

Spitfire Building Notes

By Walter Umland

Thank you for choosing our Spitfire, the best balsa wood available was used to make the Spitfire kit. The laser cut parts are state of the art. We hope that you enjoy building this kit as much as we have enjoyed building the prototype. While this kit is primarily for the more experienced builder, flyer and competitor, this kit was modernized to make building much easier than the original Spitfire kit so if you have moderate model building experience and a rod type wing jig you should do just fine.

Due to the nature of the excessive bending, intentional warping and molding of materials to build the Spitfire wing, it is my strong opinion that to more effectively build a straight wing for your Spitfire, it will require the use of a rod type wing jig to sufficiently secure the wing in place during assembly therefore, 1/4" rod holes have been laser cut into the ribs for you and we strongly advise against building this kits wing any other way but in a rod type jig using 1/4" rods. If you do not have a rod type wing jig; Do Not attempt to build this wing with out purchasing or making one. Either way they are simple to fabricate and inexpensive.

We have made every effort to make this one of the most efficient kits available for the serious modeler just shy of any hardware. Use the following building notes to act as guidelines for construction of this kit. Read them at least once before starting construction and they should familiarize you with terminology in building Control Line Stunt Models, especially if you are new to this type of construction.

Before starting construction, lay out all the parts in the kit and check them against the checklist. If you have found any problems at all and have access to the Internet contact me at: builtrightflyright@builtrightflyright.com Attn: Walter

Let's start with the wing rib doublers. Take ribs GD-2 (1/2), GD-3 (1/2) and R-10 (1/2) add epoxy to the 1/32 plywood 1/2 ribs and laminate them to their corresponding full ribs R-2, R-3 and R-10 and apply pressure, then wipe off any excess epoxy, then pull them apart once and re-place back together, tape ribs and 1/2 ribs together, set aside, add weight and let cure. ** R-10 & R-10 (1/2) not shown here. **

Setting up the jig. While these are curing, take this time to correctly secure your wing sheet to your bench and set up your wing jig. Once the ribs are cured, clean off any excess epoxy and stack all the ribs back in their proper order also making sure that all top sides are up, and then add all the ribs onto the rods and place in jig. **When the wing ribs are in the jig, you will be installing the bottom spars from below.

Wing Construction & Pre-warping. ** If you're not too anxious to get this completed in one day, then I suggest Pre-warping the spars and L.E.'s by wetting the 1/4" sq. leading edges and spar ends and tape them on to the front of the ribs and let dry over night. Wrapping tape around the spars and L.E.'s should hold it for the night and once dried, this should help prevent the L.E.'s from trying to pull away and cause unwanted stress and warps.

Spars and T.E. sheeting. With the ribs properly spaced on the rods, mark the spars, test fit the spars and then on both the inboard and outboard sides of the wing, permanently install the top and bottom spars and then the bottom trailing edge sheeting. **Note.. do not install the T.E. sheer webbing all the way out to the tips at this time, stop at Rib#7. Next install the upper trailing edge sheeting. Most of the webbing is already done so this should not create any problems and will prevent any difficulties when gluing on the tips later on in the construction and can be completed once the wing is removed from the jig and the tips are installed.

With the spars and T.E. sheeting permanently installed, and the 1/4 sq. L.E.'s intentionally warped to follow the shape of the ribs, glue on the L.E.'s and as needed, lightly sand the ribs flush to the L.E. now.

Bellcrank. Using the bellcrank of your choice, make sure you check that the bellcrank will fit in the pre-cut bellcrank hole as shown on the plans. Once satisfied, permanently install only the bottom B.C. mount at this time.

Gear blocks. Fit the gear blocks into the ribs and mark the locations where the ribs and torque blocks will be located once they are assembled. Once marked, remove gear blocks from wing and tape the gear door covers and gear mounting blocks together so that you can pre-drill them for the screws or bolts. If using bolts and blind nuts, then make sure you allow enough spacing for the blind nuts to clear the torque blocks and ribs on the inner side of the blocks. Pre-drill holes now (install the blind nuts now if being used). ** Only if you feel confident enough, and because the gear wire is flat, you can also pre-drill the holes in the pre-grooved gear blocks and torque block for the gear wire. If not then mark and drill only the pre-grooved gear blocks. *Using a drill press is recommended for this task.

Once done, using small amounts of epoxy, permanently install the main gear blocks. Once the epoxy has set using small clamps, install the torque blocks. Being careful not to get glue into the holes of the blind nuts, also add epoxy around the edges of the blind nuts.

Controls setup. With the bottom B.C. mount previously installed, you can now temporarily add in the top B.C. mount and test fit the bellcrank and set up your flap horn and pushrod.

Once the flap horn and pushrod are setup, remove the top plywood B.C. mount and B.C. and prepare to install the LE sheeting.

L.E. sheeting. To make installing the L.E. sheeting a little easier, I suggest you partially mold it first, to achieve this is very easy. First square off the ends that will be joined in the center, and then cut the sheeting to proper length with just a little overhang. **Remember that the leftover sheeting will be used in other areas of construction so don't be wasteful.

Holding the sheeting away from the wing, "wet" two(2) of the sheets that will be used on upper inboard and upper out-board sides of the wing and then temporarily (without gluing at this time) secure the upper L.E. sheeting by pinning it to the wing's spar and let it dry. * The balsa will naturally curve down and take on the shape of the ribs, let dry overnight.

Once dry, remove pins and then permanently install the bellcrank, leadouts and the top plywood bellcrank mount . Once this is done, add a piece of scrap balsa sheeting on the inner sides of the L.E. sheeting that extends past the center seam as a support and joiner for both pieces of L.E. sheeting. Unfortunately we can not install the adjustable L.O. guide now so we can not complete the ends of the leadouts so leave it until later when the tips and the weight box are installed later on when the wing is removed from the jig.

To give you ample working time, keep your pins ready and use a medium to slow drying glue then add the L.E. sheeting now. Once glue and sheeting is applied, lightly dampen the outside portion of L.E. sheeting and pin the sheeting to the spars and actual L.E. Let dry over night.

Cap strips. When the L.E. sheeting is dry add the cap strips to the ribs (upper side only). Once the cap-strips are completed you will need to flip the wing over but Read below before removing the wing from the jig.

**** Before removing the wing from the jig. ****

Removing the wing from the jig. **Now that the top L.E. is sheeted, you can no longer support the front rod as was done while un-sheeted therefore, you'll now need to have a few blocks ready to support the sheet wing L.E.. Here's what I did before removing the wing from the jig. Pick three specific locations of the main spar. For example: the center section and both inboard and outboard rib 5's. Then measure from the bottom of the spar to the bench, then deduct 1/16" from the height and that's how tall your new front supports will need to be. The good news is the rear supports that were used under the back rods can still be used in their same locations.

Okay... CAREFULLY remove and flip the wing over, add support blocks under spars and under the rear rod, measure to see your level then secure back into the jig.

Now that the wing is upside down, if you overlooked drilling the gear blocks (as I did), "NOW" would really be a good time to carefully drill the gear blocks.

Insert the gear and then mark and drill a hole for the landing gear to exit the Gear Door covers. Then add some 1/4" balsa around the gear blocks to allow for the sheeting to glue on to. Use 1/4 sq. scrap that was leftover from the spars.

Once done, mark the location of the gear blocks on the L.E. sheeting and add the bottom leading edge sheeting now. This is best achieved by repeating the process for sheeting the wing as was done earlier on the reverse side.

Once the L.E. sheeting is installed and dry, move to the rear of the wing and carefully install the balsa trailing edges and the bottom cap strips, then sand the trailing edge to follow shape of the ribs and T.E. sheeting. Once done, you're just about ready to permanently remove the wing from the jig.

Wingtips, L.O. guide and weight box. **Assemble the inboard and outboard wingtips before removing the wing from the jig. Assemble wingtip parts T-1, T-2, T-3 and the appropriate T-4 (inboard) and T-5 (outboard) parts now. Once done, remove the wing from the jig and then carefully wick (apply) some slow drying glue down onto the T.E. where the T-4 and T-5 will adhere to the T.E., then carefully insert the wingtips (T-4 and T-5) into the rib slots and onto the T.E.. Then quickly and carefully line up (centering) the front of the wingtip to the L.E.. Once done, wick some glue around the ribs and then install the remaining T.E. sheer webbing. Once done, install the adjustable L.O. guide frame and assemble and install the adjustable weight box now.

Temporarily tack glue the 4 wingtip blocks in place (as shown on the plans) and sand to shape. Once satisfied with the shape, carefully remove the tip blocks and hollow as desired and then permanently reinstall.

Remove all the lightening holes from the ribs, then insert the leadouts through the nylon portion of the adjustable L.O. guide, finish off the leadouts and install the sheer webbing on the spars, this is easily achieved by adjusting the leadout guide as far forward and rearward as you can for L.O. cable clearance.

Center section sheeting. With the Sheer webbing done, do a final check on your control system and when satisfied install the center section sheeting. Once sheeting is installed, assemble and install the adjustable weight box.

Flaps. Assemble and install the lucky boxes to the flaps as shown on the plans, mark the location of the stationary flap tips on the wing T.E., and then install hinges to the both the flaps and T.E..

**Save your final sanding of the wing and flaps for later when the fuse is assembled and you have successfully fit the wing into the fuselage.

Now as long as I haven't missed anything, construction of the wing is pretty much complete.

Rudder. It is recommended that you assemble the rudder before the stab because the top center sheeting of the stab is slotted to receive part RR-6 of the rudder. Rudder parts are labeled RR-1 through RR-10. Start assembly with the frame, then add in the rudder ribs and then add the 1/4" x 3/8" balsa filler as shown on the plans. Once the rudder is assembled, sand the airfoil shape into the L.E & T.E. of the rudder. The outboard side is to remain the flat side.

Assembling the stab and elevator. Start by placing the Stab over the plans and mark "Top" & "Bottom" on the stab, then dress off the ends of the laser cut stab (ST-1) and then on a flat surface glue the ST-1 together with the long 1/2" square. Using some leftover 1/16" sheeting from the wing, cut to fit and then add the 1/16" balsa to the bottom side of the center section. Use caution here as there is a this must be flush to the bottom side of the Stab frame. Excluding the stab's top center sheeting, install the four (4) 1/16 x 3/8 balsa center stab ribs and then all the 1/16 x 1/2 balsa stab ribs.

Once done, using the two (2) shorter 1/2" square sticks and the two (2) E-1's and the two (2) E-2's, repeat process with the elevator and elevator horn. *When adding in the ribs; do one side at a time, start with the stab then do the elevator of the same side. Repeat process on the opposite side until Stab and Elevator is completed.

Adding Hinges...

Mark a center line on both the leading edge and the trailing edge of the stab and elevator as shown below. This center line will assist you with installing the hinges as well as sanding the airfoil into the parts. Next, stack the Stab and Elevator and tape together and then mark the locations for all the hinges and horn; then cut the slots for the hinges and horn to be installed. Once the hinge slots are cut in, sand small grooves in the elevators. These are hinge pockets and will only be done on the elevator. Doing this will allow a hinge line with minimum amount of space. Once completed, the hinge line with the hinges and horn installed should have almost no space between them.

Separate the parts then sand either a (radius or a < shape into the leading edge of the Elevator now.

Sanding the Stab and Elevator. Sand an airfoil shape into the stab and elevator. The leading edge of the kit prototype was rounded and then starting from the leading edge of the elevator sanding down towards the trailing edge. The elevator is tapered slightly to a point at the T.E..

Crutch construction. The first and most important thing to watch for is that both of the motor mounts, formers and balsa crutch are square and true. Gather all the parts needed to assemble the motor mounts/crutch assembly. Then referencing the plans, mark the locations of the bulkheads onto the mounts, this will help you square up the crutch. Test fit parts by inserting the two 3/8 x 1/2" maple mounts into the formers along with the two 1/2" balsa crutch pieces, also test fit your engine of choice at this time. Once satisfied, carefully epoxy the two motor mounts and only the front 1/2" balsa crutch piece together, wipe off any excess epoxy, check fit of bulk head, then tape together, remove bulkhead, add weight and set aside to cure. Once cured, lightly sand and clean off any excess epoxy. ** Make sure the assembled crutch remained flat, square and true, but most of all it must be FLAT.

Once done, glue F-1a and F-2 onto the crutch assembly, and then add the rear crutch balsa & F-3 making sure the entire assembly stays square and true. When dried, glue the 1/4 x 1/2 balsa filler to the maple mount, lightly sand the sides of the filler flush with the angle of the F-1a, F-2 bulkheads & F-3 former or you will cause a poor joint when gluing to the fuse sides.

Fuselage / Fuse Doublers. The fuselage has a block just in front of the mounts/doublers so carefully mark the balsa fuselage sides where the plywood parts will end so you do not misalign the doublers or prematurely add glue in that location. Also mark where they will receive the glue in the wing opening area. Once done, add epoxy only to the plywood doubler and join together with the balsa sides, press down evenly all around the doubler, this can also be achieved by rolling a piece of dowel across the doublers. Wipe off any excess epoxy that may squeeze out. Then separate the parts once and rejoin. Then tape together before the epoxy sets, wrap with wax paper, set aside on a flat surface, add weight and let cure. Let the Fuse Doublers cure thoroughly.

****Considering** we all normally build parallel sided fuselages (self included) I decided to do a test assembly or "dry run" and I'm glad I did. While doing the "dry run" I experienced that the angled formers and bulkheads wanted to move around, so I added tape to keep them from shifting.

Okay with that said and since you will only get one shot at making the fuselage correctly I strongly recommend doing a "dry run" assembly to get acquainted with what the fuselage may do when trying to assemble it.

Fuselage Dry run assembly. Mark the locations of all the formers, plywood bulkhead and tank floor then temporarily install the pre-assembled crutch in place check that it is square and level.

Now would be a good time to check your tank fit. If necessary, trim the inside of the fuselage sides that you may be able to make tank height adjustments possible. check to make sure your tank can be removed. Also check to make sure the crutch will be straight and level. Now would also be a good time to pre-sand your tail block.

Once you have completed your dry run assembly remove tape so the actual fuse assembly can be started.

Fuselage assembly... Carefully measure, mark the fuse sides for the tank floor, then add the 1/4" triangle stock to the fuselage sides just under the tank mount, with that done and the tail block already added to the rear of the fuselage, proceed with adding the crutch assembly you have pre-assembled. I recommend using slow curing epoxy for installing the crutch assembly so you have ample time to tape the fuselage together, add the balsa formers and also make any adjustments. Check the fuselage to make sure it is flat on top and straight, this can be achieved by placing the fuse on the top view of the plans. If equal add weight, clamps and let cure.

Next add the 3/16" square stringers, sand flush to the bottom of the fuselage sides. Once done, you will move on to marking, shaping and hollowing the blocks and cowl, bottom sheeting. ****The tail wheel mount is actually mounted to the front of F-6 and into the bottom sheeting so you should fit the bottom first.**

Fuselage blocks, cowl, bottom sheeting and tail wheel mount... Start with the fuselage and top block in the inverted position; place the fuselage top block under the fuselage. Mark the top block all around the inside and outside edges, this will give you a reference for the former locations when hollowing the inside of the top block after it has been shaped.

Next, fit and permanently install the nose filler block. **It will be easier to sand the top side flush with the mounts so make sure the nose filler block is flush with the bottom of the engine mounts when installing.*

Temporarily tack glue the top block on the fuselage and sand the top block flush to the outside of the fuselage now, then carefully measure the width of the top block at the front and rear and then mark a centerline from nose to tail of the top block. This will be a guide when you sand the top block.

Flip the fuselage over and repeat process for the bottom fuselage sheeting, relieve the location of the tail wheel mount in the bottom sheeting, then, start fitting the bottom sheeting. This is only temporary so just tack glue these in place at this time. This is best achieved by starting at F-1b with the sheet running cross grain and cutting the sheet approximately 1/16" longer on each side of the fuselage all the way back until you reach the fuselage's tail post. See plans for tail wheel mount location. ** Running the bottom sheeting cross grain will increase the strength of fuselage and decrease the possibility of the fuselage twisting.* reinforce tail wheel mount as you deem necessary.*

Once you have completed this, sand and shape the top block. Then permanently install "ONLY" the tail wheel mount pieces. Once dry, sand the bottom sheeting flush with tail wheel mount and the fuselage sides. *Remember not to permanently glue the fuse sheeting on yet.*

Fitting the Canopy and Cowl. Start by trimming the excess plastic from around the canopy and then place flat on the top block. Then completely mark all around the canopy on the top block. This will be the outer edge of the trench you will dig.

After the trench is completed, mark the front of the bottom sheeting for the plywood cowl mount and hold downs, and then carefully cut out for the plywood to be installed. **Do not** permanently install the plywood into the cowl block yet as you will also need to add the plywood tongue from the cowl and a fill-in piece of balsa.. The method of mounting your cowl is usually left up to the builder and it normally is not shown on the plans but we have provided how we suggest it can be done.

Next... sand the inside of the front nose block using a large dowel with sandpaper wrapped around it to clear for the engine crank case. Then proceed with mounting the engine. Once the front nose block is sanded enough for the engine to fit, permanently add the nose ring to the front nose block.

After the nose ring is installed tack glue at least four small pieces of scrap balsa to the front side of the nose ring as temporary spacers for your spinner. Mount the engine. **The mount spacing is set to accept modern engines up to a .40 so be very careful you have the proper spacing to fit your choice of engine.*

With the engine temporarily installed and the nose ring permanently glued in place, mark for the rear and side cowl hold downs. Due to the angled fuselage sides, small hardwood wedges may need to be made. ****2-56 bolts and blind nuts can be used to secure the cowl. Sand cowl to shape.**

The above notes Re: mounting the cowl is how the cowl on the prototype mounted and is simply a suggested method, please use your preferred method if you feel this is an inadequate way to mount a cowl.

Next step is to cut out for the engine. Start by re-installing the engine; then mark a center line and the location of the glow plug on the inside of the cowl. Then with a compass mark and cut a circle for the engine crank case. Then cut away as needed for your engine and muffler.

Next, sand and hollow the top block. Now if you marked the inside of the top block as instructed earlier, carefully hollow the inside of the top block. Once you are satisfied with the hollowing sand the inside smooth. After the top block is completed, repeat the process on the bottom block and mark the location of the blind nuts and trim, carve and sand the inside of the bottom nose block as necessary.

**** Remember that the top block, bottom nose block and bottom sheeting are not to be permanently installed until after the wing is built and permanently installed into the fuselage. Sand entire fuselage to shape.**

Final assembly and inserting wing into the fuselage...

After the frame is together install the external plywood bellcrank mounts. Once the 1/16th x 1" external plywood bellcrank mounts are secured, grind off flush to the plywood the 1/8" pivot shaft that is sticking out. You don't want any excess. Then add a thin piece of scrap plywood on the top and bottom of the external plywood bellcrank mounts to cap off the pivot shaft. As shown on plans.

Trim fuse sides for the horn wire and install wing into the fuselage, the wing is best mounted from the bottom by cutting away the bottom section and reinstalling after the wing has been inserted. Also install the stab and elevators and setup the pushrod at this time.

Close off the fuselage that was opened or cutaway. Add filler if needed.

Hook up the controls for the final time. Check everything over two or three times just to make sure there is nothing binding, dragging or jamming and that you have perfect neutral. Then start closing off the fuse. With it shimmed back on the table, install the bottom sheeting and bottom cowl. Wipe edges clean of any excess glue and depending on the type of glue, let dry.

Prepare your cockpit now if you are putting one in. Once satisfied with your cockpit, take a final check of your controls and then permanently glue on the top block and rudder and the overall construction is complete.

By now you should have a handle on things and can finish up from here...

Things remaining are covering, finishing, wrapping the leadouts and final installation of your power plant tank wheels etc...

I am sure you will be fine from here.

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