-heavy. Remember that if the C.G. is a *little* ahead of the point shown on the plans, the model will still fly nicely.

We highly recommend the use of short lengths of fuel tubing over each nylon clevis to retain them in the closed position. This also includes the four clevises used on the interplane struts.

Prior to flying this model, get in the habit of making a complete check of the airframe. Is the propeller nut fully tightened? Batteries in both the airplane and transmitter fully charged? Engine bolts tight? All components firmly attached to each other? Fuel lines clear? Wheels roll easily with no binding? And always make it a routine to perform a radio system check—up is up, down is down, throttle moves freely and the ailerons move in the right directions—let's fly!

## FLYING

Once again, if this is your first R/C aircraft DO NOT ATTEMPT TO FLY IT YOURSELF. Go to your local hobby shop and obtain information about any local flying

clubs in your area. It is within such groups that knowledgeable, experienced individuals can be found to assist you.

Assuming that the radio system (airborne and transmitter) are fully charged and that your engine is completely broken-in and reliable, let's head for the flying field.

Fuel the tank and turn the radio system on. At this point we always suggest a radio range check, per the equipment manufacturer's directions. With the engine warmed up and running at idle, point the airplane directly into the wind and advance the throttle smoothly. As with most "tail-draggers", the Elder Biplane will require a small amount of right rudder to keep the initial take-off roll on a straight heading. With a little experience you will be able to keep the model quite straight during take-off. Since the Elder Biplane needs so little flying speed, the tail will come up almost immediately and shortly thereafter it will be flying. Keep it headed straight into the wind in a shallow climb; don't "horse" it up with excess elevator.

Once sufficient altitude is reached, try some turns to get used to the handling characteristics. With the throws that we've suggested, the ailerons should be positive but not jumpy. Once you have the airplane trimmed out to suit you, try the throttle, at altitude and get the feel for the slow-speed characteristics. At lower speeds, the rudder is quite effective. Like most aircraft that use flat-bottom airfoils, the Elder Biplane will naturally want to climb at higher throttle settings and settle at low throttle. A point somewhere in-between these two throttle settings will provide the "cruise" speed. This setting will vary with the engine size, flying weight and wind conditions.

With flying time experience you will find that the Elder Biplane is quite aerobatic and a great deal of fun to fly; loops from level flight, left and right snaps, rolls and spins, biplane-type rolls and even inverted flight, with practice. Touch and go's are super with this design.

Landings can be as slow and predictable as you'd like, just remember to maintain your heading into the wind and enough power to compensate for drag. We've found that the Elder Biplane steers quite satisfactorily on the ground with deflected rudder and short bursts of power. If you've opted for the steerable tailskid, just hold a bit of up elevator to keep the tail down and steer it like you would any other design.

We at Top Flite Models, Inc. and Hal Parenti, sincerely hope that this has been a rewarding project for you and that the time spent at the building board will be rewarded with many, many enjoyable hours spent at the flying field with your Elder Biplane!

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