CAP 232

BUILDING INSTRUCTIONS

Thank you for purchasing our Cap 232. Before starting to build, we urge you to read through these instructions while viewing the plans. It contains pertinent information about general construction, building sequence, and will lead you through to a successful development of this model. Some building tips have been included along the way to help you out. Again, read the instructions while viewing the plans before you start to build! We know you will enjoy building and flying your Cap 232.

FUSELAGE CONSTRUCTION

The fuselage is entirely built up with no other plastic parts except the cowl, canopy and stab cover. As a general overview of construction, opposite hand fuselage sides are constructed by adding a forward doubler, a top rail and bottom tri-stock rail. Laser cut bulkheads are installed in the provided slots in a specific order. Stringers are added to the top of the bulkheads and sheeted with 3/32" sheet balsa. The bottom is sheeted with 3/32" sheet balsa and the landing gear block is installed. The engine box, **FS2** has been left over size in length and is trimmed to accommodate various engine lengths. The cowl former is installed over the motor box against **F1** and blind nuts are installed to retain it. The cowl is assembled and glued to the cowl former. This is by no means all the steps but, should give you a general idea of what to expect in construction.

1. Layout the fuselage sides, opposite hands, on a flat surface. They have been CNC routed for accuracy and will require some clean up work. Use a razor saw to cut through the small lands that retain the hole center pieces. Use a file to square up the small radii, left by the router, where necessary. Look them over and decide which side will be on the outside. Locate the two **FD1** doublers and bond them in place with Zap 30-min. epoxy. To ensure good alignment of all holes, use one of the fiber wing spar tubes and the _" dowel as a centering tool. Do not epoxy the tube in place and wipe clean when through. When satisfied, weight down and allow to cure.

2. Locate three 1/4" sq. x 36" spruce sticks and glue them flush with the top edge of the fuselage. It will be necessary to splice them near the tail. You can butt join or scarf , the choice is yours, either will do. Now find four 1/2" x 36" tri-stock sticks. Glue one piece, flush with the back edge of **FD1** to the tail end, right over the tail wheel block notch on the bottom edge. You will have to notch this out later. Glue another, flush with the bottom edge, from the end of **FD1**, forward to the landing gear block notch. This one will have to bent slightly to follow the fuselage edge, a few saw cuts part way thru, at that point will help. Now glue on a piece from the back edge of the landing gear block to the forward edge of the fuselage. Before joining the side, locate and install the four **SB1's,** servo mount backing, at the fore and aft edges of the servo hole cut outs on the inside of the fuselage. It's easier at this time.

3. **In order to build a square and true fuselage, so the wing spar will be perpendicular to the fuselage sides, the following important construction steps should be followed.** Laying one fuselage side on a flat surface, locate **F2** and **F3** and glue in position. The slot in the fuselage sides will locate them. Use a square to ensure perpendicularly while glue is curing. Locate **F1** and the two **FS2's**. Slide the **FS2's** into the slots in **F1** firewall and mate the slots at the rear end of **FS2** with **F2** former. The whole assy is now loosely in place. Place the other side in position making sure the tabs are firmly in the slots in the fuselage. Install the a piece of fiber tubing thru the wing spar holes for alignment. With everything in place

square up **F1** firewall and tack glue in place. Now adjust the other parts squaring up the fiber tubing with the fuselage side. Hold in position with weights and apply 30-min. epoxy to all the joints. A little tricky but, well worth spending some time getting it right. **Note: Some of the formers may be warped, that is bowed. Lite-ply has this tendency and we cannot control it. If you encounter this problem, clamp a straight piece of firm wood to the former to hold it straight while installing it.**

4. When epoxy has cured, score both side of the fuselage on the aft edge of **F3**. Angular razor saw cuts in both top and bottom rails, on the inside, will be required to make the sharp bend required. **Caution, do not break the sides off. When you hear it crack, stop!**

5. Place the fuselage over the top view of the plans for accurate alignment, pin down, pull the sides together and install **F7.** Tape in place to hold while curing. Now locate **F4**, **F5**, **F6,** and slip in between fuselage sides and slots, making sure they are fully engaged and against the fuselage sides. Cut two pieces of 1/2" tri-stock, 5-1/4" long and epoxy them at the juncture of **F3** and the fuselage sides to reinforce the fuselage side break. Sand them, to increase the angle, so they will fit snug in the corner. Ca the scored line on the outside of the fuselage, on both sides.

6. Find **F3A** and glue in place. The front edge should be in line with the front edge of **F3**. Tip back and glue to top of **F4.** Now, locate seven, 1/4" sq. balsa sticks. Each stick is enough for a complete stringer on the forward and aft sections. There are no notches for them in **F3A.** Cut an angle on the end of each stringer and glue against the bulkhead. Now sand the top edge of **F3A** flush with the stringers.

7. Next we'll sheet the turtledeck. Locate four 3/32" x 3" x 36" sheets and cut them in four 26" lengths. Edge glue two 26" sheet together. Now do the other two. Block sand smooth on one side of each. CA the edge of one sheet to the top side of the fuselage, centrally locating it between bulkheads **F3A** and **F6**. Make sure it is flush with the side. Now bend and form the sheet around the turtledeck and mark off the center of the top stringer on the sheet. Trim off and CA the sheet to stringers. Note: if you cannot bend the balsa because of hardness or grain structure, spray it with a foam glass cleaner to make it more pliable. Now do the other side taking care to make a good seam at the top.

8. Now, sheet the front section as described above using 3/32" x 3" sheets left over from the above step. Use CA glue. When cured, sand the ends flush with the bulkheads. Locate **LG1** and layout the mounting holes for the blind nuts as shown on the plans. Drill holes and install the blind nuts. **NOTE: SEE LOCATING AND DRILLING LANDING GEAR HOLES**. **Do not install LG1 until you have completed the canopy frame.** Reason? You must have an opening to install the two **C6** pieces on the back side of **C1**. Ok, so you didn't read the instructions and have come back to wonder why. There is another way. Place a 2" long strip of Scotch tape down on one of the C6 parts. Cut a _" hole in the tape in the center of **C6**. Now place it into the hole in **F2**. The tape will hold it there. Now do the other one. Place a spot of thick CA in the center of each **C6.** Now carefully position the canopy frame up against **F2** and allow to cure. Remove and re-glue the two **C6** parts. You lucked out!

9. Sheet the bottom of the fuselage with 3/32" sheet, noting the grain is cross-grained, to the notch for **TW1**. Cut out the 1/2" tri-stock in the notch at the tail end flush with the notch on the sides. Now align and epoxy in **TW1** using 30- min. epoxy. Using 3/32" sheet balsa, sheet the area aft from the trailing edge of the stab to the end of the fuselage. Trim off all the sheeting flush with the sides of the fuselage.

10. Locate **FS3** spacer and glue in against the fuselage side and top rail on both sides, inside where shown on the plans. Find one of the 12" fiber tubes and cut off a length of 8-1/2". Install in the fuselage spar hole and epoxy in place. When cured, sand flush on both sides of the fuselage. Glue in a short piece of 1/2" x 1" balsa, left over from the aileron leading edge, against the inside of **F7** for hinge backing.

11. Locate the four **FD2's** and laminate two together. Now laminate two more together. Glue these in just aft of **F6** on the inside of the fuselage, on both side. This will give you additional gluing surface for the stab. Find **TS1** (throttle servo mount brace) and cut two lengths of 1/4" sq. hardwood 2" long. Glue one flush with the bottom edge of **TS1**. Now locate and glue in this assembly as shown on the plans. Glue the other servo mount to **F2**. Make sure the two mounting surfaces are in-line with each other and the correct distance apart to install the servo.

12. The fuselage is now basically finished and can be set aside until cowl and wheel pants are constructed. Rough sand it all over, getting it ready for final sanding and covering.

CANOPY CONSTRUCTION

1. The canopy is built right on the fuselage. Locate **C1, C2, C3, C4**, **C5** and **C6.** Lay a piece of wax paper at the juncture of **F2** and the top rail of the fuselage, also where **F3,F3A,** joins the fuselage.

2. Centrally locate and tape **C1** to **F2,** and **C2** to **F3A**. The bottom edge of **C2** should be sanded at an angle to match the surface.

3. Find a _" sq. hardwood stick and cut off two lengths 12" long. Cut and angle on the end of each to mate with **C2** surface. Now glue in the rails, offsetting them approx. .040, the thickness of the canopy, from the fuselage outer surface on each side. Tape in place.

4. Glue in **C3** and **C4** gussets. Note, the **C4** gussets go on the back side and have a slot to locate the hold down retainer block **C5**. Now glue in both **C5's,** shimming them out from the rail, on each side, with a piece of scrap 1/16" balsa. They should fit snug between the fuselage rails.

5. Locate a 3/32" x 3" x 36" sheet and sheet the top of the framework. Sand off the ends flush with the side rails. With the canopy framework still in place, glue in both **C6's** into the large holes in **F2** on the back side of **C1.** Take care not to let any glue to extend past the edges and glue everything fast. With the canopy firmly in place, locate the two mounting holes from the plans and install #6 blind nuts on the inside of **C5**.

6. Locate and trim the canopy to the mold lines. Trial fit if necessary to make sure of the fit. If you intend to add cockpit detail and a pilot, do so at this time. We leave the interior of the canopy up to you. We recommend gluing on the canopy with Pacer Formula '560' canopy glue.

BUILDING THE COWL

Building the cowl always seems to be an unpleasant task. Especially if you are working with ABS plastic and are not acquainted with its characteristics. Hopefully these instructions will be straight forward and you will end up with a super looking cowl.

1. Locate the cowl ring and slide it over the engine box briers, **FS2**. Note the top and upper portion of the sides should fit against **FS2**. This is to help key the part in location. Tape the cowl ring in place making sure it has been positioned properly. Now match drill the four small retaining hole into **F1** with a 5/32" drill. Remove the cowl ring from its location.

2. Note the lower retaining bolts are reversed from the upper. This will require you to install two blind nuts on the inside of F1 (the lower ones) and two on the outside of the cowl ring (the two upper ones). Drill out the upper holes in the cowl ring and the lower holes in **F1** with a #6 drill. Now install the #6 blind nuts and epoxy them in place.

3. Locate the cowl, upper and lower half, and note the trim lines. These lines are the same color as the cowl making them hard to see. By holding them at a certain angle to the light, you will be able to view them better. Trim off the excess ABS to these lines. Cut away most with scissors and use a Dremel motor with a drum sander to clean up to the line. Now sand the flat edges with a sanding bar. Cut a hole for the engine crankshaft leaving a 5/16" flange on the 3-1/2" dia. Also, trim out the air vents

4. Lay down the cowl ring, with the blind nuts up, of course, and weight it down over a piece of wax paper. Place the lower half of the cowl against the ring, flush with the back edge, and glue in place. Make sure it is tight against the ring, especially the sides. Hold and tack glue with thick CA in several places, when satisfied final glue all the way around.

5. From the scrap pieces of plastic, cut eight _" x _" pieces. Using thin CA, glue these pieces along the lower cowl mating surface. Allow them to stick up above the edge _". Place one about _" from the ring. The last one 8-1/2" out from the ring. Equally space the other two. Do both sides. These will help guide and reinforce the surfaces when butted and glued together.

6. To make the cowl more durable, we suggest you fiberglass the inside of the top and bottom with 2 oz cloth. First place a _" strip along the joint between the cowl and ring for reinforcement. Use Goldberg Cowl Cement or Ace general cement # 43691 to glue the cloth to the cowl. **Do not use excess glue**. Cut a piece of cloth the approx. size required, lay it on the surface of the cowl, and paint in the glue. Work from the center out in all directions for a wrinkle free application. It is not necessary to glass the nose section of the cowl.

7. Now, check the upper cowl for fit. It should rest completely on the cowl ring and mate with the lower cowl edges. It may be necessary to sand some off the mating edges of the upper cowl to accomplish this. When satisfied tape the halves together and tack glue. Remove the tape and final glue. Apply a strip of glass cloth along the juncture of the upper cowl and ring. We recommend using Bondo to fill any cracks along the seams on the outside.

8. Depending on your engine choice, it will be necessary to cut a hole for a needle valve and muffler. Measure and cut carefully in order to avoid mistakes.

9. A word about assembling the cowl on the airplane. The upper retaining bolts are accessible thru the large holes in F2 bulkhead. The lower retaining bolts are accessible thru the opening required for the muffler. In both cases it will be necessary to use a ball driver, with a drop of CA, to hold the bolt and washer in position, for insertion. The muffler must be removed in order to install and remove the cowl.

10. This completes the cowl. Sand it and set aside for painting.

MOUNTING THE ENGINE

Now that the cowl is finished, it is a good time to finish off the front of the airplane. That is, set the firewall at the proper distance for the engine you have chosen to use. We have shown a Super Tigre 3250 and will give you the location for that engine. If you have chosen a different one, then you will have to do your own calculations. The cowl length from back edge to spinner face is 11-7/8". It is better to error on the short side and then shim out the engine to fit if necessary

1. First trim off the **FS2's** to the proper length. Measure out 4-7/8" from **F1** strike a line. Use a square so that it is parallel with the laser cut edge. Use a razor saw and cut on the line. If it starts to bind, a shot of WD-40 on it will help.

2. Locate the firewall and the side marked "top". Find the horizontal center line of the engine by measuring down 2" from the top. Now find the vertical center of the part. Layout the engine mounting hole locations and install 1/4-20 blind nuts in each. Use epoxy to hold them in place. Install the firewall between the sides of the engine mount using epoxy and hold with tape.

3. Locate **MB2** and epoxy on the bottom side of the box. Cut pieces of _" tri-stock to brace the firewall. It may be necessary to relieve the edges on those that interfere with the blind nuts. Now find **MB1**. It is epoxied in between the sides and flush with the top sides of the box. If desireable, this piece could be a hatch, by adding hardwood blocks on the under side and fastening it in place with screws thus, making the fuel tank more accessible.

WING CONSTRUCTION

The wing surfaces are foam cores covered with 3/32" sheet balsa without wing spars. As a general overview of construction, it will be necessary to identify the LH and RH panels, install the fiber wing spar tubes, glue in W2, makeup the wing sheeting skins and bond them on to the cores, glue on the leading edge and wing tip caps, cut out the ailerons and cap the ends, locate and cutout the servo well. This should give you an idea of what to expect.

1. Carefully unpack the wing cores. Save the shell packing for supporting the cores when bonding skins and cutting and trimming steps. You should have a RH and LH. Identify the top of each panel by the manufactured wire cut. Note that the spar hole goes in at a slight angle giving a slight amount of dihedral to the wing panel. Mark the top of each panel for identification. Lightly sand them, if necessary, with 220 grit paper. Handle them carefully so as not destroy the thin trailing edges.

2 Locate the two remaining fiber tubes. Mix up some Zap 30 min. epoxy or Hobbypoxy II epoxy and paint the outside of one of the tubes with a good coat. Slide it in the hole in the core with a twisting motion leaving 3/16" extending beyond the wing root. **Wipe off any excess epoxy around the end of the tube**. Now locate and epoxy **W2** in place as shown on the plans, while you have some extra epoxy. Now do the other wing.

3. Preparing the wing skins is somewhat a laborious task. Take special care in keeping the edges in line when edge gluing, a good flat surface is a must and it will be necessary to true up the edges of the balsa sheets before edge gluing them together. Use a long straight edge and do not try to cut thru on the first pass with the blade. Rather, use a slicing motion. Remove the minimum amount of material. Find 26 sheets of 3/32" x 3" x 42" balsa and trim them all to 38" in length. 6-1/2 sheets will be required for each side of each of the four panels. Note plans for skin configuration.

4. Pick a good flat surface, large enough, and lay down a piece of wax paper. Apply thick CA or white glue. to the edge of a sheet and push up against an adjoining sheet. If using white glue, wipe off excess with plastic card or piece of sheet balsa and allow to cure Use weights to keep the edges in-line. Use of kicker with CA will speed up the operation. When one panel configuration is achieved, block sand the skin so that the surfaces are level and smooth. Spend more time on the surface you plan to use on the outside. Remember, sand now and it will save time later on. Now identify it with a mark.

5. Place a packing shell over a skin and trace the outline on it. Allow an extra 3/16" along the leading edge. The trailing edge can be as marked with extra material at each end. Do all four skins.

6. Lay two packing shells **on a flat surface**. A right side and a left side. Place a skin in each aligning the trailing edge flush with the packing shell, and some extra on each end. Apply Hobbypoxy II, thinned to brushing consistency with 91% isopropyl alcohol, to one side of each skin. (contact cement may be used) Place the core over the skin and place a packing shell on top. Check for alignment and weight down evenly using one gallon zip bags filled with play sand. **Note: Do not apply an excessive amount of epoxy, it adds weight. Allow to cure over night.**

7. When cured, sand a slight bevel along the trailing edge to allow for the top sheeting. Apply extra epoxy along the trailing edge to help stiffen it. Now bond the skin to the core as described above and allow to cure over night. Note: the top and bottom skins can be bonded at the same time if you prefer and want to speed up the process.

8. Remove sheeted cores and sand the leading edge, root, and tip flush with foam. Locate the _" x _" x 42" leading edge and glue in place with white glue. Tape in place to hold. When cured, shape and sand to configuration shown on the plans. Now locate **W3** tip and glue in place. Sand flush with airfoil all the way around. Do both wing panels.

9. Place a wing panel in its packing shell and tape in place. Noting the wing plans, layout the aileron on the wing panel with a ball point pen at the hinge line. Cut out the aileron with a band saw. Supporting the aileron in its packing piece remove _" from the leading edge and 1/8" from the inboard end. Do both wing panels.

10. With the wing still in the packing shell for support, remove _" from the wing trailing edge and 1/8" from the aileron inset. Locate **W4** cap and white glue to inset. Now glue on the _" x 1-1/4 " x 36" trailing edge, trim length to fit. Sand both trailing edge and **W4** flush with airfoil.

11. Locate the _" x 1" x 36" aileron leading edge and trim to approx. length, and white glue to leading edge of aileron. Plane and sand top and bottom flush with surface. Note the configuration on the plans. Lay it out on both ends with lines connecting the end points on the top and bottom surface. This will help promote more accuracy when shaping.

12. While you still have a flat surface to work on, drill the hinge holes. **Note: see LOCATING AND DRILLING HINGE HOLES.** Now plane, shape, and sand the aileron leading edge to the layout lines. Do both ailerons as described.

13. Place an aileron in its packing support and drill the _" hole for the control horn dowel at the location shown on the plans. A Forstner drill bit or a hole saw with fine teeth will do a much better job here. Cut off a length of _" dowel, drill a #28 (.140) hole down thru the center and epoxy in place. Sand flush with all surfaces. This completes the ailerons. Let's finish the wings.

14. Next, layout the servo well on the bottom side of the panel as located on the plans. The opening is 7/8" x 2-1/4" x 2-1/2" deep. Using a straight edge, cut thru the skin and remove the balsa. Cut down as far as possible in the foam on all four side. Using a flat bladed screwdriver dig out a layer of foam keeping the sides straight. Repeat this process until the desired depth is achieved. Locate the 1/4"sq. hardwood stick and cut off two 7/8" lengths. Epoxy these in at both ends of the well, 1/8" below the surface. These will be used to mount the aileron servos.

15. Find the two **W1** wing root ribs, **W1A** and **W1B** blocks. Position **W1A**, 1" from the edge of the spar hole, on the inside of the rib and in the center. Position **W1B**, 6-7/8" from the edge of the spar hole in the center of the rib. **Epoxy these blocks to the back side of W1 root rib.** These blocks provide extra material for the bolts that hold the wing against the fuselage.

16. Before installing **W1**, align the rib spar hole with the fiber tube in the foam core, centrally locate the rib with the wing panel and press it down into the foam. This will leave an outline of each block in the foam. Cut and dig out just enough foam under each block so the rib will lay flush with the foam core. Epoxy **W1** in place with 30-min. epoxy. Tape to hold until cured.

17. Locate the four 3/8" dowels. Round off one end and sharpen the other end as shown on the plans. Drill 3/8" holes into the core end located from the **W1** root rib. Now glue in the dowels allowing 3/4" to protrude from the root rib. Be sure the holes in the core are straight and perpendicular to the surface.

18. Locate the servo lead hole in the end root rib **W1**. You must have a 1/2 " servo lead hole in the foam core to route the wires and connectors. Using a piece of 1/8" music wire, push it thru the foam from the hole in **W1** to the servo well. As a visual aid, draw a line on top of the wing panel to help keep you in alignment. Once thru, keep enlarging the hole until you have it the right size. Take your time and do both wing panels.

19. Locate the 3/8" x 1" x 8" balsa block. Cut two pieces 3-5/8" long. Now taper each, on the 3/8" edge, from 3/8" to a sharp edge. Glue the blocks on each of the root ribs at the trailing edge. Slide the wing on the aluminum spar and up against the fuselage and check the fit. It should be fairly close but, will need more fitting. The block and root rib should fit snug against the fuselage.

20. This completes the wings. Rough sand them and lay aside until ready to final sand, cover and paint.

Tail Construction

The tail surfaces are foam covered with 1/16" sheet balsa. As an overview of construction, it will be necessary to: cut a slot in each foam piece of the stab to accommodate **SJ1** joiner, prepare the skin sheeting for covering in the configuration shown on the plans, layout and cut out the rudder and elevator, install the rudder, stab and elevator end caps, locate and drill the holes for the hinges, shape and sand the parts. Note: The foam cores are in packing shells. Do not throw these away. They will be needed throughout the tail construction.

1. Locate the foam parts for the tail. Unpack and inspect the cores for roughness and any irregularities that might cause problems. The cores are symmetrical, no need to worry about top and bottom. Lightly sand them, if necessary, with 220 grit paper. Handle them carefully and do not destroy the thin trailing edges.

2. Starting with the stab/elevator cores, place each of them in one packing shell to keep them level. Tape in place. Layout the slot for **SJ1** on each core noting the dimensions shown on the plans. Carefully cut the slot with a band saw or scroll saw. Check the slot width with **SJ1** to see that it fits properly.

3. Locate 7 sheets of 1/16" x 3" x 36. Cut 6 sheets in two making 12 sheets, 18" long. Cut one sheet into four 9" lengths. Make up four skins as shown in the layout on the plans by edge gluing the sheets together. Some of the balsa sheets may be crowned. True up the edges taking off as little as possible. Use CA or white glue.

4. Lay one skin on a flat surface and trace the outline of a packing shell on it noting the location shown on the plans. Allow 3/16" of extra sheet on the tip, root, and leading edge only. Trim off excess sheeting. Now prepare the other three skins. Block sand the skins, on both sides, to assure flatness and smoothness. **See steps 6 and 7 above for skin bonding.**

5 Remove the surfaces from the packing shells and sand the root, tip, and leading edge flush with foam on each. Locate the 1/4" x 1/2" x 36" leading edge and cut in two. Align and glue it on each of the surfaces using white glue and masking tape to secure it while curing. Now shape and sand it to the airfoil shown on the plans and sand flush with ends.

6 Place two packing shells on a flat surface with root ends butted together. Locate **SJ1** and install in slot cut in root end. Now slide the other surface in place. Tape together temporarily and lay in shell packing for support. Noting the plans, layout the hinge line and end configuration of the elevator. Remove the two halves and saw along the hinge line using the shell packing for support . Now do the other one.

7 Using the packing shells again for support, epoxy the **SJ1** joiner and halves together using 30 min epoxy. Weight down and allow to cure. While supported in the packing, remove _" from the trailing edge and 1/8" from each end. Glue on the _" x 1-1/4" trailing edge with white glue. Use masking tape to hold it in place. Plane and sand trailing edge flush with airfoil and ends. Glue stab tip **ST1** on each end with white glue and tape until cured. Sand flush with airfoil. **Note: You may fiberglass the center section of the stab however, there is enough strength with the ply joiner and the trailing edge in one piece. It's your choice.**

8. Place each elevator in its respective packing shell, tape in place and remove _" at the hinge line, 1/8" at the root and tip and 1/8" on the inside of the offset. Locate **ET1** and **ET2. These are cut oversize to allow for sanding.** Glue on both surfaces with white glue and tape in place. When cured, sand flush with airfoil.

9. Find the 1/2" x 1-1/4" x 30" elevator leading edge. Cut in two and glue in place with white glue. Tape in place until cured. Plane and sand down the leading edge sides until flush with airfoil. Sand off flush with root end. Establish a center line on the leading edge. **See LOCATING AND DRILLING HINGE HOLES**. Now shape the leading edge as shown on the plans. (Note: you might find it easier to shape the leading edge before gluing in place. Tack glue it in place. This way you can get the correct angle on both ends without having the elevator offset in the way.)

10. Unpack the fin/rudder and inspect the foam core. Sand only if necessary. Note the skin layout on the plans and edge glue the balsa sheets as shown to make up 2 covering skins. You will need 5 - 1/16" x 3" x 36" sheets. Save the packing sheets. They will be used to support the cores in a level position when applying the skin, and cutting the fin and rudder apart.

11. Once the sheeting has been applied, as described above, sand the leading edge flush with the foam core. Glue on the 1/4" x 3/4" x 16" leading edge with white glue and tape in place. Place the fin in its packing shell and remove 1/4" from the fin trailing edge, and 1/8* from the outer tip, sand smooth. Glue on the 1/4" x 1-1/2" x 12" trailing edge. Both should be flush with the tip. A good portion of the bottom will be trimmed off so don't worry about a shortage of wood. Locate **FT1** and glue on the tip. Now trim 5" off the bottom portion. Shape and rough sand and when cured.

12. Place the rudder in its respective packing shell, tape in place, and trim 3/4" off the hinge line and 3/8" off the bottom. Locate the 3/8" x 2" x 10" block and glue on bottom. Shape the sides flush with the rudder surface and sand flush at the leading edge. Locate the 3/4" x 1-3/4" x 16" leading edge block and glue it in place using white glue. Centrally position it with masking tape. When cured, plane down the edges flush with the rudder surface and sand smooth. Establish

a center line down the leading edge. **See LOCATING AND DRILLING HINGE HOLES.** Layout the leading edge configuration (as shown on plans) on both ends, plane down and sand to shape.

13. Locate the 3/4" x 1" x 6" rudder tip block. Cut out profile shape from plans and glue in place using white glue. Shape and sand with rudder hinged to fin for best results. Set aside for covering and painting.

LOCATING AND DRILLING HINGE HOLES

1. Before shaping any of the hinged leading edges, it is best to drill them while you are working with a flat surface. To ensure accurate alignment, make up a drill gauge for each of the hinged control surfaces. e.g., rudder, elevator and ailerons.

2. Using a piece of hardwood, 1/4" x 3/4" x appropriate length, locate and mark a center line. Layout the hinge hole locations from the plans, on the center line, and drill with a 3/16" drill. On one end make a stop index for positioning. Label each gauge for its use.

3. To use the gauge, first establish a center line on the control or flying surface, align the index stop and holes with the centerline and securely tape in place. Now drill the holes.

4. Although you cannot drill many holes without wearing out the gauge, for the small number to be drilled the gauge will be of great benefit. Its thickness will also help guide the drill straight. Control surfaces will actually be interchangeable with accurate alignment.

LOCATING AND DRILLING THE LANDING GEAR HOLES

1. It will be necessary to drill some holes in the landing gear. First, to retain the gear to the fuselage and second, to retain the pants to the strut. The dimensions provided for their locations are shown on the plans. It is recommended that you use a drill press for convenience and accuracy. However, if you center punch them well, they can be drilled with an electric hand drill with a good sharp drill bit. All of these holes will be used to locate other holes so location can be compromised slightly.

WHEEL PANTS

1. Locate the wheel pants and pair them up. You will need to make up a **LH** and **RH**. Lightly sand the edges with a flat sanding block so the halves will mate better. Tape the halves together aligning the edges and apply CA along the seams where possible. Remove the tape and finish gluing.

2. Cut out the opening in the bottom of the pant and allow clearance for the wheel. Use a Dremel Motor with a drum sander.

3. Cut a strip of 2 oz glass cloth approx. 1" wide and place on the seam inside the pant. Use Ace Hardware General Cement #43691. Lay the strip of cloth and paint it in place with the dauber. Do not put on a heavy coat, just enough to cover the cloth. Do both wheel pant.

4. Locate the two **WP1's** and round off the bottom edge to fit in the pant. Find the center of the wheel opening and thick CA them in place on the inside of the pant. Remember to make a LH and RH.

5. Now remove the plastic inside the 1/2" wide slot on both wheel pant. Note the section of the wheel and pant on the plans as you proceed to the next step.

6. Locate the landing gear and install a wheel axle. Slide a wheel on to the axle and hold in place temporarily with a wheel collar. The 1/2" hole in the pant should fit over the hex on the axle and against the landing gear strut when it is positioned correctly.

7. Locate the **WP2** parts and round off the surface of one side which will fit up against the pant to help support it on the outer end of the axle. Now slip it on the axle.

8. Mount the landing gear on the fuselage and block up the tail to flying position. Position the wheel pant so that it's level and match drill a 1/8" hole in the wheel pant locating it from the hole in the landing gear. Remove the wheel pant and install a 6-32 blind nut or #6 all-thread on the inside of **WP1**. Reassemble the pant and wheel on the axle and secure with a 6-32 soc. hd. bolt, flat metal and lock washer. Make sure the **WP2** is on the axle and against the side of the pant. Glue it to the pant using thick CA. Now do the other wheel as described above.

WING ASSEMBLY AND INCIDENCE SETTING

1. Now is the time to set the wing incidence. This is critical so take your time and do it right the first time. You want both wings to be at zero incidence setting with the stab. Assuming you have glued the stab on by now. Set the fuselage up on a flat surface and block up the tail in flying position. Flying position means the stab should be at zero incidence. Use a Robart Wing Incidence Indicator to accomplish this.

2. With the fuselage firmly blocked up in place, slide the wing spar into the fuselage and slide a wing panel on it all the way in until the 3/8" dowels are in the 5/8" holes with the wing panel firmly against the fuselage. Place the Incidence Indicator, use the Robart long beam if necessary, on it and zero out the wing. If you can't zero it out because the 3/8" dowels hit the edge of the 5/8" holes, then enlarge them locally until you can. More than likely you did not centrally locate **W1** as we told you to do when you glued it in place, if this happens. Now pin or tape it in place.

3. Locate two of the four **FS4's**. Carefully epoxy each one in place by sliding it over the 3/8" dowel and against **FS1.** Be careful not to disturb the incidence setting while doing so.

4. Slide the other wing panel in place and repeat the alignment procedure as described above.

5. In the future when it comes time to remove the wings, remove the spar as well. The aluminum spar is captured between the wing panels and will float plus or minus _" from end to end.

6. Once the incidence has been set, and the wings are firmly against the fuselage, mark the two wing retaining hole location, on each side, from the holes in the fuselage. Remove both wing panels, drill and tap for a 1/4-20 nylon bolt, four places.

FINISHING AND RADIO INSTALLATION NOTES

1. We leave the covering and finishing up to you and what you have had experience with. In order to keep your Cap 232 as light as possible we recommend you cover it with a film covering. Keep the paint down to a minimum, also heavy decals. With extra power up front you can cover

it with Super Coverite or Super Shrink and paint it making the model more durable. But, expect it to weigh more. Keeping the model light will give you added performance with lesser power.

2. Our prototype's were covered with Super Coverite and painted. We recommend using Formula U, K&B Superpoxy, Hobbypoxy, Perfect Paint, Coverite 21st Century or MonoKote paint over the ABS plastic. Do not try to mix different paints and thinners together and by all means test a small piece first before using any other paint not listed.

3. Make up the push rods as shown on the plans. The true length of each can be taken off the plans. We have shown 4-40 threaded rods and hardware for stiffness. Use them for better control response. Install the radio and batteries up forward. Wrap them in foam and tie them down to keep them from wandering around. You have plenty of room to shift the batteries forward or aft to help offset any balance problems. We recommend you install the standard servos that come with your radio on all surfaces except the throttle which can be smaller. If you install a larger motor with more speed, then by all means install 70 oz servos.

PRE-FLIGHT NOTES

Before the first flight, and to ensure some longevity in your Cap 232, you will do well to check out a few things before heading to the flying field. Heed these words of wisdom!

1. Balance the Cap at the indicated CG point shown on the plans with the fuel tank empty. Depending on your type of flying you may want to adjust it forward some.

2. Check the control surface travels. We have given you a starting point however, they need to be fine tuned to meet your flying needs.

3. Run the engine and check the idle. Have it ready so you don't encounter any problems at the field.

4. Turn on the radio with the engine running to make sure there are no intermittent glitches. Give it a good range check.

5. Check all hardware to be sure it is secure. There is nothing worse than losing an airplane on the first flight because of a loose nut or clevis.

6. Hopefully by now you are ready. We know you will be thrilled with your first flight and thast it was a successful one. From now on ---- **Happy fly'in!**

CAP 232 MATERIAL SPECIFICATION

ABS Cowl (two halves)
Wing foam cores (LH and RH)
Tail foam cores (1-fin/rudder and 2-stab/elevator)
Wheel pants (LH and RH)
Wing foam cores (LH and RH)
Aluminum spar 1" OD x 33"
Canopy
Formed aluminum landing
Fiber tube 1" ID x 12" (3)
ABS stab cover

FUSELAGE

Laser cut parts

F1 (bulkhead) (1/8" ply)
F2 " "
F3 " "
F3A " "
F4 " "
F5 " "
F6 " "
F7 " "
FS1 (2) (fuselage side) (1/8" ply)
FD1 (2) (fuselage side doubler) (1/8" ply)
FD2 (4) (stab support)
FS2 (2) (engine box sides) (1/8" ply)
FS3 (4) (wing incidence retainers) (1/8" ply)
SB1 (4) (servo mounting backup) (1/8" ply)
MB1 (engine box top) (1/8" ply)
MB2 (engine box bottom)
Firewall (1/4" birch ply) (router cut)
LG1 (landing gear mount) (1/4" birch ply) (router cut)
TW1 (tail wheel mount) (1/4"ply)
WP1 (2) (wheel pant retainer)
WP2 (2) (wheel pant support)
TS1 (throttle servo support)

Wood stock

1/4" sq. x 36" spruce (3) (fuselage top rail)
1/4" sq. x 36" balsa (7) (fuselage stringers)
3/32" x 3" x 36" sheet (7) (top and bottom sheeting)
1/2" tri-stock x 36" (4) (fuselage reinforcement)

WINGS

Laser cut parts

W1 (2) (wing root rib) (!/8" ply)
W2 (2) (spar support) (1/8" ply)
W3 (2) (wing tip cap) (1/8" balsa)
W4 (2) (wing insert cap) (1/8" balsa)
W5 (2) (aileron end cap) (1/8" balsa)
W6 (2) (wing retainer block) (1/4" ply)
W7 (2) (wing retainer block) (1/4" ply)

Wood stock

1/4" x 3/4" x 42" (2) (wing leading edge)
1/4" x 1-1/4" x 36" (2) (wing trailing edge)
1/2" x 1" x 36" (2) (aileron leading edge)
3/32" x 3" x 42" (26) (wing sheeting)
1/4" X 1/4" x 12" (servo mounts)
3/8" dowel x 24" (wing retainer)
3/8" x 1" x 8" balsa block (wing root rib extension)

TAIL SURFACES - laser cut parts

FN1 (2) (fin top cap) (1/8" balsa)
ST1 (2) (stab end cap) (1/8" balsa)
ET1 (2) (elevator tip cap) (1/8" balsa)
ET2 (2) (elevator inset cap) (1/8" balsa)
ET3 (2) (elevator root end cap) (1/8" balsa)
SJ1 (1) (stab joiner) (1/8" ply)
Rudder post (1/8" balsa)

Wood stock

1/4" x 3/4" x 12" (fin leading edge)
1/4" x 1-1/2" x 12" (fin trailing edge)
3/4" x 1-3/4" x 16" (rudder leading edge)
3/8" x 2" x 10" (rudder bottom)
3/4" x 1" x 6" (rudder top)
1/16" x 3" x 36" (12) (sheeting fin and rudder)
1/2" dowel x 8" (control surface horn anchor)

CANOPY - laser cut parts

C1 (front former) (1/8" ply)
C2 (rear former) (1/8" ply)
C3 (2) (forward gusset) (1/8" ply)
C4 (2) (rear gusset) (1/8" ply)
C5 (2) (retainer block) (1/8" ply)

Wood stock

1/4" sq. x 30" spruce (side rail)
3/32" x 3" x 36" (1) (canopy frame sheeting)

COWL - laser cut parts
Cowl ring (1/4" ply)

HARDWARE AND MATERIAL LIST FOR CAP 232

GENERAL

1. 4 or 6 channel radio
2. engine - suitable size
3. Muffler - Slimline (no. 6003 Pitts Style)
4. fuel tank - 24 oz Du-Bro no. 424
5. propeller - suitable size to fit engine
6. fuel line
7. 3-1/2" spinner - Tru-Turn #TT3552B
8. covering, paint and trim - your choice
9 3-1/2" dia.- Du-Bro 3.50L Feather Lite wheels

Note: Fiberglass cowl and wheel pants available from Lanier R/C.

FUSELAGE and TAIL

1. 1/4-20 blind nut (6) (engine mount and landing gear mount)
2. 1/4" flat washer (6) "
3. 1/4" lock nut (6) "
4. 1/4-20 socket head cap screw (6) "
5. #6-32 blind nut (8) (cowl retainer, canopy retainer, wheel pant retainer)
6. #6 flat washer (8) "
7. #6 lock washer (8) "
8. #6-32 x 3/4" socket head cap screw (6) (cowl retainer, canopy retainer)
9. #6-32 x 1/2" socket head cap screw (2) (wheel pant retainer)
10. Engine Control Flex-Cable (1) Du-Bro #165 (engine throttle cable)
11. Wheel Axle, Du-Bro # 249 (one set)
12. Wheel Collars, Du-Bro #138 (4) wheel retainers)
13. Ohio Superstar Tail Wheel Assy. (L)
14. #8 x 3/8" sheet metal screws (2) (tail wheel retainer)
15. Threaded Rod, Du-Bro #144 (3) (elevator and rudder pushrods)
16. Solder Link, Du-Bro #305 (3) (elevator and rudder clevis)
17. Swivel Link, Rocket City #69C (3) (elevator and rudder clevis)
18. Strip Aileron Horn, Du-Bro #103 (1) (tail wheel pushrod connector)
19. Threaded Rod, Du-Bro #306 (1) (tail wheel pushrod)
20. Solder Link, Du-Bro #112 (1) (tail wheel pushrod clevis)
21. #6-32 x 2" bolt (2) (elevator control horn)
22. #6-32 x 2-3/4" threaded rod (1) (rudder control horn)
23. Robart Super Hinge (11) (rudder and elevator)

WING

1. Threaded Rod, Du-Bro #144 (2) (aileron pushrods)
2. Swivel Link, Rocket City #69C (2) (aileron clevis)
3. Solder Link, Du-Bro #305 (2) (aileron clevis)
4. #6-32 x 2" bolt (2) (aileron control horn)
5. Robart Super Hinge (10) (aileron hinges)
6. #2 x 3/8" sheet metal screw (20) (servo mounting, wing and fuselage)
7. 1/4-20 nylon bolt, Du-Bro #142 (4) (wing retainer)

GLUE

Zap CA (thin and thick)
Zap 5 min. and 30 min. epoxy
White glue