Hobby Lobby's Telemaster 40 BUILDING INSTRUCTIONS

Telemaster 40 is a smaller version of the famous Senior Telemaster. It is just as stable and easy to fly as the Senior Telemaster. On our first flights of the prototype Telemaster 40 we throttled it down, while up at a safe altitude, put in some rudder trim and put the transmitter on the ground. it just flew around in big circles up there, waiting for our next command. While it's stable and capable of slow flight to make it the best R/C trainer, it's also capable of fun flying many maneuvers such as a loop, wing over, inverted flight, rolls, and more. But, most important for beginners and for people who have small flying fields, it lands about as slowly as a model airplane can - even without the flaps. While the kit can be built without flaps, all of the parts needed for flap installation including building instructions are provided. With the flaps down in a small headwind it should be possible to land the Telemaster .40 at just about zero ground speed. Now that's slow landing! Telemaster 40 has conventional landing gear -- it's a "tail dragger". It should give you no problems with ground looping (circling on the ground during takeoff attempts). The conventional landing gear arrangement is better for flying from grass fields than if it had a nose gear. But, if you prefer using a nose gear there is a drawing that shows you where to locate the main gear. Any steerable nose gear can be mounted on the thick "firewall" bulkhead which is just aft of the engine.

While this great flying plane has been flown with only rudder, elevator, and throttle controls, we recommend that you add the ailerons even if you want to get started with only the rudder, elevator, and throttle. Connect the aileron linkage to the servo, just don't use it as you fly. We think the airplane flies best with a .25 to .46 size engine. Some flyers use .61 size engines and if you do this you should strengthen the horizontal stab with shear webs and there is a note about this in the stab assembly instruction.

Engine size: Some flyers like to install the largest engine for which the kit is designed. Their reasoning is that you can always throttle down, but with the larger engine you'll have power to get you out of trouble if needed. The other approach is to outfit the plane with a smaller engine so the aircraft is lighter and will be a more docile flyer. You decide. We prefer a .40 or .46, using full throttle only for the take-off and for some maneuvers. Half throttle is more than adequate for level flight.

Electric power: Telemaster 40 is one of the very best candidates for electric motor power. A big variety of inexpensive motors, gear or belt reduction devices work well in it. It's big enough to carry 14 to 20 nicad cells and doesn't need any special lightening measures during building.

Before you start building the kit it's best to glance ahead through the entire building notes first. That way you'll see how it should go and be able to anticipate what's coming. Refer to the plans as you read and identify each of the pieces you'll be using as you build the kit.

While Telemaster 40 is as complete as most kits on the market, if you are new to R/C or if you don't have much hardware in your shop you may want to consider getting the Telemaster 40 Accessory Pack, stock number HLA111AP. It's available from Hobby Lobby. The list of materials included in the Accessory Pack is included at the end of these construction notes. The items in the Accessory Pack change from time to time as newer items replace old ones. The Hobby Lobby Accessory Pack #HLA111AP includes all of the extras needed to complete the R/C model aircraft, except the engine and radio and flying field accessories such as fuel and starting battery.

In building our Telemaster 40 we used several different kinds of adhesives. Titebond, an aliphatic resin, was used for most glue joints that could be easily pinned or clamped in place while the adhesive set up. We used this adhesive to prepare the fuselage sides, build the wings, stab, fin, and elevator. Cyanoacrylate (CA) glues can also be used. They are very fast setting but you must be careful that you have made a tight-fitting joint before applying the glue.

For most other glue jobs such as installing the fuselage bulkheads, adding the engine compartment sides, the ply wing dowel plates, the servo rails, the outer tubing for the pushrods, gluing the fin into the stab and the stab to the fuselage and joining the wing panels, we used 5 minute epoxy. A big advantage of this

THE WING :

Because the wing has a flat bottom airfoil, the wing panels are built flat on the plans on a building board that's soft enough for you to stick pins into. Cover the plans with wax paper. The surface of your building board must be perfectly flat if the wing is to turn out true.

If you have a long enough building board, both wing panels may be built at the same time. Since the wing panels are to be glued together at the center at an angle for the dihedral, the wing cannot be built in one piece. As shown on the plans, the wing may be built with or without flaps. Torque rod linkage, similar to that commonly used for strip ailerons, is provided in the kit. A 5th auxiliary channel and a servo are required to operate the flaps. It's preferable that this auxiliary channel should give proportional control so that any amount of flap deflection from zero to 30 degrees down may be achieved. But, the flaps may also be operated with what would otherwise be the retract landing gear switch. With this installation the flaps will only operate from zero to full down. The amount of flap throw should be adjusted for about 15 - 20 degrees maximum for your test flights, increasing the deflection up to 30 degrees if desired after you test the flying characteristics. For most landings with our prototype we used only about 20 degree flap deflection.

1. Prepare the ribs and shear webbing. Stack all of the wing ribs, using the top and bottom spar in the wing spar slots to align them. Push two long "T" pins or straight pins -into the stack of ribs from both ends of the stack to keep the ribs perfectly aligned. Carefully use a sanding block to lightly sand the leading edge and trailing edge of the ribs.

Remove the ribs from the stack and number the ribs for each wing panel. Again stack ribs 1-8 for each wing panel. Using the plans as a guide, mark and drill the hole through the ribs for the music wire aileron linkage. (If you decide to use 2 aileron servos these holes can be used for the wires that connect the aileron servos to the receiver.) The hole should be properly located from front-to-back and top-to-bottom on the ribs so the linkage will align properly with the aileron bellcrank.

Remove rib #2 from the stack for each wing panel. Use a small round file or your Xacto blade to extend the hole 1/8" above and 1/8" below to form a slot. This is to prevent binding the linkage due to the up and down movement of the music wire when the servo operates.

Use the template provided in the plans as a guide to cut 2 shear web pieces that will be glued to the center wing ribs of both wing halves. Since the angle of the edge that mates with the root rib will be used to get the proper angle of that rib for the desired dihedral, make sure that it is accurately cut.

Cut the shear web pieces for the other wing bays in which webbing is used. The grain of all the shear webbing pieces should run **vertically**, so cut all the web pieces across the grain of the wood. All of the webbing pieces should be the 1-1/4" high and the width of the rib bay they will be glued into. 14

2. Glue the wing trailing edge to the bottom trailing edge sheeting. The back edge of the 1/4 X 5/16 trailing edge should align with the back edge of the sheeting. Prepare these parts for both wing panels. R L Trim to size then assemble

3. Pin down the bottom leading edge sheeting and add the leading edge stock. Glue the bottom edge of the leading edge stock to the front edge of the bottom leading edge sheeting. Use a rib as a guide to assure that the leading edge is at the proper angle to the sheeting. Pin the assembled pieces to the plan as you glue them. R L 10/19

4. Pin down the trailing edge sheeting, and when it's in place, pin and glue the 1/4 x 5/16 trailing edge piece on top of it. Use a rib as a guide to get the proper distance between the leading edge and trailing edge. Don't worry if the trailing edge is slightly out of position in relation to the plans. The plans are only a guide to location -- the factory cut parts are accurate and should be fitted to each other regardless of the size of the plan. The slight bevel in the top surface of the 1/4 x 5/16 trailing edge piece will be sanded to its angle later. R L

to the ribs along the edge of the trailing edge will help prevent accidental marring of the ribs as you sand. Replace the tape if you sand through it while you work.

8. Add the leading and trailing edge top sheeting, and cap strips on the tops of the ribs on all ribs except those at the bellcrank bay and on top of the ribs in the center section which will get sheetwood covering in Step 17. The top surface of the leading edge sheeting may be moistened with a damp sponge so it will bend easily to the rib contour. Pin the aileron/flap stock up to the wing trailing edge. Note that when working with this factory shaped balsa, there is a 90 degree angle between the bottom and front edge. Be sure to use it in that position. Use a sanding block to sand the aileron/flap stock to the wing trailing edge.

9. Prepare the aileron, flap, and wing center section trailing edge. If you are going to use flaps, cut the short length of center section trailing edge, into which the flap linkage is installed, from the stock provided for the flap. See the plans. If you are not going to use flaps, the length of trailing edge stock that runs from the wing root to the aileron will be glued to the wing later. For flaps, cut a groove down the center of the center section trailing edge just deep enough to accept the flap torque rod linkage.

10. Optional, if you want flaps:) Install the torque rod arms in the center section trailing edge pieces. Remember that the flap torque rod servo arms hang **down** from the bottom of the wing, then cut a notch in the bottom of the groove for the servo arms of the torque rods. The slot should be 1/2" from the root end. You'll need a right and left piece, and don't forget the 90 degree angle between the bottom and front edge. Wipe some Vaseline onto the torque rod at the ends of the tube. Tack glue the sleeves into the groove. It is important that these torque rods are perfectly aligned with the flap hinge line when they are installed. Put the center section trailing edge/flap linkage assemblies aside for now.

11. Prepare the aileron bellcrank plates. (Note: Some modelers will want to use 2 servos for the ailerons instead of one. If you want to use 2 servos instead of one, you may install these servos on the bellcrank plates instead of installing the bellcranks.)

To mark the hole to be drilled in the 1/8 plywood bellcrank plate for the bellcrank pivot screw, hold the plate temporarily in place on the wing. Lay the bellcrank at the approximate location shown on the plan. Align it so the outboard hole in the fore-aft arm aligns with the pushrod hole drilled in the rib. The outboard hole in the horizontal arm should be roughly centered from side to side on the plate. Mark and drill the hole for the bellcrank pivot screw.

Install the bushing into the bellcrank and install the assembly on the bellcrank plate with a #4 x 1/2" screw and hex nut. Do not overtighten the nut as this may distort the nylon bushing. Check the assembly for binding. Do not fasten the screw and hex nut tightly yet because you will need to take the bellcrank out when you connect it to the pushrod that goes to the aileron servo.

12. Install the aileron bellcrank/bellcrank plate assembly. The front edge of the plate should be approximately 1/4" below the top edge of the rib and glued to the shear web. The back edge should be 9/16" below the top edge of the rib at that location. This will put the plate at the proper angle. Note that the hole in rib #8 for the aileron linkage should be just above the surface of the bellcrank plate. Enlarge the hole to a slot 3/16 long along the surface of the bellcrank plate.

13. Add the triangular stock wing tips. When carved and sanded to the rib contour later, the tip pieces will assume the desired top view as seen on the wing plan.

14. Cut the aileron pushrod exit slot. After the wing adhesive has set, remove the wing from your building board. With the bellcrank properly aligned the slot for the pushrod to the aileron horn should be aligned with the outer hole in the servo arm or output wheel. The front of the 1 1/4" long slot should be about 1 1/2" from the back of the bellcrank plate and end about 7/8" forward of the front of the trailing edge sheeting.

15. Prepare the aileron servo-to-bellcrank linkage. A length of piano wire (music wire) is used for the aileron servo-to-bell-

Cut a 3/4" square rectangular hole in the bellcrank bay bottom sheeting in the area of the bellcrank screw and nut. This will give you access to put a drop or two of glue on the bellcrank screw threads after the linkage has been installed to prevent vibration from loosening the pivot screws. This 3/4" square piece of balsa sheetwood can then be glued back into place and sanded smooth.

17. Add the top center section sheeting, 1/4x3/8 stock down both sides of the bellcrank plate, and the cap strips on ribs #8 and #9. Shave or sand the wing leading edge to the rounded contour that is shown on the cross-section view of the wing plan.

Cut to fit pieces of 1/4 x 3/8 stock from the 1/4 x 3/8 x 36 provided in the bundle of sticks and cement the pieces to both sides of the bellcrank plate. Provide clearance for the piano wire in the 1/4x3/8 stock. Before you begin planing the leading edge check the plans to note that there is more curve on the top edge than on the bottom. For reference when you plane and sand the leading edge, draw a reference line down the leading edge 5/16 up from the bottom edge. This line represents the furthermost point forward of the wing. Try to not sand this line off and you'll keep the leading edge piece close to its proper thickness during sanding.

18. Plane the balsa wing tips roughly to match the shape of the end rib. But, do not closely plane the portion of the wing tip that joins the wing cap strip yet.

19. Cut off the wing tip at the aileron hinge line, save the little end, and glue the little cut-off piece to the tip end of the aileron.

20. Use a sanding block to sand the glued-on tip to the aileron contour.

21. Cut off the excess aileron servo-to-bellcrank pushrod at the wing center section, but leave a little for connecting to the aileron servo. The piano wire should extend about 1" beyond the root rib. Enlarge the hole in the root rib. This is done to allow the piano wire from one wing panel to extend into the other wing panel when the wing panels are glued together at the center.

22. Add the wing center section trailing edge/flap linkage piece to the wing. If you are not installing flaps, glue the trailing edge section inboard of the ailerons to the wing trailing edge. Work with the wing upside down. Apply the adhesive sparingly to the center section/flap linkage piece so it won't interfere with the operation of the flap torque rod. Use a straight edge along the bottom of the wing to align the trailing edge center section to the surface of the rib bottom cap strips.

23. Finish sanding the wing. Use a long, flat, sanding board to finish sand the wing leading edge, tip, and top and bottom sides as necessary including the rib cap strip/sheeting glue joints. If you're using a "T" bar sanding block, watch the ends to make sure they don't dig into one of the cap strips as you work.

24. Shape the aileron and wing flap leading edges. Draw a line along the center of the leading edge of the flap and ailerons. As you sand the leading edge of the ailerons and flap, don't sand the line you drew. This will assure that you leave the straight edge straight. Shape the aileron leading edge to a "V" shape as shown on the end view of the aileron. Shape the flap leading edge in a similar manner except that the angle on the bottom side will need to be at a greater angle to allow the flap to drop 30 degrees. Check the aileron by holding it up to the wing.

25. For flaps, mark and drill the hole in the leading edge of the inboard edge of the inboard end of the flaps for the flap torque rod arm. Also, groove out the flap inboard of this hole for torque rod arm clearance. When drilling the hole it should be parallel to the bottom surface of the flap and aligned with the flap hinge being careful that you don't drill through the top surface of the flap as you drill.

26. Cut the aileron and flap hinge slots in the wing and in the ailerons and flaps. Hold the aileron and flap in place and mark the location of the hinges. Draw a center line down the trailing edge of the wing as a reference before you cut the hinge slots in the wing. We recommend one hinge in each rib bay with [illegible] hinges located within 1/2" of the ends of the aileron and

the surfaces that will mate. Glue the wing halves together.

29. If you install flaps): Relieve the wing trailing edge to permit the forward movement of the flap torque rod servo arms.

30. Apply 4 to 6 oz. fiberglass cloth to the wing center section, all around the center, and about 3/4" beyond where the edge of the fuselage will be. Adhere the fiberglass cloth to the wing with cyanoacrylate glue. The glass cloth and CA glue is first applied to the bottom side of the wing, then to the top side. The glass cloth should be applied like a "bandage" around the entire center joint of the two wing panels. As you flow CA into and through the glass cloth push the cloth against the balsa wood to make sure the cloth adheres totally to the wood. Extend the fiberglass cloth out each wing panel so that it hardens and protects the places on the wing that the wing-hold-on rubber bands will press against. Keep the CA glue clear of the flap torque rods.

31. After the CA glue has set up, sand the glass cloth. VERY IMPORTANT: do not heavily sand the outboard edges of the glass cloth as you will cut into the balsa wing sheeting too much and weaken the wing! Wrap the edges of the glass cloth with masking tape so that you are prevented from cutting into the balsawood.

This completes work on the wing at this time.

THE FUSELAGE

When building the fuselage it's important for both sides to be exactly the same size. To achieve this you should build one side directly on top of the other. That's the technique we recommend here. You will assemble the fuselage sides on top of a wax paper covered plan in Step 4 below.

1. Locate the top and bottom 3/16" thick sheet balsa fuselage sides. These pieces run from the nose of the plane to behind bulkhead #2. Cut the forward fuselage center stringers using 3/16 x 5/8 stock. Working on a flat surface (if working on top of the plan cover it with wax paper so the glue won't stick to it), glue the fuselage top, bottom, and center stringer together to make a complete forward side. When the glue has dried trim the ends of the center stringer to match the top and bottom sides as shown on the fuselage side view. Make two sides this way.

2. Hold the two sides up on edge as they will be installed in the fuselage, mark the inside of the right piece "right inside" and the left piece "left inside".

3. Draw the location of bulkheads #1 and #2 and the engine mounting rails on the inside of the two fuselage side pieces.

OPTIONAL ELECTRIC POWER: If you use GR1770 Graupner Power Gear 2:1 you will want to move Bulkhead #1 3/4" aft. This will enclose the Power Gear's belt drive within the side cowls. If you move Bulkhead #1 aft, keep the top edge of Bulkhead #1 even with the top edge of the fuselage sides.

Use a ruler and extend the bulkhead and engine bearer lines drawn on the fuselage plan's side view. Lay the left and right fuselage side pieces down on top of each other in their proper location on the fuselage side view plan and pin them in place. Using the extended lines you drew on the plans as a reference, mark the locations of the engine mounting rails and bulkheads #1 and #2 on the edges of the sides.

Remove the sides from the plans and use the marks you made on their edges to mark the locations of bulkheads #1 and #2 on the inside of the sides.

Use the plan to measure and mark the location of the motor mount rails on bulkhead #1. Use bulkhead #1 and the marks you made on the front of the fuselage sides to mark the location of the motor mount rails on the inside of the fuselage sides.

ASSEMBLING THE FUSELAGE SIDES

Note that when you begin building the right fuselage side after the left has been completed, the building sequence will be a bit different. Follow the sequence outlined or you might end up with two left sides.

5. Pin the left forward fuselage side down on the plans with some 1/4" balsa pieces under it. The side marked "left inside" should be down so the marks for the bulkhead don't show.

6. Cut the 3/16 x 1/4 center side stringer from stock and glue in place. Glue the previously cut 3/16 x 5/8 top and bottom side stringers in place. The stringers should be glued to each of the vertical braces and butt glued (the ends are to be glued) to the fuselage side front piece.

7. Allow the fuselage side to dry completely.

8. Remove the pins from the fuselage side but do not remove it from the plan. Cover the side with some waxed paper and replace a few pins to hold everything in place.

9. Pin the right forward fuselage side in place directly on top of the left forward fuselage side. The side with the bulkhead location lines should be the side that is up.

10. Pin the 3/16 x 1/4 center stringer and the previously cut 1/16 x 5/8 top and bottom side stringers in place while butt gluing them to the forward fuselage side.

11. Glue the five 3/16 x 1/4 rear vertical braces onto the fuselage side stringers and let the fuselage side dry.

12. Remove the fuselage sides from the plans.

13. Glue the triangular shaped 3/16 balsa brace for the landing gear plate to the inside of both fuselage sides. The forward end of the brace should fit up to the line drawn earlier to locate bulkhead #2. The brace is properly orientated when the wood grain is vertical or perpendicular to the fuselage side grain.

14. Cut the top and bottom 3/16 x 5/8 stringer doublers from stock. Use the plan side view to cut these doublers to their exact length since they will be used to locate bulkhead #3. The top doubler fits between bulkheads #2 and #3. The bottom doubler is cut at an angle to butt against the landing gear plate brace and extends to bulkhead #3.

Glue the top and bottom stringer doublers in place on the inside of the fuselage sides.

15. Prepare bulkhead #1 (the "firewall") by drilling the holes for the fuel feed and vent lines and the throttle linkage. Prepare bulkhead #2 by drilling the hole for the throttle linkage.

OPTION FOR ELECTRIC POWER: Cut a 2-3/4" high x 2-1/8" wide hole in Bulkhead #2 with the bottom opening 1-9/16" above the bottom of Bulkhead #2. This hole is for the Electric Power Battery Ramp.

16. Cut the top and bottom 3/16 x 1/4 rear cross braces. Also cut the 3/16 x 1/4 cross brace to be glued to the back side of bulkhead #3 and the one glued between the fuselage sides 6-1/4" behind bulkhead #2.

17. Cover the top view of the fuselage on the plan with waxed paper. Pin the five rear cross braces in place on the plans. Put glue on the ends of the pinned-down cross braces and pin the fuselage sides upright in place on the plans, UPSIDE DOWN. The vertical braces on the fuselage sides should touch the cross braces that were pinned to the plans. If they don't touch, move the cross braces slightly until they do touch.

Use a square to assure that the fuselage sides are at 90 degrees to your building board. Add the 3/16 balsa bulkhead #2 and the 1/8 balsa bulkhead #3 so they butt up to the stringer doublers. Clamp the fuselage sides to the bulkheads while the glue dries. Glue the fuselage sides together at the tail.

18. Glue the remaining rear 3/16 x 1/4 cross braces in place on the "up" side of the fuselage. (Since the fuselage is pinned in place upside down the "up" side is the bottom of the fuselage). Add the cross braces located on the back side of Bulkhead #3 and 6-1/4" behind bulkhead #2.

19. Glue the 1/4" thick plywood landing gear plate in place on the fuselage.

OPTION FOR TRICYCLE LANDING GEAR: Glue the 1/4" thick

24. Glue bulkhead #1 in place using the lines you drew earlier for reference. Clamp the sides to the bulkhead to assure a good glue bond.

OPTION FOR ELECTRIC FLIGHT: You may glue Bulkhead #1 3/4" aft of its normal location as mentioned in Step #3.

25. Glue the 3/8 balsa lower engine compartment doublers in place on the fuselage. The doublers are butted to bulkhead #1 and aligned with the bottom edge of the fuselage sides.
OPTION FOR ELECTRIC FLIGHT: If you moved Bulkhead #1 3/4" aft of its normal location as mentioned in Step #3 then add 3/4" wide scrap wood to the front of Bulkhead #1 to fill the gap to the doublers.

26. Glue the 1/2 x 3/4 hardwood engine mounting rails in place. The rails should be butted to bulkhead #1 and on top of the lower engine compartment doublers. Glue the upper 3/8 balsa engine compartment doublers in place.

27. Glue the 1/8" plywood hatch mounting plate to the back of bulkhead #1 and to the fuselage sides. The top of the plate should be even with the top of the bulkhead.

28. Cut the 1/2" triangular stock to fit and glue in place on the back of bulkhead #1 and bulkhead #2 as shown on the plan.

29. Mark the center of the hatch mounting plate and drill a 1/8" hole at the mark.

30. Glue the 1/4 balsa windshield in place on the fuselage.
31. Use masking tape to temporarily mount the 1/4 balsa forward hatch on the fuselage. Working through the bottom of the fuselage and through the previously drilled hole in the hatch mounting plate, mark the location for the hatch hold-down screw on the hatch. Also, mark the location of the fuselage sides on the back end of the hatch.

32. Remove the hatch from the fuselage and drill the hole for the hatch hold down screw. Glue the two 3/16 x 3/16 hardwood hatch pins to the hatch so that they will contact the fuselage sides and extend beyond the hatch under the windshield when the hatch is installed. Install the #4 blind nut on the bottom side of the hatch mounting plate. To prevent crushing the hatch when tightening the hold down screw, a piece of scrap plywood may be glued to the top of the hatch at the location of the screw.

33. Cut the 1/8 x 1/2 fuselage forward bottom spacers from stock. Cut one piece from each piece of stock. The remaining stock will be used later for the stabilizer spars. Glue these spacers to the bottom of the fuselage and to the landing gear mounting plate.

34. Sand the bottom spacers using a sanding block to blend into the fuselage contour at the nose as shown on the plan.

Cut the fuel tank compartment bottom sheet from the 1/8 x 3 x 12 stock provided and glue in place on the fuselage with the grain going across the fuselage.

35. Drill the 1/4 holes in the fuselage for the wing hold dowels at the location shown on the plan. Trial fit the dowels but do not glue them in place until you have covered the fuselage.

36. Drill four 1/8 holes through the bottom of the main landing gear for the mounting screws.

OPTION FOR ELECTRIC FLIGHT: The Battery Ramp will cover your access to the inside of the plywood main landing gear plate. Install blind nuts in the next step instead of hex nuts on the inside of this main landing gear plate if you are going to install the Electric Flight Battery Ramp.

37. Position the main landing gear on the landing gear mounting plate and drill holes through the mounting plate using the landing gear as a template. The landing gear will be installed later using #4 x 1/2 screws and hex nuts.

OPTION FOR ELECTRIC FLIGHT: Install the Electric Flight Battery Ramp. Glue a Crossbrace between the bottom fuselage stringers and glue the Battery Ramp floor to the bottom of the hole that was cut in Bulkhead #2 and to the crossbrace. Glue the two Battery Ramp sides in place. The top of the Ramp will it. Drill the holes through the engine mounting plate for the four 4-40 x 1 mounting screws. Be sure these holes are clear of the engine mounting flanges.

Install the engine mounting plate by drilling the holes in the engine mounting rails through the holes in the engine mounting plate. Secure the mounting plate with four 4-40 x I screws and hex nuts. Mount your engine on the mounting plate.

40. With the engine installed, make the required cut-out in the forward hatch. Also make any clearance cut-outs for the engine muffler.

41. Remove the engine and sand the front of the fuselage as shown on the plan. Then, sand the entire fuselage.

42. Prepare the fuel tank and fuselage as necessary. Because the fuel tank should be located in the position shown on the plans, it may be supported either by adding some rails inside the fuel tank compartment or just rest on a bed of foam rubber. Do not permanently install the fuel tank yet.

43. Cut and install the 3/16 x 1/4 balsa center stringer doublers. These doublers extend from bulkhead #2 to bulkhead #3 and are used to mount the servo rails.

44. Cut the servo rails from the piece of 1/4 x 3/8 plywood provided and glue in place to suit the servos you are using.

45. Temporarily install the rudder, elevator, and throttle servos. Install the rudder and elevator pushrod outer housings. Drill holes in bulkhead #3 for the pushrod housings to suit your servo installation. Trim the pushrod housings flush with the outside of the fuselage where they exit at the tail. Do not forget to support the pushrods with pieces of scrap 3/16 x 5/8 balsa as shown on the plan.

46. Make and install the stabilizer platform from the 1/4 x 3 x 4 balsa stock supplied. The stock is installed crossgrain you should trim it to be flush with the fuselage sides.

47. Install the Throttle cable housing.

48. Cut the holes for your radio switch and charging plug in the fuselage in the forward end of the servo compartment. The holes should be cut on the side opposite the muffler.

49. Seal the entire engine compartment, fuel tank compartment, engine mounting plate, and forward hatch with resin or epoxy to prevent fuel soaking.

This completes the fuselage structure.

THE HORIZONTAL STAB:

1. Cover the stab plan with wax paper. Pin down the stab leading edge, and add the bottom spar, center section sheeting, and center ribs. Pin the stab leading edge down first to the waxpaper covered stab plan. Use a stab rib to get the desired location of the bottom spar as you pin the spar in place on the plan. Cut and glue the bottom sheeting in place. Draw a center line down the sheeting. Add the four smaller center section ribs, using the fin rear section to get the desired spacing of the center ribs. Note the center line mark on the fin piece. Remove the fin piece before the adhesive sets up.

2. Glue the remaining ribs in place. Pull the leading edge snug to the ribs and add a pin at each rib station to assure a good glue joint.

3. Add the trailing edge cap, top spar, top center section sheeting and the stab tips. There should be a slot left in the center section sheeting for the fin. **Note that if you will use a .60 size engine** on the Telemaster 40 (which is not recommended by the manufacturer), spar webbing such as that used on the wing (not supplied in the kit) should be added to the stab to connect the top and bottom stab spars. If you add this spar webbing be sure to use spar webbing in the rib bays under the sheeting.

4. Add the elevator halves. The balsa stock provided in the kit for the elevator halves should be sanded to the rib contour. It should be sanded to no less than 1/8" thick along the back edge. Use a sanding block.

8. Sand the stab leading edge and the bottom side. Draw a reference LINE down the stab leading edge as you did on the wing. Remember there is more curve to the top side of the stab leading edge than there is on the bottom.

9. Cut the elevator hinge slots in the trailing edge of the stab and the leading edge of the elevator. Draw a center line down the back of the stab and along the front of the elevator. Mark and cut the hinge slots. Shape the front of the elevator to a "V".

That completes the work that should be done on the stab at this time.

THE FIN AND RUDDER:

1. Glue the forward and aft pieces of the fin together, and cut out the bottom of the fin for the stab leading edge, spars, and trailing edge.

2. When properly fitted into the slot in the stab, the bottom of the fin will mate with the bottom sheeting, stab leading edge, top spar, and trailing edge.

3. Sand the sides of the fin and rudder. Use a sanding block.

4. Sand the fin leading edge and tip, and the rudder tip and trailing edge. For best control characteristics, only slightly round the corners on the rudder trailing edge -- leave it thick and do not feather it to a sharp edge.

5. Glue the dorsal fin to the fin assembly. Pin the stab in place on the fuselage. Put the fin temporarily into the slot in the stab. Glue the dorsal to the fin but NOT to the fuselage.

Temporarily install the tail landing gear into the fuselage. Mark the location where the tail gear tiller arm is inserted into the rudder and drill a 3/32" hole into the rudder to accept the tiller arm. Provide clearance in the rudder for the tail gear bearing.

6. Mark and cut the hinge slots in the rudder and shape the rudder leading edge. Use a center line down the back of the fin and rudder as a guide to cut the hinge slots. Shape the rudder leading edge as you did the elevator.

7. Cut out a space in the rudder leading edge to provide clearance for the elevator joiner as shown on the plan.

That completes work on the fin and rudder at this time.

Completing the Telemaster 40:

1. Prepare the airplane to be covered. The Telemaster .40 has been designed so any of the plastic iron-on covering materials may be used. Follow the manufacturers instructions. We prefer Oracover for its strength and resistance to sagging over a long period of time. Before you begin covering, finish sanding all surfaces with a sanding block, winding up with 400 grit sandpaper. Wipe off all balsa surfaces with a tack rag to remove any sanding dust.

2. Cover the wing, stab, fin, rudder, elevator, and ailerons before these control surfaces are hinged, and before the stab and fin are glued into place. Before the wing is covered the aileron clevis rod must be installed. To prepare the aileron clevis rod the clevis should be screwed all of the way onto the clevis rod; so the threads just show on the inside. Using a "Z" bend at the BELLCRANK end the pin in the clevis should align with the aileron hinge line. After the clevis rod is installed into the bellcrank, snug down the bellcrank pivot screw and add a couple of drops of 5 minute epoxy to the threads and nut on the bottom side of the bellcrank plate.

When covering the stab and wing, cover the bottom side first, bringing the covering material all of the way up to completely cover the trailing edges, and overlap the covering about 1/4 inch onto the top surface. The top covering will adhere better to the layer of covering material than it will to raw balsa wood. Then cover the top surfaces and overlap the bottom covering which extends onto the trailing edges. Then install the hinges onto the flying surfaces. When covering the fuselage don't cover the top aft portion of the fuselage to which the stab is to be glued.

3. Install the hinges into the elevator, ailerons, (and flaps). 5 [illegible] place. Since the covering material on the bottom of the stab must be removed to the width of the tri stock, add a second set of lines on the bottom of the stab the width of the triangular stock.

Use a sharp razor blade to cut the covering material out to the edge of the location of the triangular stock. Don't cut too deeply or you will weaken the wood of the stab. Remove the covering material. Also remove the covering material from the sides of the bottom of the fin where the fin glues into the slot in the stab and from the sides of the fuse under the stab to which the tri stock pieces are to be added. It is important that all stab, fin, and tri-stock glue joints be glued balsa-to-balsa with no covering material in the glued area. Glue the fin into the slot in the stab. Use 5 minute epoxy. Make certain that the sides of the fin are at 90 degrees to the stab top spar before the adhesive sets up.

4. Glue the stab/elevator/fin assembly to the fuselage. 5 minute epoxy may be used. Set the fuselage on a flat surface with some weight added to the top back of the fuse to hold it firmly to the flat surface. When you glue the stab in place make certain that the center of the fin leading edge is aligned with the center line mark on the top of the fuselage and that the trailing edge of the fin is properly aligned with the back of the fuselage. Check the stab tips by measuring the distance from the flat surface to the top of the stab on both stab panels. Even better is to take a critical look at your airplane from some distance to make sure that the alignment of the stab and fin looks right.

5. Epoxy the tail gear bearing tongue into the slot in the fuselage. Double check its alignment by putting the rudder temporarily in place before the adhesive has set. To help prevent the tail gear from pulling out of the fuselage on a rough landing, you might want to install a sheet metal screw through the fuselage side at the tail wheel strut bearing tongue to pin the tongue in place.

6. Add the aileron control horns. Use the aileron clevis as a guide to find the proper location of the aileron control horn. The row of clevis holes should be directly in line with the hinge line. Install the control horn.

7. Make the cutout in the bottom side of the wing for the aileron and flap servos. If you use a single aileron servo, its servo well is located just behind the spar. Do not cut the spar under any circumstances. The center ribs must be cut away in the area of the aileron servo well. Note the enlarged holes for the aileron linkage in rib #2 to permit the up and down movement of the linkage as the servo operates.
Because of the direction of rotation of the servo we used for the flaps, our servo is mounted just left of the center rib. Check the operation of your flap servo before cutting the hole, or determine that your radio transmitter permits reversing of the servo to match the control direction you need. Remember that with the servo lever all of the way "up" for the flaps at zero, the flap servo output arm should move such that it will pull the flap torque rod arms forward to lower the flaps when the level is pushed down.

8. Prepare the aileron servo mounting plate. Use a piece of scrap 1/8 ply and small hardwood rails (not supplied) to prepare a plate to which a side mount aileron servo tray will be installed. Drill the holes for the side-mount servo tray into the plate. Use 5 minute epoxy to glue the hardwood rails to the bottom side of the plate such that the screw holes are centered on the rails. After the adhesive has set up, extend the screw pilot holes through the hardwood rails.

To glue the plate into the aileron servo well, temporarily mount the servo tray to the plate and install the servo. With 5 minute epoxy applied to the rails, put the aileron servo plate/servo tray/servo assembly in place into the aileron servo well. The servo wheel should align with the piano wire linkage. After the adhesive has set up, remove the servo tray from the plate.

9. Add the flap servo hardwood mounting rails. Depending on your servo, either the forward or rear rail may have to have a groove filed in it for the servo wires so you can slide the servo down into place.

Temporarily put the flap servo in place to mark and drill the holes in the hardwood rails for the servo mounting screws. Later when the servo is installed, a washer should be used under the head of the screws. Snug the screws down just tight enough that the washers won't move, but not tight enough to compress the rub-

An alternative connection is to make a Z-bend in the end of the pushwire that connects to the servo output wheel.

12. Prepare the flap linkage. Begin by checking the alignment of the flap torque rods. With the flaps perfectly aligned to the bottom side of the wing, the flap torque rod arms should be aligned with each other. If they are not perfectly aligned clamp vice grip pliers to the torque rod at the surface of the wing and bend the upper part of one of the arms backward or forward as necessary.

Add the flap torque rod connectors to the torque rod arms. A clevis is used to connect the linkage to the flap torque rod arms. A brass threaded coupler and ball joint connector can be used on the servo wheel. Note that a second clevis rod for the other flap torque rod should be wrapped and soldered to the rod which connects to the servo wheel.

Bend the clevis rods as necessary so they won't bind on the servo body as the servo wheel rotates to drop the flaps.

13. Install the fuel tank. If you have not done so earlier, prepare the fuel tank as outlined in the manufacturer's instructions. The fuel feed and vent lines exit the fuel tank compartment through two holes drilled in the firewall just above the engine mount. Drill the holes.

After the fuel tank is installed extend the brass tubing through the firewall, cut the brass tubing if it's too long. The hole through the firewall for the tubing may be sealed with Silicone seal to prevent fuel penetration.

14. Install the engine and muffler. Note that the fuel tank vent line can be connected to the muffler for pressure. A fuel filter is used both in the pressure and feed lines. Fill the fuel tank by removing the feed line on the tank side of the filter and fill the tank through it. The vent/pressure line should be removed from the muffler during fueling to detect fuel overflow that shows you that the tank is full.

15. Install the rudder and elevator pushrods, and the throttle linkage. Flexible pushrods are used for all control surfaces and throttle. The receiver battery pack should be wrapped in foam, wrapped in a plastic bag, and inserted in the fuel tank compartment under the fuel tank. The radio receiver should be installed in a foam rubber "nest" under the servos. The receiver antenna should exit the fuselage as close to the receiver as possible and should be routed as away from all other wires inside the servo compartment.

When preparing the flexible pushrods you may use Pushrod Connectors (fittings that attach to the servo output wheel or arm and have a set screw for holding the pushrod cable or wire). At the control surface end, a short threaded coupler can be soldered to the pushrod cable and a clevis screwed onto the threaded coupler. The clevis is then attached to the control horn.

With the rudder and elevator linkage prepared, the rudder and elevator control horns may be installed. As in the case of the aileron installation, the row of clevis holes in the control horns should be in line with the hinge line.
Once the linkage is connected and the operation of the control surfaces checked, the outer plastic tubings should be glued to the cross brace added inside the fuselage and to the slot in bulkhead #3.

When all of the linkages have been installed, check the operation of the rudder, elevator, throttle, ailerons, and flaps. All of these controls should operate smoothly without jerky movements and without any binding. When the rudder control is moved to the right, the rudder should move to the right side of the airplane. When the elevator control is pulled back, the elevator should move up. When the throttle control is pushed up, the throttle should be full open.

There are two ways the throw of the control surfaces or throttle may be changed. The linkage at the servo arm may be moved to a hole farther away from the center or pivot point to increase the throw. At the clevis horn, the clevis must be moved closer to the hinge line to increase the throw.

17. Align the control surfaces. Turn on the receiver and transmitter. Set the trim controls on the rudder, elevator, and ailerons [illegible] The throttle trim should be full up and the flap control

To remove any warps you find, twist the warped area a bit beyond "straight" while you heat the plastic film covering on both sides of the warped surface. Hold it until the covering material cools. Check your work.

2. Align the wing by resting the fuselage on the floor and placing the wing onto the wing saddle. Put a rubber band to each side to hold the wing in place. Measure the distance from each wing tip at the spar to the side of the fuselage. The distances for each wing panel should be the same. When you have the wing centered, add a mark to the wing and fuselage at the wing leading and trailing edge. With this mark you'll be able to center the wing conveniently each time you install it. Also view the wing from the front, checking to see if it is in line with the stab. If one side of the wing is high, the low side of the wing saddle may be shimmed with some scrap balsa strips.

When you prepare to fly the plane, 14 elastic bands should be used on the wing. The last two elastic bands on each fuse side should cross the wing to be attached to the wing dowels on the other side of the fuse. This will hold the other elastic bands onto the dowels.

3. Add foam wing seating tape. This prevents oil residue from seeping into the servo compartment.

4. Check how it rolls on the ground. With the transmitter control centered, let the aircraft roll down a small incline. If it veers to one side or the other after several tries, bend the tail wheel strut until the airplane rolls straight.

5. Check the CG; the center of gravity of the aircraft. The CG is the balance point required for the plane to fly properly. Hold the plane up at the wing root at the location of the CG as shown on the plans. The fuselage should be level -- neither in a climbing nor diving position when it's balanced properly. Add weight to the nose or tail as necessary. Stick-on weights are available for this purpose. UNDER NO CIRCUMSTANCES SHOULD THE MODEL BE FLOWN TAIL HEAVY.

6. Check to make sure that all of the servo screws, servo output arm or wheel screws, engine mount screws and such are snugged down. It's important that you occasionally check the engine mount screws, both those that hold the engine to the engine mount and those that hold the engine mount to the firewall out at the field. The ply firewall will compress slightly due to the pressure of the screws and loosen the screws. Tighten them.

FIRST FLIGHTS:

Be sure that your receiver and transmitter batteries are charged the night before your first flights as recommended by the radio manufacturer. Also perform a distance or range check of your R/C system. See the instruction booklet that came with your R/C system for the range check procedure.

If this is your first R/C aircraft, it is best to get the help of an experienced R/C pilot who will recheck your aircraft and radio installation, help you get your engine operating properly, and get your aircraft "trimmed out" for flight -- take nasty turning and climb or dive tendencies out of it by adjusting the control surfaces. While our prototype "flew right off the board", variations in balsa wood densities, amounts of glues used, different engines and props and fuels and such mean that each model will have to be flight trimmed on its first flights. Your helper will also inform you about field safety procedures and such that will help assure your flying is both successful and accident free.

If you do not have a flight instructor please read the following:

How to Fly a Radio Controlled Model Airplane Without a Flight Instructor

1. Understand how an airplane flies. Here's how airplanes fly: As the wing moves through the air it causes lift. Too slow, no lift and it falls out of the air -- stalls. So, it needs flying SPEED either from a motor and propeller, or by descending and gliding. The airplane is flying whether it's upside down, in a turn, inverted, or doing acrobatics -- there is always lift from the wing even though the lift might not be straight UP as it is in level flight. The airplane makes right or left turns by tilting in the direction of

2. Pick out an airplane that can fly all by itself without you controlling it. Don't pick a low-wing, aerobatic airplane. The best choice is a glider than uses an electric motor for power. Gliders can glide straight ahead all by themselves (if they do not have a warped wing -- see below) without you doing any controlling from the radio transmitter. If you want to fly without an instructor these glider type airplanes will fly themselves while you are trying to figure out how to make them go some other direction. You NEED this STABILITY while you learn how to fly. The second best choice is a non-glider (powered airplane) that has the wing on the top of the fuselage and which is advertised to be a good training airplane.

3. Make SURE that these following things are correct BEFORE each flight:

A. The balance point MUST be where the airplane's designer intended. Don't be afraid to add lead weights to either the nose or the tail to MAKE the airplane balance where it is supposed to. If you think that the required weight to achieve the correct balance point (sometimes called "CG" -- Center of Gravity) is too much, you're wrong -- USE WHATEVER WEIGHTS ARE NECESSARY TO MAKE THE AIRPLANE BALANCE WHERE IT'S SUPPOSED TO!

B. The wing must not be warped, and it helps your flying if the wing should have something called "washout". Fasten the wing onto the airplane. Set the airplane on a table and walk off to the rear of it. Look back at the airplane from an eye position where you can see just a bit of the BOTTOM of the entire wing. If you see MORE bottom wing surface on, let's say, the left wing, then your airplane will tend to turn left even when you have the aileron or rudder control in neutral. Remove that warp before you try to fly the airplane.

"Washout": this is an intentional and desirable warp of the wing at each wing tip. Usually this warp is done to the outer 20% of the wing toward each wing tip. From the rear of the airplane you should see a little more of the BOTTOM of the wing near both wing tips. Why is this "washout" good? It helps the outer parts of the wing continue flying straight ahead during the beginning of a stall. This means that your airplane will stall straight ahead instead of rolling over on its back or side which may be impossible to recover from.

4. If you hand launch your airplane throw it hard and throw it straight ahead, not up.
5. If you take off from a ground roll let the airplane build up so much speed on the ground before you signal "UP" elevator, that you KNOW that the airplane has enough speed to fly.

6. Don't try ANY turns until the airplane is very high. Climb straight ahead.

7. Practice very gentle turns high in the air before you try to land.

8. Don't try to land in a specific spot, avoid turns when the airplane is low. Just let your airplane glide into the ground straight ahead.
Jim Martin, Hobby Lobby

If you have built the model with flaps, they should not be used until you have the plane trimmed out to fly and can land well without them. To check the operation of the flaps, get the plane up high, throttle down to about 1/4 throttle, fly straight and level, and add some down flaps. Expect the plane to point its nose up a bit as the flaps are added. That's normal. Some down elevator trim may be added to maintain straight and level flight with the flaps deflected. When the flaps are added, if the plane tends to bank noticeably to the right or left, this is an indication that one flap is dropping further than the other. For example, if the right flap drops more than the right, the plane will bank to the left. Adjust the proper flap torque rod arm connector. Moving the fitting toward the wing will decrease the throw.

When landing with flaps you'll want to keep the engine running a bit above your normal engine idle speed that you'd fly without flaps. This is to compensate for the added drag. If the engine doesn't run a bit faster you may find that you'll land short of the runway.
Good fun, good flying.
Hobby Lobby International

1 - Landing gear mounting plate 1/4" x 2-3/4" x 3-7/8" ply.
1 - Engine mounting plate 1/4" x 2-3/4" x 3-5/8" ply.
2 - Aileron bellcrank plates 1/8" x 2" x 2-7/8" ply.
1 - Hatch mounting plate 1/8" x 1/2" x 3-1/2" ply.
2 - Engine mounting rails 1/2" x 3/4" x 3-5/8" hardwood
1 - Elevator joiner 1/4" x 3/8" x 4-1/2" hardwood
2 - Wing hold dowels 1/4" x 5-1/2"
2 - Hatch pins 3/16" x 3/16" x 1-1/4" hardwood

BALSA PARTS BAG

1 - Bulkhead #2, 3/16" x 3-1/2" x 6-5/16"
1 - Bulkhead #3, 1/8" x 3-1/2" x 5"
1 - Stabilizer platform stock 1/4" x 3" x 4"
1 - Windshield 1/4" x 3-1/8" x 3-7/8"
1 - Forward hatch 1/4" x 3-7/8" x 7-7/8"
2 - Upper engine compartment doubler, 3/8" x 1-3/16" x 3-3/4"
2 - Lower engine compartment doubler
2 - Landing gear plate brace
2 - Dowel supports
1 - Dorsal fin

BALSA PARTS BUNDLE

2 - Lower fuselage side
2 - Upper fuselage side
1 - Rudder
1 - Forward fin piece
1 - Aft fin piece
2 - Elevators
1 - 1/8" x 3" x 12" Fuel tank compartment bottom sheet

AILERON/FLAP BUNDLE

4 - 7/16" x 2" x 18" Tapered aileron stock

DIE CUT PARTS BUNDLE

7 - Wing rib sheets 3/32" x 3" x 18"
1 - Stabilizer rib sheet 3/32" x 3" x 18"

FUSELAGE STICK BUNDLE

7 - 3/16"x 5/8"x 36"	Balsa, side stringer, Stringer doubler, Forward fuselage side center stringer
5 - 3/16" x 1/4" x 36"	Balsa, vertical and cross braces, side center stringer, center stringer doubler
6 - 1/4" x 3/8" x 42"	Balsa, top and bottom stringers
1 - 1/2" x 12"	Triangular Balsa, Firewall and landing gear brace
1- 1/4" x 3/8" x 12"	Ply., Servo rail stock

WING AND STABILIZER STICK BUNDLE

2 - 1/8" x 1/2" x 36"	Balsa,	Stabilizer spars and forward fuselage bottom spacer
1 - 1/2" x 1/2" x 25"	Balsa,	Stabilizer leading edge
1 - 3/8" x 3/8" x 25"	Balsa,	Stabilizer trailing edge
6 - 3/32"x 3/8"x 36"	Balsa,	Wing cap strips
4 - 3/8" x 1/2"x 36"	Balsa,	Wing main spars
2 - 3/8" x 3/4" x 36"	Balsa,	Wing leading edge
2 - 1/4"x 5/16"x 36"	Balsa,	Wing trailing edge

SHEET BALSA

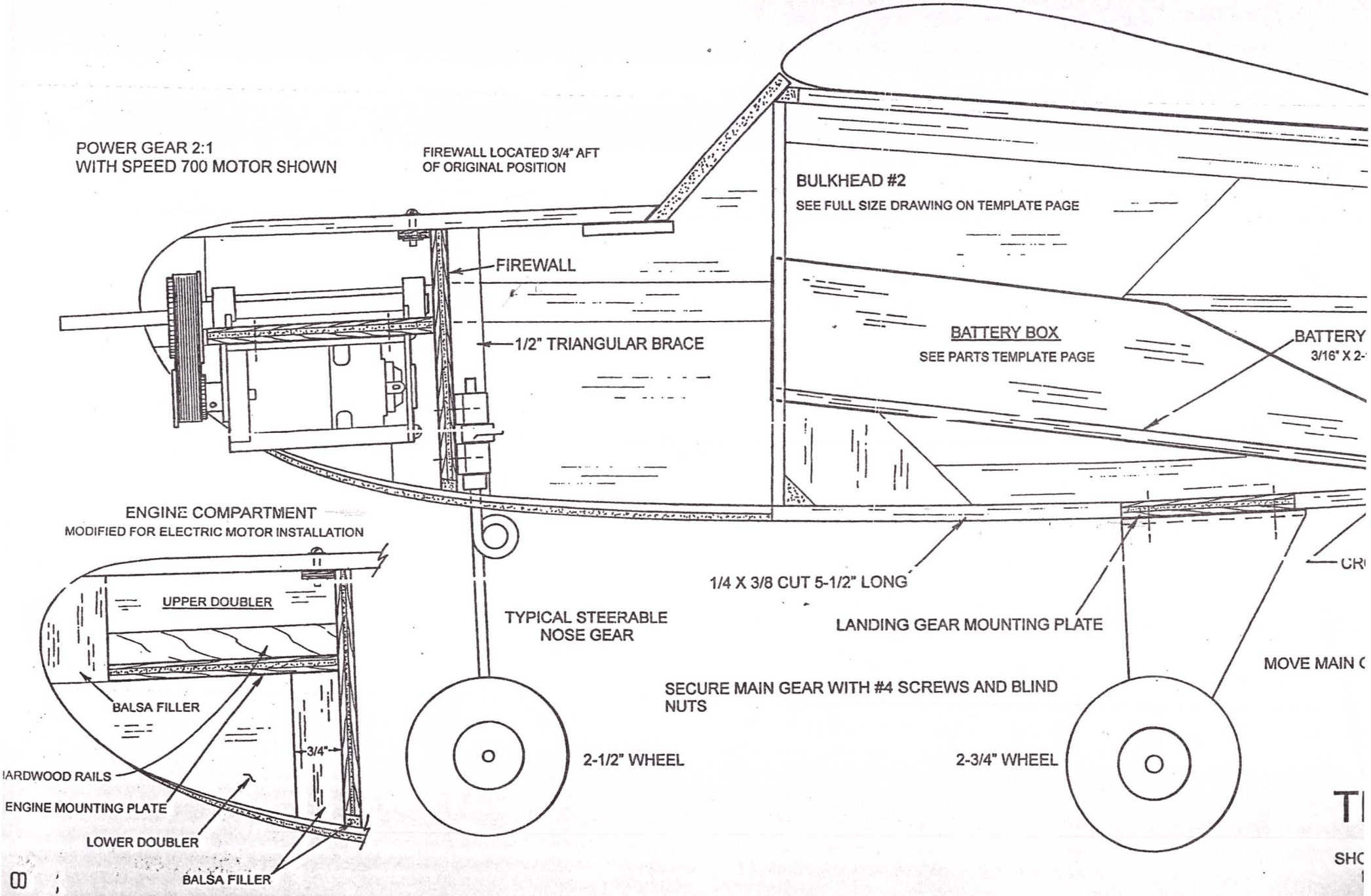
8 - 3/32" x 3" x 8-1/4	Wing center section sheeting
4 - 3/32" x 7/8" x 36"	Wing trailing edge sheeting
5 - 3/32" x 3" x 36"	Wing leading edge sheet and shear webbing

MISCELLANEOUS

2 - 3/4" x 8-5/8" Triangular stabilizer tips
2 - 1-1/2" x 11-7/8" Triangular wing tips
1 - Main landing gear

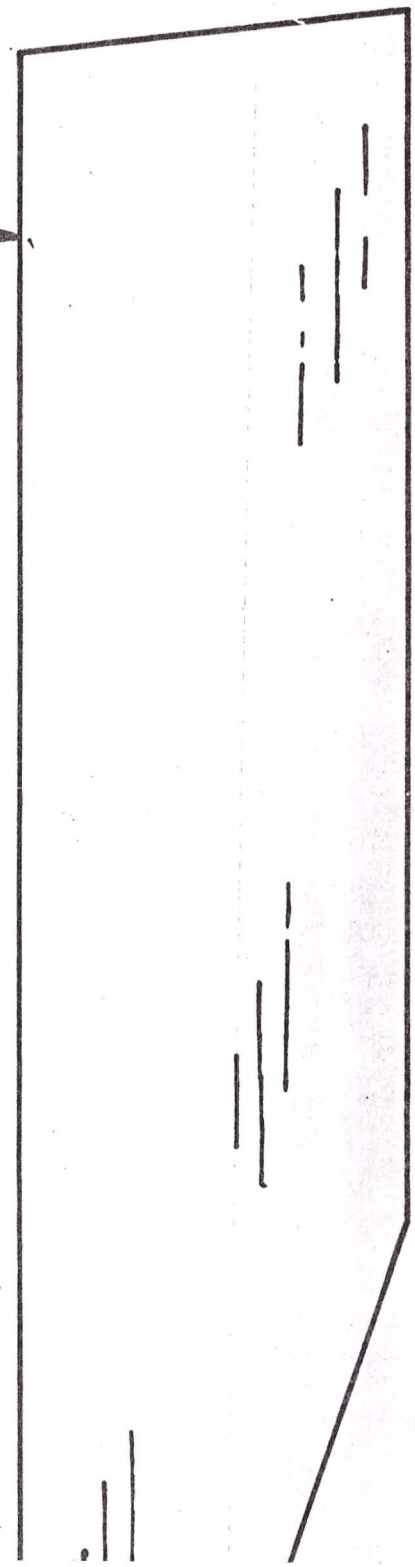
List of items in optional HLA111AP Accessory Pack for Telemaster 40:

1 HLH233 S.L.E.C. 8.5 OZ FUEL TANK
1 RA14022 1 1/4" ALUM. HUB WHEELS,2
1 DEV205 1 OZ 5 MINUTE EPOXY S205
1 HLH325 Z-10 FAST CYANO, 2 OZ.


POWER GEAR 2:1
WITH SPEED 700 MOTOR SHOWN
FIREWALL LOCATED 3/4" AFT
OF ORIGINAL POSITION
BULKHEAD #2
SEE FULL SIZE DRAWING ON TEMPLATE PAGE
FIREWALL
1/2" TRIANGULAR BRACE
BATTERY BOX
SEE PARTS TEMPLATE PAGE
BATTERY
3/16" X 2-
ENGINE COMPARTMENT
MODIFIED FOR ELECTRIC MOTOR INSTALLATION
UPPER DOUBLER
BALSA FILLER
3/4"
HARDWOOD RAILS
ENGINE MOUNTING PLATE
LOWER DOUBLER
BALSA FILLER
TYPICAL STEERABLE
NOSE GEAR
1/4 X 3/8 CUT 5-1/2" LONG
LANDING GEAR MOUNTING PLATE
SECURE MAIN GEAR WITH #4 SCREWS AND BLIND
NUTS
2-1/2" WHEEL
2-3/4" WHEEL
MOVE MAIN
SHO

FULL SIZE PART TEMPLATES

BATTERY BOX SIDE 2 REQ.
MAKE FROM 3/16" BALSA



CUT OUT FOR BATTERY BOX