Elder

RC-32 INSTRUCTION MANUAL

.30 Size

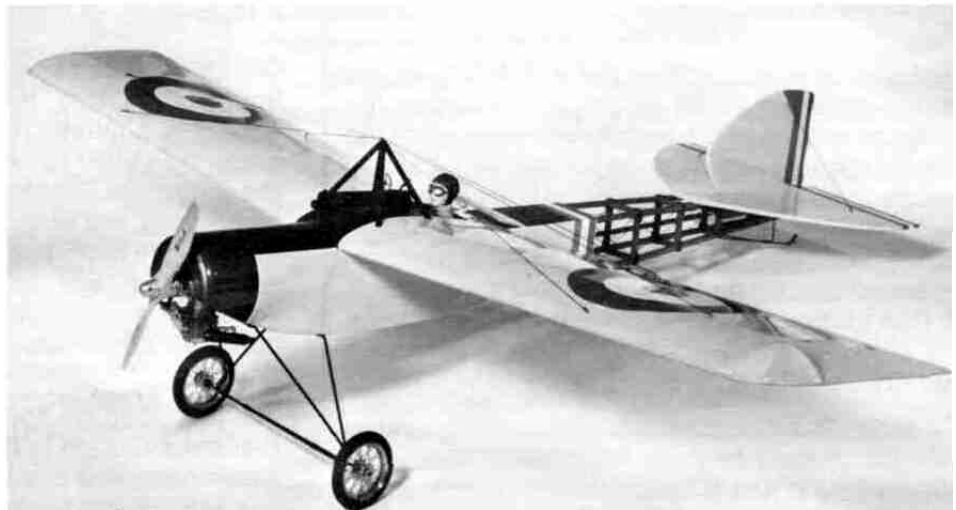*CG - 3¼" from front edge of wing*

wing plane

INTRODUCTION

In this day and age of specialization, TOP FLITE MODELS felt that it might be a refreshing break from the "norm" to come up with an airplane that was specifically designed for FUN. The Elder was *not* designed to Pylon Race, fly Pattern, be entered in Scale or be used in Fun-Fly contests, which have become anything but. Nope, the Elder was designed for the FUN of it.

Relatively slow, realistic and stately in flight, the Elder is easy to fly and build. Furthermore, it's a lightly-loaded design that does not tend to build-up lots of inertia with excess flight speed. This means that fairly rough handling does not necessarily mean destruction. Nothing is "crash-proof" but the **Elder** is a rugged aircraft that will keep coming back for more.

For the beginners, nothing fancy is needed; go out and fly it. For those of you who are into detailing, the design lends itself extremely well to all kinds of "bells and whistles"; flying wires, turnbuckles, detailed cockpits, plastic machine guns, etc., etc., etc. We have flown our prototypes both "stripped" and detailed to the nines. Either way it still looks and flies great.

A word about power is in order. Fire-breathing, Schneurle-ported engines are *not* needed and indeed are not recommended for the Elder. Normal, everday sport engines with mufflers are all that is needed to provide you with some delightful flying. Any discussion about powering the Elder would be incomplete without mentioning and highly recommending the use of the HP .21 rotary-valved 4-cycle engine. This little jewel, when installed in the Elder, makes probably the best possible combination imaginable! With it's quiet, scale-like exhaust note, this engine flies the Elder beautifully! The 6 ounce fuel tank shown on the plans will keep this little engine purring for almost an hour without coating your airplane with oil! If you *do* decide on this engine, replace the engine mount in your kit with a ".40-size" mount. It all fits quite nicely; in fact, we've shown this installation on the plans.

IMPORTANT NOTE:

TOP FLITE MODELS, INC. would certainly recommend the Elder as a first R/C powered aircraft. However, if you are a beginner to the sport of R/C aircraft, 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 shortcuts. These considerations have to be carried over to the flying field where safety must come first and limitations

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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 property damage or in bodily injury to yourself or others.

PRE-CONSTRUCTION NOTES

TheElder, like otherTop 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 and X-acto #11 blade or equivalent handy for assistance in removing any parts that might not have completely cut-through on 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, this is a 2'x 4'fiber board 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, Cyanoacrylates, aliphatic resin (such as Titebond) and 1-hour epoxy was used to secure the main wing wire tubes in the wing roots. Since all of us have our own construction techniques and favorite adhesives, stick with the ones that 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 later on.

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 been proven to be the most straight-forward and provides the finished components in the order that 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.

WING ASSEMBLY

Wing construction for the Elder consists of building three (3) separate pieces; the two wing panels and the center section. These will be joined in the Final Assembly section of this manual. You will need the center section, with its top unsheeted during the Fuselage Assembly section. In this sequence, be certain that you are working with a *flat* work surface. The wing is built directly over the plans so cover them with Monokote backing or food wrap.
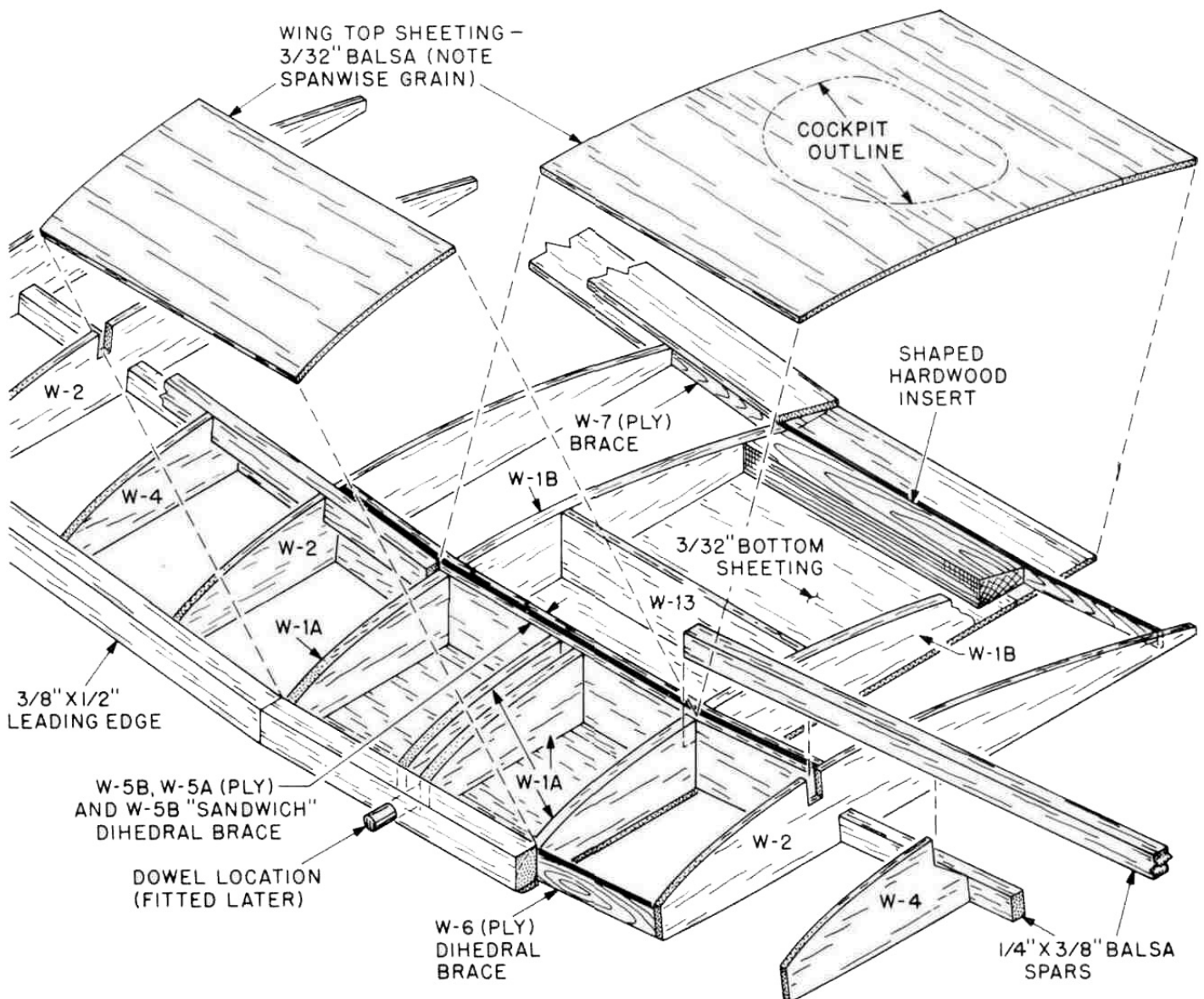
1. Start with the center section first. Locate the die-cut sheets containing parts W-5A (ply), W-5B (2, balsa), W-6 (ply), W-7 (ply), W-1A (there are four but you need two at this time, balsa) and W-1B (2, balsa). Remove these parts from their sheets and clean-up any rough edges before assembly. Also, locate the shaped hardwood insert for the wing bolts and W-13 as well.

2. Using the plans as a guide; measure, cut and butt-glue the three required lengths of 3/32" balsa sheet that makes-up the bottom center section sheeting. Note desired cross-grain of this sheeting. Measure,

cut and glue in place the *3/8"* x *1/2"* leading edge. Glue the forward ply dihedral brace, W-6, in place against the inside surface of the leading edge piece—be sure it's centered. Glue the two forward 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.

3. As shown on the plans, the center dihedral brace is a composite made by laminating the two W-5B's to each side of the ply W-5A, resulting in a *1/4"* thick part—do this now. Glue the completed center dihedral brace in place to the bottom sheeting and the two rear edges of the W-1A half ribs—again, be sure it's centered.

4. Now glue the two rear W-1 B ribs in place to the bottom sheeting and rear face of the center dihedral brace. As shown, these two half ribs also line-up with the outside edges of the bottom sheeting, at right angles to the work surface. Now glue the shaped hardwood wing bolt insert in place between the W-1B ribs, with its rear edge lined-up with the rear edges of these ribs. Finally, glue remaining W-7 ply dihedral brace in place against the rear edge of the shaped wing bolt insert and the two W-1B ribs—be sure it too is centered. Locate and mark the position of W-13 on the outside surfaces of the two W-1B ribs, do this with light pencil marks (you will need these marks for later locating and cutting-out the cockpit opening). Glue W-13 in place.

NOTE: For the time-being, this completes the center section construction. We will finish it after we have used it in the construction of the fuselage. Set it aside for now and build the two wing panels. The wing panels are constructed directly over the plans —build both at the same time.

WING TOP SHEETING – 3/32" BALSA (NOTE SPANWISE GRAIN)

COCKPIT OUTLINE

SHAPED HARDWOOD INSERT

W-2

W-7 (PLY) BRACE

W-1B

W-4

W-2

3/32" BOTTOM SHEETING

W-13

W-1A

W-1B

3/8" X 1/2" LEADING EDGE

W-5B, W-5A (PLY) AND W-5B "SANDWICH" DIHEDRAL BRACE

W-1A

DOWEL LOCATION (FITTED LATER)

W-2

W-4

W-6 (PLY) DIHEDRAL BRACE

1/4" X 3/8" BALSA SPARS

5. Locate and remove all of the required die-cut parts, W-2's (12), W-3's (10), W-4's (10) and the W-8 wingtips and the W-9, 10, 11 and 12 wingtip formers. These should be removed carefully and their edges cleaned-up with a sanding block as needed. Start construction by accurately cutting and positioning the bottom *3/32"* x 1" leading edge sheeting strip in place. Do the same thing for the rear 3/32"x 1"trailing edge sheeting as well. Now take one of the W-2 ribs and test fit it in place between these two sheet strips. The notches should fit accurately, allowing the bottom of the rib to contact the work surface. If any adjustment is needed due to gaps, move the rear sheeting strip slightly forward or back as needed; once satisfied, pin the sheeting in place.

6. You are now going to provide the proper dihedral angle to the leading edges and the spars to give you an accurate, tight fit when the two panels are joined to the center section later. Take the center section structure that you just built and position it in place against the inboard edges of the two sheeting strips that are pinned in place. Tilt the center section structure down until the front and rear ply dihedral brace arms contact the sheeting. The resulting angle of the side of the center section is the angle that you want to impart to the inboard ends of both spars and the leading edge. Take one of the 3/8" x 1/2" x 30" leading edges and lay it in place on the leading edge sheet, against the now tilted center section—note the gap at the bottom due to the tilt. Use a razor blade to trim the end of the leading edge to fit flush and square to the tilted center section's leading edge. Once satisfied, mark and cut the other end of the leading edge to end at the outboard edge of the leading edge sheeting. You should now have a perfect fitting leading edge—repeat the process for the opposite panel and glue the leading edge in place. Now do the same thing to the inboard ends of the top and bottom spars. Position and pin the bottom spar in place over the plans. Glue the first, inboard W-2 rib in place to the rear face of the leading edge, to the spar and the rear trailing edge sheeting strip. Hold the tilted center section structure in place to provide accurate placement of this first rib.

7. Glue all of the remaining W-2 ribs in place.

8. Glue the top spar in place into the W-2 rib slots—use the center section once again to ensure proper inboard positioning of the spar end.

9. Glue all of the W-4 half ribs in place to the top and bottom spars and the leading edge.

10. Glue all of the W-3 angled rear ribs in place. NOTE: Where the forward ends of these ribs contact the W-2 ribs, they should be chamfered to fit flush, do this with your sanding block.

11. As shown on the cross sections on the plans, the bottom rear trailing edge sheeting strip needs to be chamfered a little to receive the top rear trailing edge strip. Do this now with your sanding block. Once satisfied, glue the top rear trailing edge sheeting strip *(3/32"* x 1") in place, again using the

tilted center section structure for alignment and positioning. Pin in place and allow to dry.

12. Glue wingtip W-8 in place to the ends of the wing panels. Note the positions of and glue wingtip formers W-9, W-10, W-11 and W-12 in place.

13. Remove the wing panels from the work surface. Inspect them for any dried globs of glue, remove these with a #11 X-acto knife. While holding both panels together, make sure they are identical by using a sanding block to go around all of the edges to match them as closely as possible. Take your time here and do a neat job.

14. Use a razor plane and your sanding block to now shape the leading edge down to the cross sections shown. A strip of masking tape just behind the leading edge and across all of the ribs will protect them while you are forming the leading edge shape. Finally, use a well-worn piece of light sandpaper to go over all of the wing panel surfaces to totally smooth it out for covering later.

15. You will notice on the plans that each wing panel is shown with three lengths of 1/4" sq. spruce which is meant to serve as wing wire anchor points. If it is your intention to use these wires on your model, cut and glue these anchor points in place.

TAIL GROUP

The tail group of your Elder, hopefully like the rest of the airplane, is quite straight-forward and buildable directly over the plans. Note there are a few 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." This look can be changed by rounding the outboard trailing edges of the elevators to get rid of the sharp point. 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 seal lop the trailing edges of the rudder and elevators to give yet another look.

1. Start with the stab, build it directly over the plans which you have covered with the clear backing from Monokote or food wrap. Position S-1 in place and pin. Cut a length of 1/4"x 1/2" stock to glue to the forward edge of S-1—glue in place. Glue the two S-2 leading pieces to the two S-3 pieces to form the two required leading edges. Glue these in place to each side of S-1 and the 1/4" x *1/2"* trailing edge of S-1.

2. Cut, fit and glue the two 1/4" sq. balsa ribs into each side of the stab. Use short lengths of *1/4"* x *1/2"* stock to make the fillets—note their grain direction.

3. From the *1/4 "* x *1-1/2"* x 24" balsa stock supplied, measure and cut the two elevators. Notch them as shown to accept the *1/4"* dia. x *3-1/2"* dowel elevator joiner. With the stab still in position on the work bench, position the elevator halves in place and pin. Protect the trailing edge of the stab with a strip of waxed paper and epoxy the dowel elevator connector in place in the notches made earlier—allow to dry 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 a *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 1-1/2" 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. 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; once satisfied, 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.
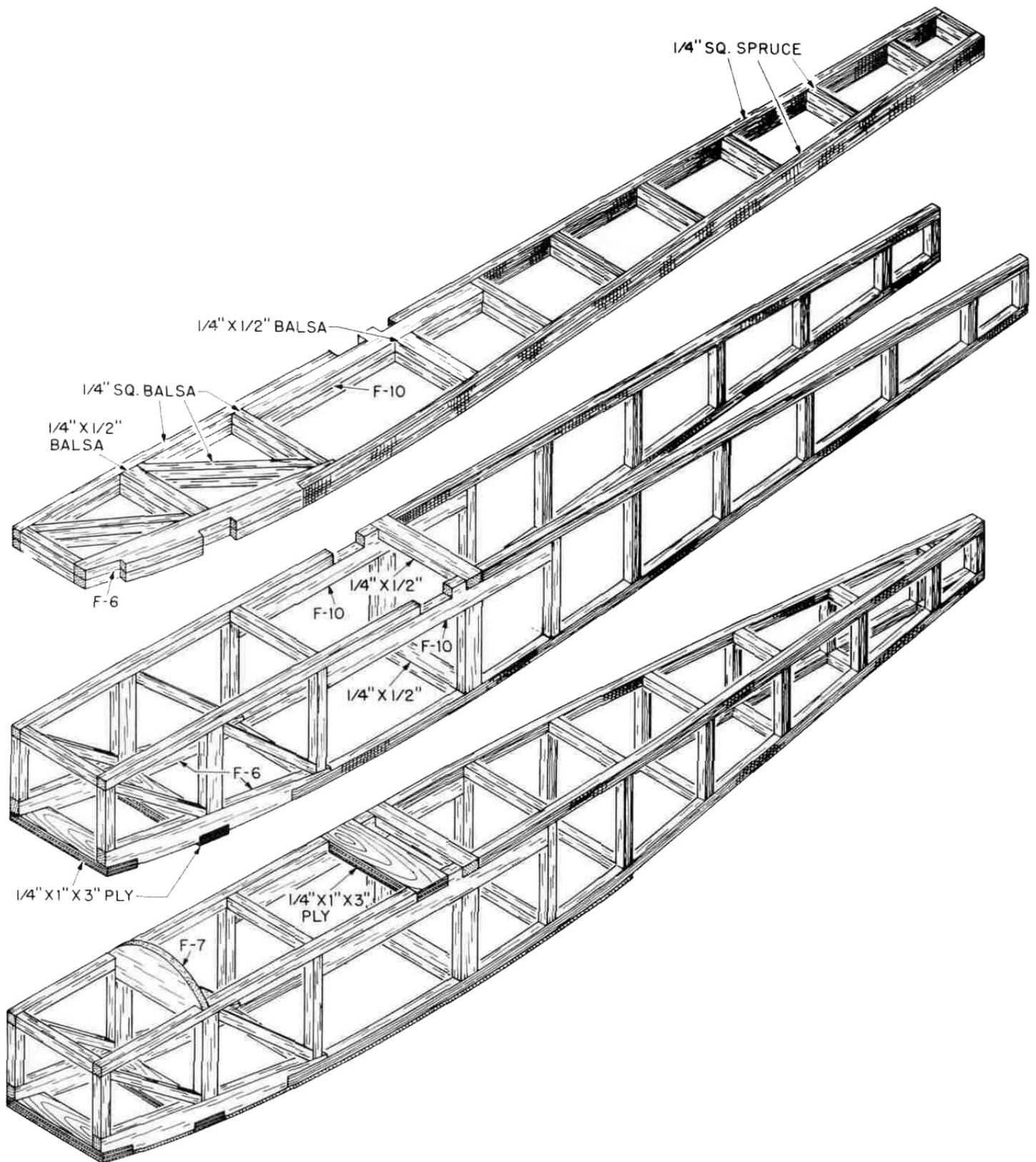
FUSELAGE ASSEMBLY

Before starting construction, study the plans and drawings to familiarize yourself with how the fuselage is assembled. Note that it really is nothing more than a basic "box" fuselage with semi-formers in the nose area to create the rounded cowling effect. 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 relys a great deal on the strength of its frame—make those joints fit correctly. Note also that the uprights and cross braces are a mix of both spruce and balsa. These are notated.

1. Locate and remove die-cut parts F-6 and F-10, two of each. Securely pin F-6 in place directly over your covered fuselage plan. Note that the bottom aft spruce longeron terminates in the rear notch in part F-6. Glue the forward end of the bottom spruce longeron into F-6, disregard the curve of this longeron for now.

2. Pin F-10 in place directly over the plans. Measure and cut the top rear spruce longeron that fits in place from the back of the "tab" on F-10 aft to the tail post. (A tool such as an X-acto mitre box and razor saw is quite good for cutting spruce.) Glue the top rear longeron in place to F-10.

3. Locate one of the three 1/4"x1"x3"ply formers that are supplied with your kit. Hold this former in place on top of F-10, in front of the "tab." With a pencil, mark its forward location on the former. From your *1/4"* sq. balsa stock, cut and fit the top forward longeron which extends forward from the pencil mark you just made to the back face of the firewall. Note that you will have to make a slight cut in the top

of this longeron at the wing's leading edge location to get It to bend back down to follow the drawing—just "crack" It slightly at this point. Glue this longeron in place.

4. Cut, fit and glue In place all of the uprights and diagonal braces (1/4" sq. and *1/4"* x *1/2"* balsa) from the nose back to and including the *1/4"* sq. uprights just ahead of the F-10 former (these connect the front edge of the F-10 with the top rear edge of F-6).

5. Cut, fit and glue In place the rearmost *1/4"* sq. spruce tailpost upright—be sure that the correct angle is also trimmed Into its bottom end for the bottom longeron. With the frame firmly secured to the building board, bend the bottom longeron up to meet the rearmost upright that was Just Installed. Glue and securely block this longeron in place.

6. With the exception of the *1/4"* x *1/2"* servo tray bearer, cut, fit and glue all remaining balsa and spruce uprights in place; thus completing the basic frame. You will now want to make a second, identical frame. We have found the easiest way to be sure that they are identical is to build the second frame directly on top of the first. Be sure to cover the first frame with Monokote backing or food wrap first.

7. Hold or tape the two completed frames together and use your sanding block to make sure they are identical. Separate them and sand their sides smooth (both sides) with the sanding block.

8. Measure and cut the two required *1/4"* x *1/2"* x *2-1/2"* balsa cross braces that fit at the top and bottom of the fuselage at the wing's trailing edge. Measure and cut the *1/4"* x 2-1/2" balsa bottom cross brace that fits in the bottom of the radio compartment and the *1/4"x2-1/2"* spruce cross brace that fits in place at the top, front of the two frames. Locate all of the three 1/4" x 1" x 3" ply formers. Position the two frames upside down over the top view on the plans—accurately please! Pin them in place at right angles to the work surface. (NOTE: Due to the slight incidence angle in these frames, they will not fit flat to the surface. This is not important at this time.) Epoxy the two forward *1/4"* x *1"* x 3" landing gear formers in place in the notches provided in the F-6's. Glue the two remaining balsa bottom cross braces in place-pin and allow to dry. Remove the frame from the work surface, turn it over and glue the forward *1/4"* sq. spruce and rear (wing's trailing edge) 1/4" x 1/2" cross braces in place. Now epoxy the remaining 1/4" x 1" x 3" ply former in the space left on top of F-10.

9. Locate the *1/4"* x 2-5/8" x 3" ply firewall. You must now use the plans to locate the position of your motor mount on the firewall. This mount is installed inverted. Mark the location of the four mounting holes onto the firewall. Use a drill and a 1/8" dia. drill bit to drill the holes through the firewall. Use the four 4-40 blind mounting nuts provided and epoxy them in place to the back of the firewall, into the holes just drilled—keep adhesive out of the threads. Test mount the motor mount with the 4-40 x 7/8" bolts provided. Remove the mount and epoxy the firewall to

1/4" SQ. SPRUCE

1/4" X 1/2" BALSA

1/4" SQ. BALSA

1/4" X 1/2" BALSA

F-10

F-6

F-10

1/4" X 1/2"

F-10

F-10

1/4" X 1/2"

F-6

1/4" X 1" X 3" PLY

1/4" X 1" X 3" PLY

F-7

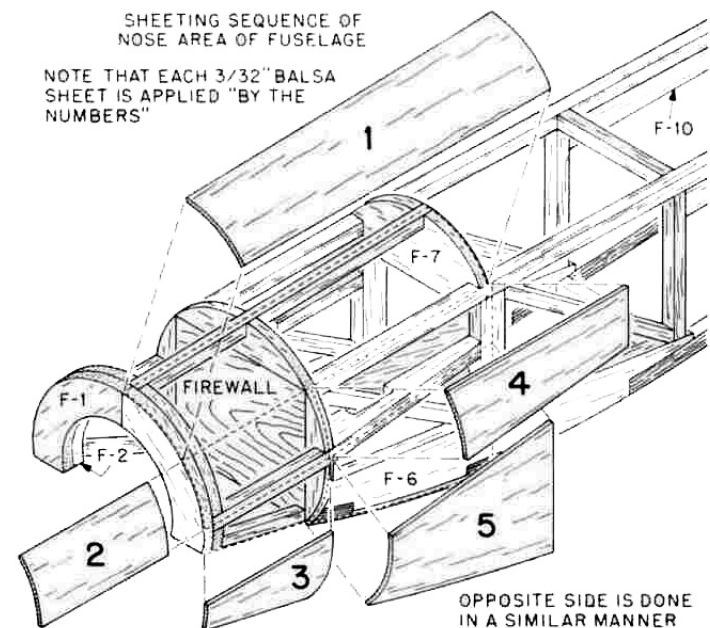the front of the fuselage frame, align it carefully and allow to cure.

10. Use your sanding block and medium sandpaper to now go over the frame. Make sure the edges are all square and clean.

11. Locate and assemble, if needed, the fuel tank that you plan to use. This airplane can use either 4,6 or 8 oz. fuel tanks. Note that we are showing the Sullivan slant-type tank that is mounted inverted in the nose. This is because this position places the tube outlets more inline with the engine's carb. Fit your tank into the nose of the fuselage frame. Use short *(3")* lengths of scrap balsa stock to make "support" for it. With the fuselage open at this time, it's easy to see if the tank will sit level—adjust as needed. In this

way, when the fuselage is done, your tank can be inserted from the wing opening into the nose and removed, if needed, with assurance that it is mounted correctly. Now use a 3/16" drill bit to drill the two required holes for the fuel tank (one 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 bolts 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 3/16" 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 nicely.

13. The servos shown on the plans are of average configuration, however yours may be different; taller, wider, etc... The Elder will accept almost any radio system, there is plenty of room. Lay the fuselage frame over the side view of the plans and take one of the servos that you plan to use and lay it in place, about where they are shown on the plans. Remember that these servos will be mounted on the 1/8" ply servo tray. Observe if your servos will fit. Cut, fit and glue the 1/4" x 1/2" balsa servo tray bearers in place between the two uprights in the radio (servo) compartment—note that their outer edges are flush with the rest of the fuselage frame

14. You can now sheet the bottom of the fuselage from the nose (between the two landing gear formers) back to the last bottom 1/4" x 1/2" cross brace—don't sheet any further back. Note this sheet is applied cross grain. Use your sanding block to clean the edges flush with the frame sides. Sand the landing gear mounts and sheeting to a smooth curve when viewed from the side.

15. Use the 3/32" x 4" x 24" balsa sheet provided to now make the primary fuselage sides. Be economical here, you will need the rest of this sheeting later. Lay the fuselage frame on the sheet with the forward edge of it lined-up with the leading edge of the wing. Use a pencil to trace the fuselage side outline onto the sheeting. Cut out the fuselage side and glue it in place, repeat the process for the other side. Use your sanding block to again true-up edges and generally tidy the fuselage.

16. Stand the fuselage on its nose, firewall flat to the work surface. Locate and glue in place the two side F-4 formers to the firewall sides, flush with its front face.

17. Locate and glue in place the two side formers, F-5. Glue balsa former F-7 to ply former F-8 (see plans). Glue the F-7/F-8 former in place at the top of the fuselage where the leading edge of the wing will be.

18. Locate and accurately pin in place the wing center section to the top of the fuselage—take your time and locate it as accurately as possible. Use a 1/4" dia. drill to drill through F-7, F-8, the leading edge and dihedral brace of the center section—back up the dihedral brace with a piece of scrap wood to avoid splintering as the drill bit passes through it. Remove the center section and set aside for now. Once again stand the fuselage on it's nose, flat on the work surface and glue the top F-3 former in place on top of the firewall and flush with it's front face.

19. Measure, cut and glue in place the top 1/4" sq. balsa cowl longeron from F-7 through F-3 and out past the firewall as shown on the plans to pick-up F-2. Cut, fit and glue the two side 1/4" sq. balsa cowl longerons to the slots in the F-4's. Now fit in place cowl former F-2, don't glue yet. Observe how this former is fitting in place, make sure that it is parallel with the firewall and that when viewed from the side it is also parallel with the firewall. Once satisfied, glue it to the three 1/4" sq. balsa longeron ends. Now glue the two F-1 cowl pieces to the front face of F-2, leaving a 3/32" "shelf" for mounting the cowling sheet.

SHEETING SEQUENCE OF NOSE AREA OF FUSELAGE

NOTE THAT EACH 3/32" BALSA SHEET IS APPLIED "BY THE NUMBERS"

F-10
F-7
F-1
FIREWALL
F-2
F-6
1
4
2
3
5

OPPOSITE SIDE IS DONE IN A SIMILAR MANNER

20. You are now going to sheet the nose of the fuselage as follows: Start by sheeting the top of the fuselage from F-7 out to F-2. Do this in two pieces with the seam on the centerline of the top 1/4" sq. balsa longeron. Wetting the top of the sheet (3/32" balsa through-out) will help conform it to the formers. Use thick CA adhesive for this operation; in that way no pins or tape will be needed. Next, cut and fit a piece of sheeting that will fit against the edge of the top sheet, extend down to the centerline of the side 1/4" sq. balsa cowling longeron and fit between F-1 (on the top of F-2) and half the thickness of F-4. The next piece butts up against the edge of the last piece just installed, down to the bottom of F-1, angling back to the bottom of F-4. This then leaves only the sides of the fuselage open at the tank compartment. This area is done in two pieces also. One from the

centerline of F-5 up to the top sheeting and the other from the centerline of F-5 down to the bottom edge of the fuselage. This completes the sheeting of the front end of the airplane. If you have taken your time and fitted these pieces with a minimum amount of gaps, all that remains is sanding to shape.

21. Use a sanding block to bevel the inside ends of the spruce fuselage framework at the tailpost—see plans. Once satisfied, glue these ends accurately together providing equal bends to each side of the fuselage. Now accurately cut and glue in place all of the remaining spruce and balsa cross braces as shown.

22. Once again, accurately position the wing center section in place on the fuselage. Using the trailing edge as your mark, finish sheeting the top of the fuselage, cross grain, back to the point where the fuselage sides end. Remove the center section from the fuselage.

23. With the exception of final sanding and rounding as shown on the plans, the fuselage is now complete.
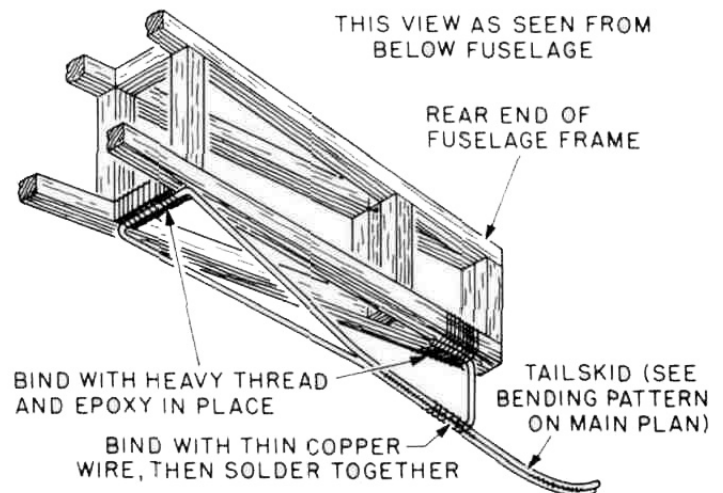
LANDING GEAR AND TAILSKID ASSEMBLY

Note that the front and rear 1/8" dia. M.W. landing gear forms are supplied to you pre-bent. Note on the plans that they must be joined together at the bottom, towards the wheels. We recommend soft copper wire for first firmly wrapping the two pieces together followed by soldering the legs together. 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 "crossed-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. Using a pencil to mark the hole locations of these clips onto the ply base, remove the wire and clips. Drill shallow, small diameter "guide holes" for the clip's screws. Now attach the landing gear wire to the fuselage with the clips and the #2 x *3/8"* screws provided—there is no need to overtighten them. Repeat this process with the forward landing gear wire.

2. Pull the two components 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 neatly fit.

3. Use soft copper wire to now neatly wrap the forward short arms to the rear L/G wire as shown on the plans. Apply some STAY-CLEAN flux to the joint and solder. Repeat the process on the other side. Be neat and try and be sure that the joint is at once solid without a lot of excess solder. Once satisfied, completely clean the solder joints of any flux.

4. As shown, the crossed-axle landing gear system derives its ability to accept landing loads and shock

from the two (2) 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 Elders weighing 3-3-1/2 lbs. Join these axles by first measuring the 2-1/2" distance required, wrapping with soft wire (about 3/8") and soldering. Again, clean the solder joints completely.

5. The same process is now used to make the rear tailskid assembly. First bend the 1/16" dia. M.W. provided to the shape shown using pliers. Wrap the tip of the skid with soft copper wire and solder. Now tape the main skid wire in place to the bottom rear of the fuselage. Locate the pre-bent tailskid support wire and wrap it in place to the tailskid with soft wire. Solder it in place to the skid. Remove the assembly from the fuselage and again, clean the solder joints completely.

THIS VIEW AS SEEN FROM BELOW FUSELAGE

REAR END OF FUSELAGE FRAME

TAILSKID (SEE BENDING PATTERN ON MAIN PLAN)

BIND WITH HEAVY THREAD AND EPOXY IN PLACE

BIND WITH THIN COPPER WIRE, THEN SOLDER TOGETHER

6. Remove the main landing gear from the fuselage. The landing gear and tailskid are now complete and can be used as is or painted flat black or aluminum (we use K&B epoxy paints for this as well as other painting needs on this airplane). As we did on some of our prototypes, you may wish to add wood backing to the wires, sand these to airfoil shape and paint them a wood color—looks great! We used 1/8" x *1/4"* hard balsa with a 1/8" dia. "groove" sanded into one edge, carefully fitting the piece in place. We glued the wood to the metal with thick CA adhesive and sanded the whole affair smooth. Then we used clear, paintable Monokote to cover the "wooded" parts of the landing gear to provide a one-piece look and airbrushed wood-colored epoxy paint on the whole thing.

FINAL ASSEMBLY

1. Locate one of the *1/4"* dia. by 3-1/2" dowels. Insert the dowel into the hole previously drilled in the leading edge of the wing center section. As shown on the plans, it extends all the way back to the main wing dihedral brace with about 1/4" - 3/8" of it extending out to connect with the F-7/F-8 formers; trim the length as needed. Now install the center section to the wing with the forward dowel in place. Liberally

apply epoxy around and beneath this dowel. Then glue in place the two remaining W-1A half ribs into position on each side of the dowel. Fill the resulting cavity above the dowel with more epoxy and allow the structure to cure.

2. The top of the wing center section can now be completely sheeted, cross grain. As with the wing panels, slightly bevel or chamfer the trailing edge of this part to allow proper seating of the top sheet. When dry, use a small sanding block to clean the edges of the top sheeting flush with the outer surfaces of the W-1A and W-1 B ribs.

3. Carve and sand the short leading edge of the center section to shape, matching the two wing panels.

4. Once again, accurately pin and/or tape the wing center section in place to the fuselage. Use the plans for reference to now drill two 1/8" dia. wing bolt holes through the top rear of the center section and through the *1/4* " x 1 " x 3" ply former directly beneath it—note the angle that these two holes are drilled at to take into account the slope of the top airfoil at that point. Remove the center section from the fuselage. Tap the two holes in the ply former with either an 8-32 tap or an 8-32 metal bolt. Once the threads have been established use a little *thin* CA adhesive to "coat" them and then run the tap into the holes once again; this toughens-up the threads. It may be necessary to run the tap or bolt through these threads several times to allow the nylon 8-32 bolts to clear. Use a *3/16"* drill bit to now "clear-out" the two 1/8" holes in the wing center section for clear passage of the wing bolts. Now bolt the center section in place on the fuselage.

5. Locate die cut former F-9 (balsa). As you can see from the plans this former is trimmed at the bottom (sanding block) to fit onto the top of the center section's leading edge where it becomes the "shelf" for the *3/32"* x 1/4" fuselage fairing strips. Apply glue to the bottom of this part and position it accurately in place on the center section, flat against the rear face of F-8—don't get glue on F-8. Start making the fuselage/wing fairing by first cutting to length the top center 3/32 " x 1/4" balsa strip (the center one when viewed from the top). Sand its rear bottom edge to match the contour of the center section's sheeting. Once satisfied, carefully glue in place to the top of F-9 and the center section sheeting. Repeat this process to the left and right of this center strip until the rough fairing is complete. With the center section still in place, use your sanding block and sandpaper to now smooth the fuselage/wing joint to a one-piece look. Any small gaps or rough edges can be filled with a filler such as DAP White Vinyl Spackling compound and sanded smooth again. Remove the center section from the fuselage.

6. You can now make the cockpit cut-out in the wing center section. The pattern for this is provided on the plans and it can either be traced or the pattern itself cut-out of the plans to serve as a cutting guide. Use a #11 X-acto knife for this purpose and try to be as neat as possible.

7. Locate the four remaining *1/4"* dia. by *3-1/2"* dowels. These will be used to now make the "king post" that fits to the wing center section. This is most easily made by first constructing two separate "triangular" pieces and then joining the two pieces at the top. Chamfer the top ends to fit as shown on the plans and epoxy. The bottom ends of the "king post" must also be chamfered to sit squarely on the top surface of the center section, ahead of the cockpit. Don't attach this structure yet, it will be assembled to the wing after covering.

8. The two wing panels can now be permanently attached to the wing center section. We recommend that you use epoxy for this operation. With the center section flat on your building surface, slide the two panels in position onto the exposed arms of the front, center and rear dihedral braces. The fit should be accurate; the front brace fits against the back face of the panel's leading edge; the center brace is in contact with both the top and bottom spars; and the rear brace is inside of the top and bottom rear trailing edge sheet strips. The panel's spars, leading edges and trailing edges should also be cleanly contacting the outside surface of the center section's sides. Take your time here to ensure that this is the case before committing to actual attachment. Locate or make a couple of 1-3/4" high supports for the wingtips to provide the required dihedral angle. Now epoxy the panels in place to the center section— don't use so much glue that it runs or drips but enough to provide a good glue joint. One-hour epoxy is best for this step. Allow the structure to cure completely.

9. Remove the completed wing from the bench and take some time to now go over it completely. Check the joints for gaps, etc. Use more epoxy to now go over the joints, making sure that every contact point has adhesive. When you are satisfied, use light sandpaper to smooth the wing panel/wing center section joints to match.

10. Locate the two required rear fuselage pushrod exits (die-cut, ply). Note on the plans where these fit beneath the stab location—glue in place.

11. A 1/16" x *3/8"* x 12 "ply strip is provided for the fuselage frame "joint caps". These can be drawn with pencil on the strip of ply and scissors or shears can then be used to cut them out. These are glued in place to each of the exposed fuselage upright and cross brace joint, as shown. Once these are in place, use sandpaper to lightly smooth their edges.

COVERING & FINISH

Now that all of the various components of your Elder 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 (as shown on the label; in cream Monokote

with red, white and blue Roundels and tail treatment) to 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 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 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 shiney. 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, wing, 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. We tried a method on one of our prototypes that worked quite well for these tips. 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-2 wing rib, but not the wingtips themselves. Next, cut an elongated triangular piece of Monokote to fit over the space between the forward W-2 rib and the forward W-9 wingtip former—keep the edges straight, allow about 1/8" overlap and iron this piece in place. Move now to the next exposed triangular area between W-9 and W-10 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. Additional information on how to use Monokote is now available on video tape. See your dealer or write to Top Flite.

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 tail group. Do the same thing for the wing hold-down bolt holes, the cockpit, the landing gear screw holes, etc.

Mount the 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. Hold the fin in place on the stab in the position that it is supposed to be; dead-center with the fuselage centerline. Use the same pencil and mark the fin's location on the top of the stab. Remove the fin and use your X-acto knife to remove the covering from the previously marked 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 end of the line into the 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 four hinges required into the trailing edge of the stab and the two hinges required into the fin. Next, mount the elevators to their hinges followed by the rudder, again using 1-hour epoxy. 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.

Install the motor mount to the firewall and your engine to the motor mount. We would suggest that you mount your engine using 4-40 Alien-head bolts into pre-tapped holes in the motor mount. Cut a couple of 10"-12" lengths of

medium fuel tubing. Use a razor blade to cut a sharp angle on one end of each of these lengths. Insert these angled ends into the holes you drilled earlier in the firewall. Use a pair of pliers, long-nosed, to reach in from the wing opening and pull the tubing ends through the tank compartment, out into open view, without pulling them all the way through the firewall. Trim the ends square and attach them to the correct tank tubes. Now pull the tubes back out from the firewall while moving the tank into the fuselage. Trim the tubing to length and attach the ends to the engine and pressure tap.

The triangular-shaped "flying-wire post" that is shown sitting in front of the cockpit can now be glued (epoxy) in place by first positioning it on the top of the wing to determine it's final position. Once satisfied, press on the top of it, indenting the covering slightly. Remove the covering material in these indentations, exposing wood and glue the post in place. If you have decided to add the optional flying wires (20#-test fishing line), drill small holes (1/32" dia.) into the tops of the spruce upright posts that you installed during wing construction. We used very small cotter pins for the flying wire anchor points, these can now be epoxied into the holes. Before adding the flying wires, apply any decoration or markings to the wings that you have decided upon, then add these wires.

As shown on plans, the exposed framework of the aft fuselage is shown with bracing wires and tubes in each joint corner for their attachment, if you have decided on this as an option, now is the time to add them.

The 1" x 1-3/4" windscreen is now trimmed to shape using the outline provided on your plans and glued in place just ahead of the cockpit opening. Position the bottom edge of the windscreen in place on the wing center section and press down to leave an indention. Use an X-acto knife to cut through the indention and wood beneath it. The windscreen can now be inserted into this "slot" and held in place with a small amount of adhesive. If you are using a "pilot," he should now be epoxied in place in the cockpit (assuming that he's all painted and ready to fly).

At this point you might well be considering detailing your Elder 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 guns, WW I type, both German and British. We used one of their Vicker's guns on the model shown on your box label. Simply glue a couple of dowels into the bottom of the gun and it can then be glued right into the center section of the wing, beneath the "king post." As shown on the plans, we also used a Williams Bros. "vintage" pilot (the one with the leather flying cap & goggles) as well as their wheels. On a couple of the prototypes we detailed the cockpits with instruments from Lou Proctor and a genuine hardwood, stained instrument panel (veneer). All kinds of neat looking flying wire clips and little metal parts can be easily made from light aluminum. Detailing the Elder is up to you; any way you choose, it'll look great.

With the possible exception of additional final detailing such as outlined above, your Elder is now essentially finished, needing only the installation of the radio.

RADIO INSTALLATION

The method of installing your radio in the Elder 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 are showing the rudder and elevator servos at the rear, 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 a jig-saw to remove the servo cut-out's (3) required. 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. (Center of Gravity) change, if needed. Later, it will be 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 tail post 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. You have been provided with a 36" length of 1/4" dia. dowel. Cut this in half to make two 18" pushrods. As shown on the plans, attach the non-threaded end of the 6" (threaded one-end) control wires to the ends of each dowel with epoxy and tightly wrapped thread. From the inside of the fuselage, slip the pushrods in place through the fuselage and out the ply pushrod guides at the rear of the fuselage. Some small amount of bending of the control wires will be needed to provide free, unbinding movement. Make sure while doing this that the bends you put into the wires are as minimal as possible—avoid any hard bends.

Locate the two nylon horns provided for the elevator and rudder. Mark the locations and drill the two holes in each of these surfaces for their mounting. Mount the horns in place. Thread the clevises onto the threaded end of each of the pushrods and attach the clevises to the horns. Now test the movement and action of the rudder and elevator while moving the pushrods by hand. It is essential that the movement be smooth, non-binding and easy —not sloppy. Use 1/16" dia. M.W., epoxied and wrapped as before at the other end of each pushrod to make the connection to the servos. A simple "Z"-bend is all that is needed for the servo connection.

Adjust the whole system for neutral and test the movement of the surfaces 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 the 1" threaded stud into one end of the inner plastic tube provided. Thread a clevis onto the stud and connect to the throttle servo. Again, test the operation of this connection to be sure

that is is free and non-binding.

Since the pushrods are exposed, you may wish to give them a coat of the same material that you used for the fuselage framework to protect them from spent fuel.

PRE-FLIGHT INSTRUCTIONS

This section assumes that your Elder 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. Note on the plans that the mark shown for the C.G. point is directly over the spars and directly beneath the top mating point of the "king-post". Slip a length of string under the kingpost and lift the airplane off your bench. The airplane, ideally, should hang suspended 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 the tail hangs low, some of the equipment has to be moved forward. Remember, this balance is always achieved *without* fuel in the tank—that's burn-off weight and cannot be counted. The easiest component to move is the battery pack. Depending on the pack's configuration, it can be installed beneath the fuel tank. If you still need more weight forward, slide the servo tray all the way forward as far as it will go. If more weight is needed (highly unlikely) then you will have to add lead weight in the nose, beneath the tank. If you have to add lead, don't worry, the Elder will still fly quite well.

If the airplane is nose-heavy, then try moving the servo tray back as far as it will go, etc... Once the airplane hangs suspended as it should, you will have to now glue the servo tray permanently in place against the *1/4"x1/2"* balsa bearers that it rests on.

Prior to flying, get in the habit of making a complete check of the airframe. Is the prop tight?. 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? Make a radio system check as well—up is up, down is down and the throttle moves in the right direction. You're ready to fly!

FLYING INSTRUCTIONS

Once again, if this is your first R/C aircraft DO NOT AT-TEMPT TO FLY IT YOURSELF. Go to your local hobby shop and get 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 transmit-ter) are fully charged and that your engine is completely broken-in and reliable, let's fly! Fill the tank and turn the radio system on. With the engine running at idle, point the Elder directly into the wind and advance the throttle slowly. With most "tail-draggers" a small amount of right rudder will be needed to keep the airplane on a straight heading. With a little experience you will be able to keep the take-off roll quite straight. As the speed picks-up, the tail will lift and in a short time the airplane will lift-off. Keep the plane headed straight with the nose in a shallow climb—do not "horse" it up with excess up

elevator, that is the beginning of a "snap roll" and at low altitude this can quickly become a crash!

Once sufficient altitude is reached (75'-100'), try some turns to get used to the handling characteristics. Non-aileron equipped models react a little slower in the turns and these turns tend to the "skidding" type. If all of the homework was correctly done on the ground, your Elder should be flying quite nicely. While at altitude, try the throttle and get used to the slow-speed characteristics of the airplane before setting-up your landing. Use the transmitter trims to correct for any unwanted climbing, diving or turning tendencies from straight and level flight at cruise speeds. Like most aircraft that have flat-bottom airfoils, the Elder will naturally want to climb at full power and settle at low throttle. A point somewhere in between these two throttle settings will provide the "cruise" speed. This setting will vary according to a.) the engine size and b.) the finished weight of your model.

With some flying time experience you will find that the Elder is quite aerobatic; loops from level flight, left and right snap rolls, left and right spins with almost instant recovery. Inverted flight is possible with practice.

Landings can be as slow and predictable as you'd like, just maintain your heading into the wind all the way through touch-down and roll-out to a stop. We have found that the Elder steers quite well on the ground with deflected rudder and short bursts of power—be sure you're holding full-up elevator while you are doing this.

We sincerely hope that this has been a good project for you and that the hours on the building board will be rewarded with many, many enjoyable flights.

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