

# Building the 12' Telemaster

The 12' Telemaster is a builder's kit. It's large size in many ways make it easier to build than smaller models. The design is conventional except for the removable tail group and functional built up wing struts required by the airplane's impressive size. The pre-cut balsa and ply parts fit perfectly and there is plenty of sheet and strip stock to get the job done even if you make a mistake or two. Four computer drawn full size plan sheets include many detail drawings to guide you through construction.

This is a very big model and requires a few special considerations. Your building board must be able to handle a 91" long fuselage and must be 24" wide to handle the wings. We used a solid door planked with 3/4" balsa. A piece of 3/4" plywood with one smooth surface straightened with lumber or extruded angle stock could also be used. What ever you use as a building board, remember it must be flat.

Another important consideration are the tools required to build the model. Some of these are listed below.

**Sanding blocks.** You will need several of these, most of them as large as possible. The best way to sand a flat surface is to use a sanding block that covers as much area as possible. Make a pair of sanding blocks as large as the sheet of sandpaper. One for medium (100 grit) and one for fine (220 grit) paper. We made our sanding blocks from 1/4 thick plywood. We contact cemented the paper to one side and glued a small block of wood to the other to be used as a handle. These sandpaper sheet sized blocks are great for initial and finish sanding of the fuselage surfaces, wing / stab bottoms, and fin sides.

You should also have a set of long sanding boards. 4" x 18" Sandpaper intended for use with auto body sanding boards is available where auto body supplies are sold. You could use this paper with an auto body board or make your long boards from plywood. Make a board for both medium and fine grit paper. Use these long boards when shaping and sanding the wing / stab. leading edges and the wing struts. These are also good for top surfaces of the wings and stab. especially where spars must be beveled to match the airfoil.

A set of smaller sanding blocks will be useful for shaping the nose and windshield areas of the airplane as well as sanding smaller components such as the wing center section and control surfaces.

**Razor plane.** Proper use of a sharp razor plane to rough shape the wing and stab leading edges before progressing to the medium grit sanding board will save a bunch of time as well as produce a straighter finished product. Use long strokes with the razor plane, shaping the entire length of the leading edge equally. A razor plane is also useful when shaping the wing struts and beveling top spars etc..

**Adjustable miter box and razor back saw.** Essential for making accurate cuts in the large sized strip stock used though out construction of the Telemaster.

**Adjustable triangle.** You can find this useful tool where drafting supplies are sold. Normally calibrated in one degree increments, the adjustable triangle is useful for measuring angles on the plan then transferring the angle to your miter box or piece of stock to be cut. During wing construction you will be asked to cut the spar ends to a two degree angle. The adjustable triangle makes this job easy.

**Scroll saw.** Although not absolutely essential, a scroll saw will make quick work of cutting thick sheet stock to fit. An example of this is fitting the 1/2" forward fuselage side fill.

**Electric drill and bits.** You will be drilling holes up to 1/4" though plywood and aluminum. Start with a pilot hole no larger than 1/8" then work your way to the finished hole size using progressively larger bits. You will need a #7 drill bit for tapping 1/4-20 threads and a #29 bit for tapping 8-32 threads.

**1/4-20 and 8-32 taps.** The model is assembled using 1/4-20 nylon screws. The wing center section top hatch is secured with 8-32 nylon screws. You will be threading hardwood and plywood to receive these screws.

**Propane torch and silver solder.** You'll need these items to build the landing gear. You will also need silver solder flux and bare single strand copper wire to wrap the wire parts together before soldering. Remember to clean the parts well before soldering. You should also thoroughly clean the finished solder joints with soap and water to prevent corrosion.

**Clamps.** This is a big model and many assemblies are best held with clamps instead of pins while the glue sets up. Speaking of pins, get a supply of the largest T-pins you can find for use where you can't use clamps. We had about a dozen small c-clamps on hand when building the prototype and found that to be just about the right amount. Put pieces of scrap wood between the clamp and parts being clamped to prevent marring the parts.

**Clamping pliers (Vise grips)** Needed when fitting the landing gear support strut and spreader to the main landing gear.

### **Parts identification**

One thing's for sure, there are plenty of parts and stock material in the kit. For the most part these parts and stock are bagged or bundled according to the assembly they are used in. All of the parts should be identified before construction begins. Not only will doing so make the construction process go more smoothly, the identification process will also help you become familiar with the kit and plans.

Begin parts identification by identifying the bag or bundles. Sheet stock bundles are easy and should be no problem identifying. If in doubt, measure the stock. Strip parts and stock bundles take a little more effort. Each strip size appears only in one bundle. This means if you identify one of the strip sizes in a bundle you can then identify the bundle. This is easy for strip bundle #6 which is the only bundle to contain hardwood strips, or bundle #5 which contains triangular stock. For the remaining strip bundles measure one of the strips and you will then be able to identify the bundle.

To figure out which balsa or plywood parts bag is which, you only need to identify one of the parts contained in the bag. For example, Bag # 1 (fuselage plywood parts) is the only bag to contain 4" wide parts, Bag #4 is the only bag containing hardwood parts, Bag #6 (wing panel, center section, and tail group balsa parts) contains two rather large wing tips, and so on.

Once you have the bags identified, open them and begin identifying each part. The best way to identify the balsa parts is to match them to the plans. Use a ruler to identify plywood and hardwood parts referencing the dimensions given for each part on the parts list. As you identify a part, write the name on the part with pencil. When you are finished identifying the parts you will have a pretty good understanding of how the model will go together and are ready to begin building.

# Construction

The 12' Telemaster utilizes laminated fuselage longerons and wing spars. While laminating long parts from shorter pieces takes a little longer than reinforced splice joints, the results are far stronger and straighter.

A laminated part is merely two layers of spliced together strip stock with the splices staggered. When creating the splices, cut the end of the strip stock pieces at a very steep angle where they will join. Ideally, the angle should be steep enough so that the length of the cut is approximately three times longer than the width of the strip stock being spliced. This angled end is especially important when splicing together strip stock that is not to be laminated, such as fuselage center stringers and wing turbulator spars. It is highly recommended that a miter box and razor back saw be used to cut accurate splicing angles.

Six foot laminates are required for wing spars while nine foot laminates are used in the fuselage sides.

To make a six foot laminate you will need two 3' pieces of stock with one end cut at a splice angle, one 3' piece of stock with both ends cut at a splice angle, and two 18" pieces with one end cut at a splice angle.

Make the bottom laminate layer by splicing together the two 3' pieces with one end angle cut. Pin them along a straight line or straight edge, wipe away excess glue and allow the glue to dry before adding the second layer. (We used carpenter's glue for all splicing and laminating jobs.) Add the top layer of the laminate starting at one end with an 18" piece, followed by the 3' piece with both ends angle cut, and finish with the remaining 18" piece. Pin the laminate together along your line or straight edge, wipe away excess glue and allow the assembly to dry completely before removing it from the building surface.

The middle and lower laminated longerons used in the fuselage side are 9' and are built directly over the plan. The top main longeron is a six foot laminate and is made as described above. A nine foot laminate requires three pieces of 3' stock with both ends angle cut, two pieces of 3' stock with one end angle cut, and two 18" pieces with one end angle cut. You will be beginning the laminates at the fuselage tail post as per the fuselage instructions. Start with a 3' piece with one end angle cut followed by a 3' piece with both ends angle cut, and finish with another 3' piece with one end angle cut. Wipe away excess glue and allow the glue to dry before adding the second layer. Start the second layer at the tail post end with one of the 18" pieces followed by the two 3' pieces with both ends angle cut, and finish with the remaining 18" piece. Pin the laminates securely in place on the drawing, (especially the lower fuselage longeron which is curved) wipe away excess glue and allow to completely dry.

## Wing Center Section

1) Begin by building the forward and aft box beams. Using epoxy, glue the forward box beam front and back plates together with the 1/4 sq. hardwood box beam spacers even with the top and bottom edges of the plates. Wipe away excess epoxy and clamp the assembly together while the epoxy cures. The aft box beam is assembled in a similar manner except the top 1/4 sq. hardwood spacer is even with the top edge of the slightly narrower box beam back plate.

2) The 1/4 x 3/4 plywood box beam thread blocks are now glued to the box beams. Use the center section side view and view A-A to exactly position the thread blocks on the box beams.

3) Use view A-A and B-B to exactly locate and mark the holes on the box beams. Drill the holes through the box beams and thread blocks for a 1/4-20 tap. Open the hole on the side of the box beam opposite the thread block to 1/4. Working through the 1/4 hole, thread the thread block with a 1/4-20 tap.

4) Use the center section top view to locate and drill the 1/4 holes in the 1/4 x 1 ply. center section mounting plates.

5) Working over the center section top view, pin both of the 1/4 thick balsa CRM ribs in place on the plan. Epoxy the box beams to the CRM ribs. Wipe off excess epoxy, check the assembly for square, and allow the epoxy to cure.

- 6) Using epoxy, glue the center section mounting plates in place against the box beams. Before the epoxy cures, add the six hardwood gussets also using epoxy.
- 7) Epoxy the 1/4 thick balsa CRF and CRA ribs to the box beams, pinning them in place on the plan.
- 8) Cut the 1/8 balsa lower skin to fit between ribs CRF and CRA from stock and glue in place. Add the piece of 1/8 balsa scrap along the trailing edge of the center section.
- 9) Make the 1/8 balsa front plate from stock and glue to ribs CRF. Cut the 1/4 x 1/2 balsa cross pieces from stock and glue to the back side of the front plate.
- 10) Block sand the top of the center section in preparation for the top skin and hatch. Cut the 1/8 balsa top skin from stock and glue in place from the back edge of the forward box beam forward and from the front edge of the aft box beam back.
- 11) Epoxy the 1/8 x 1/2 ply hatch mounting plates in place flush with the top of the CRM ribs and against the box beams. Provide relieve in the mounting plates to provide access to the center section mounting bolts as shown on the center section top view.
- 12) Make the top hatch from 1/8 balsa stock glued side to side so that the wood grain is left to right when the hatch is installed. Drill and thread the mounting plates using an 8-32 tap and secure the hatch with four 8-32 nylon screws.

### **Wing Panels**

The following six foot laminations are required for *each* wing panel.

- 2 – 1/2 x 3/4 main spars. Make from 1/4 x 3/4 stock.
- 2 – 1/2 x 1/2 trailing edge spars. Make from 1/4 x 1/2 stock.
- 2 – 3/4 x 3/4 leading edge. Make from 3/8 x 3/4 stock. A 3/4 triangular balsa cap is added to the leading edge during wing assembly.

The following parts are spliced to 6 foot lengths from the appropriate stock and are required for *each* wing panel

- 1 – 3/8 x 3/8 x 6' turbulator spars.
- 1 – 3/8 x 1/2 x 6' mid cord spar.
- 1 – 1/8 x 1-1/2 x 6' bottom leading edge sheet.
- 2 – 1/8 x 1 x 6' top leading and trailing edge sheet.

### Dihedral Note

The wing panels are built against the wing center section. Pin the wing center section on the plan against the root rib location of the wing panel being built. Shim the center section 1/4" on the side opposite the wing panel. This results in the required 2 degree dihedral. Protect the center section with wax paper to keep the wing panel from sticking. The inboard end of spars, leading edge, etc. should be cut at a 2 degree angle where they fit against the center section before installing the part.

- 1) Cut the inboard end of the bottom 1/2 x 3/4 bottom main spar at a 2 degree angle and pin in place on the plan. Trim the excess spar flush with the outboard rib location.
- 2) Prepare the inboard end of the 1/2 x 1/2 bottom main spar and the 3/8 x 1/2 mid spar as done with the main spar. Using a W2 rib to determine exact position, pin the trailing edge spar, mid spar, and 1/8 x 1-1/2 x 6' bottom leading edge sheet in place on the plan. Trim the spars even with the outboard rib location. Allow the bottom leading edge sheet to extend beyond the rib location.
- 3) Use a W2A to properly position the 1/8 x 1-1/2 inboard bottom trailing edge sheet and pin in place.
- 4) Glue all of the W2, W2A and W3 ribs in place.
- 5) Cut the center bay bottom sheeting from 1/8 x 3 stock and glue in place. The sheeting should fit against the center section but is *not* glued to it.
- 6) Cut a piece of 1/4 x 3/4 stock to fit on top of the main spar between the W2 rib and the center section. Remember to cut this piece at a 2 degree angle where it butts to the center section. Glue this

spacer to the bottom main spar.

7) Install the main and trailing edge spar plywood wing attach tongues. Slide the 1/4 x 1-3/16 x 8-3/16 main spar tongue in place in the center section box beam and against the inboard W2 rib. While holding the tongue down on the bottom spar, carefully mark the location for the 1/4 hole in the tongue working through the hole in the box beam. Remove the tongue and drill the 1/4 hole. Repeat this procedure for the 1/4 x 11/16 x 8-3/16 trailing edge tongue. Reinstall the tongues gluing them to their corresponding spars with epoxy. Be very careful not to allow epoxy into the box beam. Before the epoxy cures install a 1/4-20 screw in the box beams to secure the tongues. With the tongues in place and down tight on the bottom spars allow the epoxy to cure. Leave the screws installed until the wing panel is complete.

8) Glue the W1, W1A, and W1B in place. Remember, these ribs are glued to the bottom sheet, spars, etc., but not to the center section.

9) Glue the .320 x 7/8 tapered stock on the trailing edge sheet and against the W2A ribs. Be sure to use the tapered stock packed in bundle #5. Check the stock against a plan end view to be sure since the elevator trailing edge is very similar.

10) Trim any excess stock flush with the outboard W2A rib. Cut the 1/8 x 3/8 stiffeners and glue in place against the outboard W2A rib as shown on the plan.

11) Glue the 3/4 x 3/4 x 6' leading edge in place on the bottom leading edge sheet and against the ribs. Cut the inboard end to the 2 degree dihedral angle and locate it exactly on the plan. When the finished wing is installed on the fuselage this part of the wing will fit against the side of the fuselage. Allow the excess leading edge to extend at the wing tip.

12) Glue the 3/4 triangular leading edge cap in place. A splice angle is not required here. Simply butting the two 3' pieces together will do.

13) Trim away the bottom leading edge sheet out board of the tip rib and aft of the leading edge. Bevel the bottom of the wing tip 45 degrees and glue in place at a 45 degree angle as shown on the plan.

14) Cut the spacer to fit on top of the main spar wing attach tongue and epoxy in place.

15) The top main and trailing edge spars, 3/8 x 3/8 turbulator spar, and 1/8 x 1 leading edge sheet are fitted and added next. Each of these parts must be fitted to the center section and then beveled to fit against the wing tip. Take your time doing this, it takes a bit of trial and error but the results are worth it. Note: The top trailing edge is beveled to match the airfoil. If a table saw is available it is easier to pre-bevel the spar than to block plane or sand it to shape later. Tilt the saw blade to 12 degrees. Remember, you will need 6' behind the table saw.

16) Epoxy the 1/4 x 1 x 10-1/4 plywood strut attach plate in place on the main, mid, and trailing edge spars and against the outboard most W2 rib. Cut the negative load braces to fit between the attach plate and main and trailing edge spar from 1/4 x 3/4 stock. Glue these braces in place as shown on the plan. Also add the 1/4 x 1/2 brace to the mid spar between the attach plate and the W3 rib as shown.

17) Cut the main and trailing edge spar shear webbing from 1/8 x 3 stock and glue in place. Note that most bays are shear webbed with two pieces of 3" wide stock leaving a gap between the two pieces. The exception to this is the center bay. Shear webbing in this area is continuous. Good glue joints are especially important here since the integrity of the wing attach tongues depend on it.

18) Add the 1/8 x 1 trailing edge top sheet. Fit it as you did the leading edge top sheet.

19) Use 1/8 x 3 stock to sheet the back of the trailing edge at the aileron bay. The wood grain runs span wise here.

20) Remove the 1/4-20 screws and separate the center section from the wing panel leaving the wing panel pinned to the work surface. Add the top sheeting to the center bay.

#### The Aileron

21) Pin the 1/4 x 1/2 aileron leading edge to the wing trailing edge spar.

22) Use a W3A rib to properly locate the 1/8 x 1-1/2 trailing edge bottom sheet.

23) Glue the 1/8 x 1 x 4 plywood horn mounting plate in position against the trailing edge sheet and hold

in place with pins.

24) Use a W3A rib to locate the bottom leading edge sheet. Note this sheet is cut to fit on both sides of the horn support plate. Pin the sheet in place allowing excess sheet to extend beyond the tip rib.

25) Glue all of the W3A ribs in place.

26) Glue the .320 x 7/8 tapered stock in place on the trailing edge sheet and against the ribs allowing excess stock to extend beyond the tip rib.

27) Cut the 1/8 x 3/8 stiffeners from stock and glue in place against the inboard W3A rib as shown on the plan.

28) Glue the 1/4 x 1 x 1-1/2 hardwood aileron horn mounting plate in position on the plywood support plate as shown on the plan. Add the 1/8 balsa scrap doubler to the back end of the plywood support plate.

29) Trim away excess 1/8 trailing edge sheet outboard of the tip rib and forward of the tapered stock. Bevel the bottom of the aileron tip and glue in place at an angle to match the wing tip.

30) Remove the aileron from the work surface. Block sand the leading edge bottom sheet and tip to receive 1/8 leading edge front sheet. Cut the sheet to fit from 1/8 x 1-1/2 stock and glue in place.

#### Completing the wing panel and aileron

31) Block sand the aileron leading edge to the cross section shown on the plan. Trim the excess leading and trailing edge stock to blend with the tip.

32) Remove the wing panel from the work surface. Glue the 1/2 x 1 x 1-1/2 hardwood spacer block to the bottom of the strut attach plate forward of the mid spar as shown on the plan. When the glue has dried mark and drill the hole through the spacer block and attach plate then thread with a 1/4-20 tap.

33) Use a block plane and sanding block to shape the leading edge, trailing edge spar, wing tip, etc, as shown on the plan cross views.

34) Study the servo installation on the plan. Make servo rails from the 1/4 x 1/2 hardwood stock provided. Use 1/4 x 1/2 balsa stock to support the rails as shown on the plan.

Now that you have completed one wing panel you're an expert and should finish the second panel in half the time.

### **Stabilizer and Elevators**

1) Pin the 3/8 x 1/2 bottom main spars down on the plan. The spars should be butted together at the center and trimmed even with the tip rib.

2) Use an H2F rib to properly locate and pin the 1/4 x 3/4 trailing edge bottom piece to the plan. These should be butted at the center and allowed to extend beyond the tip rib.

3) Glue all of the H2F ribs in place.

4) Glue the 1/2 x 7/8 leading edges and the 1/4 x 3/4 trailing edge top piece in place. Both parts are butted at the center and allowed to extend beyond the tip rib.

5) Use 1/8 x 3 stock to sheet the bottom center bay. The sheeting is applied with the wood grain span wise and is one piece across the center. Note that the sheeting extends from the main spar forward to the location indicated for the forward 1/4 ply mounting plate and from the trailing edge forward to the location indicated for the aft 1/4 ply mounting plate.

6) Trim away the excess bottom trailing edge forward of the top trailing edge and even with the tip rib. The 1/8 balsa stab tips are fitted and glued in place between the leading and trailing edges, tilted outboard at a 45 degree angle

7) The 3/8 x 1/2 top spars are glued in place. These butt at the center and are fitted to the tips.

8) Temporarily install two H1F ribs to be sure the spars are properly space then glue the 1/8 ply spar joiner to the back of the spars. Clamp the joiner in place while the glue dries.

- 9) Glue the ply leading and trailing edge joiners in place as done with the spar joiner.
- 10) The 1/4 ply mounting plates are added next. Use a 1/4 scrap shim under the mounting plates and epoxy the plates to their respective ply joiners and between the ribs. Be sure the plates are shimmed equally at both ends, a good stab to fuse fit depends on it.
- 11) The two center H1F and H1R ribs are glued in place next. These must be located accurately with a 3/8 space between them. Use Scrap 3/8 as spacers between the ribs. Locate the shim pieces centered on the center line shown on the plan. Also be sure the ribs are square to the work surface.
- 12) Glue the remaining H1F and H1R ribs in place against the H2F ribs.
- 13) Glue the 3/8 x 3/8 turbulator spars and the 1/8 x 1 leading edge top sheet in place. These pieces are fitted to the tips and trimmed at the center ribs.
- 14) The 1/8 x 3 center bay top sheet is added after the servo rails are added and the stab is fitted to the fuse.

### The Elevators

- 1) Pin the elevator leading edges to the stabilizer trailing edge. Allow some excess at both ends of the elevators.
- 2) Use an H2R rib to properly locate the .285 x 7/8 tapered trailing edge stock and pin them in place.
- 3) Glue all of the H2R ribs in place.
- 4) Fit and glue the 1/8 balsa elevator tips between the leading and trailing edges. Tilt the tips to match the stab tips.
- 5) Epoxy the 1/8 ply elevator horn plates in place.
- 6) Remove the elevators from the work surface. Trim the leading and trailing edges to match the angle established by the horn plate. Make the center cap from 1/4 x 1 stock and glue to the elevators.
- 7) Remove the stabilizer from the work surface. Referencing the section views on the plan, block sand the stab and elevators to match the side views shown.

### Prepare the elevator servo wells

Referencing the plan, Make the elevator servo wells using 1/4 x 1/2 hardwood rails and 1/4 x 1/2 balsa supports. Make provisions for the servo wires to exit the stab into the fuselage. Note the servo wells are located off-set to allow for a straight pushrod to the elevator horns.

### **Fin and Rudder**

- 1) Pin the 3/8 x 3/8 fin trailing edge and rudder leading edge in place.
- 2) Glue and pin in place the 3/8 balsa fin top, rudder top, and rudder bottom. Add the 3/8 x 1/2 fin leading edge and 3/8 x 3/8 rudder trailing edge.
- 3) Glue the bottom (right hand side) 1/8 x 3/8 fin and rudder ribs in place.
- 4) Add the 1/8 x 3/8 spacers on top of the ribs against the leading and trailing edges. Also glue the 1/8 x 3/8 vertical fin center spar to the ribs. Note that the center spar extends to the bottom of the fin and has a fill piece glued on both sides below the bottom rib.
- 5) Glue the top ribs in place. (Left hand side)
- 6) Make the 3/8 balsa fin bottom fill using the 3/8 x 3 x 1-11/16 pieces provided. Glue the fill pieces in place.

Remove the fin and rudder from the work surface. Fit the fin into the slot in the stabilizer. Trim the bottom filler as required until the fin fully contacts the stabilizer bottom sheet. Be sure the fin is perpendicular when installed in the stab. If necessary, Adjust the stab center ribs until the fin is square to the stab.

## Fuselage

Make the 1/2 x 1/2 x 6' laminate to be used as the main upper longerons for both sides. Also make the short forward upper longerons

The remaining fuselage longerons are laminated over the plan during construction

Make the following spliced together pieces from the appropriate stock.

2 – 1/4 x 1/2 x 6' top and bottom center stringers

4 – 1/4 x 1 x 6' upper and lower longeron caps

Both fuselage sides are built over the plan. Follow the instructions or you could end with two right hand sides.

1) Make the 1/2 x 3/4 middle, 1/2 x 1/2 lower, and 1/2 x 1/2 stab saddle longeron for the left side first. Pin the lower laminate layers to the plan allowing them to extend slightly past the location of the 1/4 x 1 tail post. Note that the middle longeron extends to the end of the nose cheeks. Allow the bottom longeron to extend past the firewall until the fuselage side is complete.

Cut the 1/4 x 1 tail post from stock. Wrap the tail post with wax paper (this is a temporary installation) and pin it in place on the lower laminate layers. Add the second layer to the longerons trimming them to fit against the tail post.

When the glue has dried, remove the longerons and tail post from the plan and set them aside.

2) Make the longerons for the right side. First pin the 1/4 x 1 tail post to the drawing then pin the first laminate layers in place trimming them to fit against the tail post. Glue the tail post to the longerons now since you will be completing the side. Add the top laminate layers allowing them to extend over the tail post.

3) Cut the top main and forward longerons to length and pin them in place.

4) Cut the 1/4 x 1/2 fill pieces and glue in place at vertical riser locations FW2, F3, F4, F5, and F10. These fill pieces are fitted between the longerons and will be flush with the outside of the side.

5) Add the 1/4 x 1/2 diagonal braces located above the landing gear support strut.

6) Glue the 1/4 x 1/2 vertical risers in place at locations F1 through F11. The risers are glued on top of the fill pieces at those locations.

7) Glue the 1/2 balsa upper and lower cabin area gussets in place. These will be flush with the outside of the side.

The right side can now be removed from the work surface.

The left side is now built in a somewhat reverse order.

8) Pin the vertical risers in place at locations F1 through F11.

9) Glue all longerons to the risers locating them with a square directly above their plan locations. Put 1/2 balsa spacers under the longerons at location FW2 and the tail post.

10) Add the fill pieces at locations FW2, F3, F4, F5, and F10. Also glue the tail post in place.

11) Glue the diagonal braces in place. Since this is the left side these should be flush with the top with the side.

12) Add the cabin area gussets. These are also flush with the top of the side.

Remove the side from the work surface.

13) Complete the sides by adding the balsa fill between the longerons and between locations FW2 and F3 using the 1/2 x 3 stock provided. It's a good idea to fit the 1/4 fill at the tail between F11 and the tail post now. The wood grain runs front to back. Don't glue the fill pieces in place yet, they will be added after the stab is fitted.

### Joining the sides

14) All of the cross braces from F1 through F6 are cut to the same length as the plywood cabin area cross braces. Use these pre-cut parts as a template to cut the required 1/4 x 1/2 cross braces from F6

forward.

- 15) Using the plan top view as a guide, cut the bottom and top cross brace sets to fit from F7 to F11.
- 16) Trim any excess longeron stock flush at the front and back ends of the sides. Pin the sides upside down on the plan from F6 forward.
- 17) Epoxy the 1/4 x 1 x 5-34 ply cabin area cross braces in place. Check to be sure the sides are square to the work surface and allow the epoxy to cure.
- 18) Glue firewall part FW2 centered side to side and flush with the top edge of FW1 to make the firewall. Clamp the parts together while the glue dries. Make the cooling air cut-out in the firewall if you are using electric power.
- 19) Epoxy the firewall to the fuselage.
- 20) Add all of the cross braces from F6 forward.
- 21) The wing mount plates are added next. Glue the 1/4 ply top laminates together to make two 1/2 thick blocks. Epoxy the blocks in place against the ply cross braces and between the sides. Add the 1/8 ply lower laminates.
- 22) Glue the 1/4 ply upper strut support plate centered on the 1/4 ply lower strut support plate. Glue the assembly to the fuselage located as shown on the plan.
- 23) Glue the 1/4 ply forward and aft landing gear support plates to the 1/4 ply landing gear mounting plate as shown on the plan, leaving a 1/4 gap to accommodate the landing gear. Epoxy the assembly to the fuselage located as shown on the plan.
- 24) Bevel the longerons at the tail and join the sides over the center line on the plan.
- 25) Add the cross braces from F7 to F11 pinning the sides to the plan as you go.
- 26) Trim the hardwood tail gear support block to fit and glue in place.
- 27) Cut a cross brace to fit behind the upper strut support plate and another to fit forward of the tail gear block and glue in place between the lower longerons.
- 28) Fit the 1/4 x 1 lower longeron caps and glue in place. Add the 1/4 x 1/2 center stringer.
- 29) Cut the forward fuselage bottom sheet from 1/4 x 3 stock and glue in place.
- 30) Remove the fuselage from the work surface and turn it right side up. Cut the 1/4 x 1/2 cross pieces to fit on top and between the longerons at location F6 and glue in place. Glue a 1/4 x 1/2 fill piece to the back side of the top cross brace at location F11.
- 31) Fit then glue the upper longeron caps and center stringer in place.
- 32) Referencing the plan to establish exact location, glue the 1/4 ply forward and aft tail mount supports in place on the bottom of the stab saddle longerons.
- 33) Add the 1/4 scrap fill on top of the mount supports and between the longerons. Make the 1/4 sheet deck from stock and glue in place between the longerons.
- 34) Drill pilot holes through the 1/4 hardwood tail mounts at the locations shown on the plan.
- 35) Using the stabilizer as a guide, properly locate the tail mount pieces on the stab saddle. Epoxy the tail mounts in place. Drill pilot holes and install the wood screws through the tail mounts and into the ply support pieces as shown on plan section A-A.
- 36) Install the 1/4 sheet fill between the longerons clearancing them to accommodate the ply support pieces as required

The stabilizer can now be fitted to the fuselage.

Place the stab on the saddle and check it for square to the fuselage. Hold the stab in position and drill pilot holes in the stab ply mounting plate working through the pilot holes in the hardwood tail mounts. Remove the stab, open the holes in the tail mounts to 1/4. Use a 1/4-20 tap to thread the ply mounting plates. Make a hole through the saddle deck to accommodate the elevator servo wires.

At this point the top center sheet can be added to the stab.

37) Glue the 1/2 balsa upper and lower windshield side pieces in place. Add the 1/4 x 1/2 cross piece between the upper windshield side pieces.

38) Make the windshield from the 3/8 x 3 pieces provided and glue in place.

Now is the time to make provisions in the nose compartment for a fuel tank or battery tray. Add a fuel tank shelf for gas power. For electric power, make a plywood tray to hold the motor batteries and epoxy to the fuselage floor as far forward as possible.

39) Cut the 1/8 top sheet from stock and glue in place. Note the wood grain runs left to right.

40) Glue the 1/2 balsa cheek pieces in place above and below the center longeron.

41) Make the 1/4 vertical grain cheek doublers from stock and glue to the inside of the cheeks. Trim the doublers and center longeron to match the cheeks.

42) Add the 1/4 bottom sheet between the cheeks as shown on the plan.

Referencing the plan, add the rudder servo rails and balsa fill pieces to complete the servo well.

The fuselage is now complete and may be block sanded. Clamp the wing center section in place and sand the windshield to blend as shown on the fuse side view.

### **The wing struts**

The 12' Telemaster wing struts are functional and are an important part of the wing integrity. There is a left and right strut. They must both be the same length and they must be built straight. Using care when building the struts will insure accurate and equal wing panel dihedral.

1) Cut the 1/8 x 1 hardwood strut cores and the 1/4 x 1/4 hardwood core stiffeners to the exact length shown on the plan.

2) Securely pin one of the 1/4 x 1/4 stiffeners to the work surface along a straight edge or straight line. Epoxy the strut core to the stiffener then add the second stiffener pushing it tightly against the core piece forming an upside down T and pinning it securely in place. This step should be completed before any of the epoxy cures. Wipe off excess epoxy and allow to cure. Make the core for both struts.

3) Remove the strut cores from the work surface. Trim the stiffener at an angle for wing clearance as shown on the plan. This is where you will determine which side the strut will be. Be sure you don't make two struts for one side.

4) Prepare the metal end fittings by drilling the 1/4 mounting bolt holes located as shown on the plan. Clamp the end fittings to the strut and drill the holes to accommodate the #4 machine screws through the end fittings and strut core.

5) Epoxy the end fittings to the cores and install the machine screws and hex nuts before the epoxy cures. When the epoxy has cured, trim and file the screws flush with the nuts.

6) The 1/4 x 3/4 balsa fill is now added to the struts. Clearance the fill pieces to accept the end fittings then glue the fill to the struts. Weight the assembly on a flat surface while the glue dries. This will prevent the wet glue from warping the strut.

7) Glue the 3/8 x 5/8 balsa leading edge cap to the strut and hold in place with tape.

8) Block plane and sand the struts to the airfoil shape shown. Block sand the outboard end of the struts to clearance the wing as shown on the plan.

### **Fitting the wing to the fuselage**

Carefully locate the strut attach bolt holes on the bottom of the fuselage. Drill and tap these for 1/4-20 screws.

You will need a helper for the following procedure.

Clamp the wing center section in place on the fuselage. Using your helper, install the wing panels and wing struts. Check alignment of the wings to fuselage. Make adjustments as required. When satisfied with the alignment, drill holes in the wing mounting blocks working through the previously drilled holes in

the center section. Remove the wing panels and center section. Thread the blocks with a 1/4-20 tap.

### **Building the landing gear**

The landing gear is designed to take landing loads from a 24# airplane. The rubber band shock absorber is functional.

Mount the 1/4 dia. main gear on the fuselage using the metal landing gear straps and #4 sheet metal screws provided.

Referencing the plan, mark the location of the 5/16 dia. support strut on the fuselage bottom. Install the support strut using the nylon landing gear straps and #4 sheet metal screws provided.

Using the plan view as a guide, bend the 1/8 dia. wire spreader.

Using a pair of locking pliers, Bend the ends of the support strut and spreader to fit against the main gear.

Clean the wire parts where they join. Wrap the joints with copper wire and silver solder the whole thing together.

Temporarily install the hook for the rubber band shock absorber. When completing the model, three #64 rubber bands should be wrapped around the wire spreader and hook.

Make the removable rudder hinge located at the fuselage tail post from the nylon bushings and piece of 3/32 wire provided as shown on the plan.

The 12' Telemaster is now built. As with any model, temporarily install all accessories, radio equipment, control linkages, hinging of flight controls, and power installations then check for proper operation before covering the model. Remember the size of the airplane when hooking up the flight controls. Use hardware appropriate for giant scale models. The plans show a plywood motor extension if electric power is to be used. If gas or glow power is used, plywood spacers on the firewall to bring the engine forward may be required depending on the engine used.

We covered our prototype with *Superfabric* available from *Hobby Lobby Int.* and were happy with the results.

Permanently epoxy the fin into the slot in the stabilizer. Permanently hinge flight controls and install all equipment.

Control throws on the prototype are:

Ailerons – 1-1/4 up and 3/4 down.

Elevators – 3/4 up and down.

Rudder – As much as possible without hitting the elevators.

We needed eight ounces of lead in the nose of our electric powered prototype to achieve the balance point shown on the plan. When powered with a G-38 gas engine no ballast was required. This of course will vary depending on the weight and size of the servos used for the rudder and elevator.

We used high output metal geared servos for all flight controls and an 1800 mah receiver battery pack.

This version of the Telemaster design flies like all Telemasters...great. Remember to use rudder to coordinate turns and have a ball.

# 12" Telemaster Parts and Materials

## Strip parts and stock

### Bundle #1

**62 – 1/4 x 1/2 x 36** fuselage framing – wing trailing edge spar – aileron leading edge – wing center cross braces – strut mount bracing – servo well fill

### Bundle #2

**37 – 1/4 x 3/4 x 36** fuselage center longeron – stabilizer trailing edge – forward wing spar – wing strut fill – forward wing spar doubler – strut wing mount bracing

### Bundle #3

**8 – 1/4 x 1 x 36** fuselage longeron caps

**9 – 3/8 x 1/2 x 36** stabilizer spars – wing mid spar – fin leading edge

**8 – 3/8 x 3/8 x 36** stabilizer & wing turbulator spars – fin & rudder framing

### Bundle #4

**8 – 1/8 X 3/8 X 36** fin and rudder framing – wing rib stiffener

**2 – 1/2 x 7/8 x 36** stabilizer leading edge

**2 – 3/8 x 15/16 x 36** elevator leading edge

**2 – .285 x 7/8 x 36 tapered stock (13 degrees)** elevator trailing edge

### Bundle #5

**8 – 3/8 x 3/4 x 36** wing leading edge

**4 – .320 x 7/8 x 36 tapered stock (11.5 degrees)** wing & aileron trailing edge

**4 – 3/4 x 36 triangular stock** wing leading edge cap

### Bundle #6

**2 – 3/8 X 5/8 X 36** wing strut leading edge

**2 – 1/8 x 1 x 36 basswood** wing strut core

**4 – 1/4 x 1/4 x 36 basswood** wing strut core stiffener

**1 – 1/4 x 1/2 x 36 basswood** servo rail stock

## Sheet stock bundles

**12 – 1/8 x 1 x 36** stabilizer & wing leading edge top sheet – wing trailing edge top sheet – aileron bottom leading edge sheet

**10 – 1/8 x 1-1/2 x 36** wing leading and trailing edge bottom sheet – aileron front plate and trailing edge bottom sheet

**21 – 1/8 x 3 x 36** fuselage forward deck – stabilizer center sheet – wing center section top, bottom, & top hatch – wing shear webbing – wing root bay top & bottom sheet – wing trailing edge sheet at aileron bay

**4 – 1/4 x 3 x 36** fuselage cheek doublers, forward bottom sheet, tail area fill

**6 – 1/2 x 3 x 11-1/2** forward fuselage side fill

## Firewall bundle

**1 – FW1** 1/4 X 6-3/4 X 7-15/16 with notched sides

**1 – FW2** 1/4 x 5-3/4 x 7-15/16

## Laser Cut Parts

- 2 – #1 files H1F and H1R stab ribs
- 5 – #2 files H2F and H2R stab and elevator ribs
- 4 – #3 files W1, W1A, and W1B wing ribs
- 10 – #4 files W2 and W2A wing ribs
- 12 – #5 files W3 and W3A wing ribs

## Plywood and hardwood parts bags

### Bag #1 (fuselage plywood parts)

- 1 – Upper strut support plate  $1/4 \times 4 \times 5-3/4$
- 1 – Lower strut support plate  $1/4 \times 4 \times 6-3/4$
- 1 – Landing gear mounting plate  $1/4 \times 3 \times 5-3/4$
- 1 – Forward landing gear support  $1/4 \times 1 \times 6-3/4$
- 1 – Aft landing gear support  $1/4 \times 1-3/4 \times 6-3/4$
- 4 – Cabin area cross brace  $1/4 \times 1 \times 5-3/4$
- 4 – Wing mounting plate top laminates  $1/4 \times 1 \times 5-3/4$
- 2 – Wing mounting plate lower laminate  $1/8 \times 1 \times 6-3/4$
- 1 – Forward tail mount support  $1/4 \times 3/4 \times 2-5/8$
- 1 – Aft tail mount support  $1/4 \times 3/4 \times 1-5/8$

### Bag #2 (wing and center section plywood parts)

- 2 – Center section mounting plates  $1/4 \times 1 \times 6-1/4$
- 2 – Box beam thread blocks  $1/4 \times 3/4 \times 6-1/4$
- 2 – Main spar tongue  $1/4 \times 1-3/16 \times 8-3/16$
- 2 – Aft spar tongue  $1/4 \times 11/16 \times 8-3/16$
- 2 – Strut attach plates  $1/4 \times 1 \times 10-1/4$
- 2 – Forward box beam front and back plates  $1/8 \times 2-9/16 \times 6-3/4$
- 1 – Aft box beam front plate  $1/8 \times 1-9/16 \times 6-3/4$
- 1 – Aft box beam back plate  $1/8 \times 1-7/16 \times 6-3/4$
- 2 – Hatch mounting plates  $1/8 \times 1/2 \times 6-1/4$
- 2 – Aileron horn support plates  $1/8 \times 1 \times 4$

### Bag #3 (tail group plywood parts)

- 1 – Spar joiner  $1/8 \times 1-5/8 \times 6-3/4$
- 1 – Leading edge joiner  $1/8 \times 3/4 \times 6-3/4$
- 1 – Trailing edge joiner  $1/8 \times 5/8 \times 6-3/4$
- 2 – Elevator horn plates  $1/8 \times 2-3/8$  angle cut
- 2 – Stabilizer mounting plates  $1/4 \times 3/4 \times 6-3/4$

### Bag #4 (entire airplane hardwood parts)

- 4 – Box beam spacers  $1/4 \times 1/4 \times 6-3/4$  hardwood
- 6 – Box beam gussets  $1/4$  thick hardwood
- 2 – Strut attach spacer blocks  $1/2 \times 1 \times 1-1/2$  hardwood
- 2 – Aileron horn mounting plates  $1/4 \times 1 \times 1-1/2$  hardwood
- 2 – Horizontal tail mounts  $1/4 \times 3/4 \times 5$  hardwood
- 1 – Tail gear support block  $1/4 \times 1-1/2 \times 4$  hardwood

## Hardware

### Bag #5 (hardware)

- 4 – Aluminum strut end fittings
- 2 – Aluminum main landing gear straps
- 1 – Hook for landing gear rubber
- 2 – Wood screws
- 8 – #4 machine screws
- 8 – #4 hex nuts
- 8 – #4 sheet metal screws
- 2 – 3/32 Nylon bushings
- 2 – Nylon landing gear support strut straps
- 16 – 1/4-20 Nylon screws
- 4 – 8-32 Nylon screws
- 1 – 3/32 x 1-1/2 piece piano wire

**Landing gear parts**

**Main landing gear** 1/4 wire – pre-formed

**Landing gear support strut** 5/32 wire – pre-formed

**Landing gear spreader** 1/8 x 21.5 wire provided unbent

**Shaped balsa parts bags**

**Bag #6 (wing panels, center section and tail group parts)**

2 – CRF 1/4 thick

2 – CRM 1/4 thick

2 – CRA 1/4 thick

2 – Wing tip 3/16 thick

2 – Aileron tip 3/16 thick

2 – Stabilizer tip 1/8 thick

2 – Elevator tip 1/8 thick

1 – Fin top 3/8 thick

1 – Rudder top 3/8 thick

1 – Rudder bottom 3/8 thick

3 – Fin bottom fill pieces 3/8 x 3 x 1-11/16

**Bag #7 (fuselage parts)**

2 – Upper cheek piece 1/2 thick

2 – Middle cheek piece 1/2 thick

2 – Lower cheek piece 1/2 thick

2 – Lower windshield side piece 1/2 thick

2 – Upper windshield side piece 1/2 thick

2 – Upper cabin area gusset 1/2 thick

2 – Lower cabin area gusset 1/2 thick

3 – Windshield front pieces 3/8 x 3 x 6-3/4

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