

Fokker Dr1 Master Instructions

Rev 1

Congratulations on your new project. This Dr1 kit is the finest to date. The construction of the plane is similar and exactly like the original. Take your time and understand the how and whys certain parts go together. These instructions breakdown into the main components which coupled with the photographs you should have enough information to complete this project. There really aren't any special skills to build this plane besides keeping the parts straight as well as drilling straight. The main components are the fuselage, wings, tail area. Some of the components rely on another one, such as, finishing the mid-wing requires the fuselage be built. So, keep that in mind as you start this project. The suggested building sequence should be the top wings, sub-wing, fuselage, bottom and mid wings, rudder, stabilizer and elevator. Naturally, you can build in the sequence which well for you, just realize that certain components might have to be put to the side until another component is finished. The photos will help you understand how the parts go together and how the plane is built. The text below has some helpful suggestions and instructions. You should have some building experience and be familiar with some aircraft terms such as, *CG* and incidence. If you have questions contact us.

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Hinges

The hinges are true scale and quite ingenious. With that said, you will find the hinge installation will provide smooth movement and no slop. Note that there are two different hinges used on this plane. They are basically the same except the aileron hinges are longer than the rudder and elevator hinges. You need to take your time and understand what you are trying to accomplish so you can successfully create the hinges. First, you need to assembly a hinge bender using parts #6 plywood and some scrap dowel #75. The top part of the plywood #6 has a slot in it. Cut and glue two pieces of dowel #75 so it goes covers the top of plywood #6 except for the slot. Place the plywood #6 in a vice so you can now bend a hinge #302 around the dowels #75. Center one hinge #302 over the dowels and bend down both sides. Remember that a screw will go thru the hinge hole so try to bend the hinge evenly. You now have the hinge in a " U " shape pattern. Ensure the holes line up, make any adjustments as needed. Now place the hinge over the dowels again. Notice the strap in the center of the hinge. This center part needs to bend down into the slot in the plywood #6 part. You might consider using a thin screw driver rounding the screw driver head so as you push this strap down you will get a curved scrap. Keep the screw driver centered. You will see where the center strap bends over itself. Use a pair of needle nose pliers to bend that part back over the hinge. Sort of looks like a crushed center strap protruding above the hinge. You can remove the hinge and test fit the steel rod #4 into the hinge. So, you should have the center strap on one side and the rest of the hinge on the other. The hinge will wrap around the brass bushing #319; where the bushing will be inserted into this new curved strap you just made. This center curved strap is a reverse bend. You need to keep this reverse bend round so the bushing is held in place without the bushing being bent or altered. A nice snug fit is desired. Reference the photos. It might take you a little bit to form up a nice hinge. The good news is that the metal hinge is easy to form. Once you have a hinge formed go ahead and form the other hinges using parts #302 and #303. The hinge needs to be secured to the bushing #319. You should carefully do this by soldering the reverse center strap to the brass hinge. Test fit the hinge/bushing on carbon tube #229. It should fit just fine and rotate freely. Go ahead and secure the other hinges to brass bushing #319; keep the hinge centered on the brass bushing. To mount the hinge in place on a dowel or carbon tube, the hinge will be surrounded on both sides with brass collar #320, then you will secure those collars in place with the brass pin #109. When you are ready to mount a hinge in place, put two collars #320 one on each side of the bushing #319. You want a slight gap between the bushing and collar so you won't have metal to metal rubbing. You can put masking tape on the collars keeping everything in place. Using drill bit #153 carefully center drill the collars and insert a pin #109. **CAREFULLY**, glue the outside of

the collar (away from the bushing) or add some glue to the brass pin #109 which will secure the brass collar to the carbon tube or dowel. Trim the brass nail and file the end. Repeat for the other collar ensuring that the hinge can move freely. If desired, you could add a little oil after you have completed the plane. This completes the hinge assembly.

Rudder

The rudder is fun to build and there is a sequence in building the rudder. You will laminate the rudder outline; create the control horn and hinges and then assemble these parts as well as the rudder ribs. Place the two cardboard outlines #93 together using some masking tape; be careful as the cardboard edges are sharp. The rudder outline is a mix of plywood and balsa parts. These parts #42 and 43 laminated in an order. The balsa #42 stringers are on the outside and the center of the lamination. The plywood #43 will be sandwiched in-between the balsa. Soak these wood parts in warm water for 5 minutes, if desired. This will help the wood bend around the cardboard outline. You can join these wood parts on top of some wax paper so when the wood is held in place against the cardboard outline it won't glue to the cardboard outline. Using wood glue; laminate all the pieces together. Place one of the balsa parts #42 on a flat surface; brush some wood glue on the top of that. Now add two of the plywood #43 parts (12 and 24 inch long) on top of the balsa #42. Add another balsa #42 layer, add another plywood #43 layer and finally add the last balsa #42 layer. Make sure the lamination is straight and aligned and now insert one end of the lamination in the front slot of the cardboard and wrap the lamination around the cardboard outline. Use masking tape to secure the lamination against the cardboard. Ensure the lamination is flat, aligned and smooth against the cardboard. Set aside to dry. Locate two FR4 parts #296 and #297. These parts are a little messy since they have been laser cut. One thing to notice here, the center hole is offset a wee-bit, creating a thinner wall on one side of the center hole. So, when you place the control horn on the rudder post (carbon tube) ensure that the thinner wall points forward toward the pilot. This will keep the control horn n-sync with the hinges. Now join these parts having the two inner #296 part in the center and the two outer parts #297 on the outside. Use slow CA glue which will give you some time to align the center hole and ear tabs. Once you have these parts joined and glued you, use a 1 inch belt sander or something similar and twirl / twist the control horn against the sanding belt to get the airfoil shape desired. Use a file or carefully sand under the tabs creating a straight line. This is where the original was welded, so, you are trying to recreate that feature. The rudder ribs #19,41,44 and 45 are laminated together like the rudder outline. The balsa parts on the outside and the plywood part on the center. Align and glue the rudder

ribs together. Slightly sand the ribs giving them an airfoil outline. The two hinges #302 needs to be created before you final assemble the rudder. Bend two hinges to shape. The rudder post is a combination of the brass tube #230 and the carbon tube #229. Cut a 3 inch long piece from the brass tube #230. Insert this in one end of the carbon tube DO NOT glue yet. Lay the balsa outline and ribs on the plans. Notice where the ribs attach to the rudder outline; make a notch in the laminated outline for the rudder ribs. This will help secure the ribs to the outline. Just notch the first layer of balsa. Place the ribs on the rudder post (carbon tube) and glue them in position. Glue the outline to the ribs but DO NOT glue the rudder outline to the bottom of the rudder post (carbon tube) as you still need to add the hinges and control horn. Cut two half inch pieces of bamboo #401. These parts will go from the front of the bottom rib to the bottom of the outside of the rudder outline going over the rudder post. You are trying to simulate the metal tubing used for the rudder rib and outline. Sand and glue the reed in place. Looking at the rudder drawing you will notice that one hinge is above the control horn. Locate the related hinge parts #109, 319 and 320 placing them in position. The hinges are exact scale. You need to add the top hinge first and the bottom hinge will be added when you mount the rudder to the fuselage. The hinge is on a bushing #319 and is secured in place by two collars #320. This keeps the hinge from sliding up or down the rudder post. The collars #320 are pinned in place. It is CRITICAL that you do NOT get any glue under the bushing as it will just about weld it to the rudder post (carbon tube). You will have to scrap your work. You could just add glue to the pins which will secure the collars in place. The hinge should move very freely add a little oil (WD-40) under the bushing if desired. Ensure you have the control horn oriented properly, perpendicular to the rudder and the thinner side of the center hole pointing forward, glue the control horn in place with some CA glue. Slightly crush the top of the brass tube #230 where it connects to the rudder outline making it the same thickness of the rudder outline. Now glue the brass tube to the carbon tube and rudder outline. This completes the rudder for now as you will add the bottom hinge when you locate the rudder on the fuselage. At which time you will permanently add the bottom hinge and glue the bottom of the rudder outline to the rudder post. Plus you can sand the rudder outline to shape giving it a little airfoil shape. If by chance you have a slight warp in the rudder; you might be able to undo that when you add the fabric.

Stabilizer

The stabilizer should be built on a flat surface and over the plans. No real magic to building the stabilizer but ensure you have good glue joints. Follow the plans and assemble the stabilizer. The ribs go together like the rudder ribs, in that; plywood is laminated between two balsa pieces. Glue the stabilizer ribs together. Slightly sand a curve on each side of the ribs removing the square edges. Place and cut the trailing edge dowel #75 to length. Position the ribs on the trailing edge and glue in place. Keep the ribs vertically straight, level and flat. Add the inner and forward dowel support #75 through the ribs securing it to those ribs and the trailing edge. You might consider waiting until the fuselage is framed up before you add forward ribs #25 and outer dowel #77. The reason is you can adjust the distance between these ribs and the fuselage longerons; ensuring that the gap between these parts is satisfactory before adding the fabric. If desired, add the ribs #25 and the outer dowel #77 to the stabiliser gluing them into position. This completes the stabilizer for now. The stabilizer will need to be fitted to the fuselage and at that time you will finish the stabilizer by locating the drill holes securing the stabilizer in position.

Elevator

The elevator should be built on a flat surface and over the plans. The stabilizer should be built before the elevator so you can "fit" the elevator to the stabilizer. Like the rudder the elevator outlines are laminated; same concept using balsa and plywood parts. Soak the balsa and plywood parts #59 and 79 in some warm water. Using a wood glue laminate these parts (like the rudder) having balsa on the outside. The lamination goes balsa-plywood-balsa-plywood-balsa. Once you have the parts glued, wrap the lamination with wax paper and then around the cardboard outline #94 using masking tape to hold the lamination in place. Create both elevator outlines. Once they are dry, remove the laminations from the cardboard and carefully sand a curve in the laminated outline. The ribs are just like the stabilizer and rudder, in that, plywood is laminated between two balsa parts. Keeping the ribs aligned, glue the elevator ribs together. Slightly, sand the rib edges giving the ribs a little curve getting rid of the square edges. The control horns are the same as the rudder #296 and 297. Create two control horns as you did in the rudder. Sand the control horns. Remember that the thinner side of the center hole will face forward towards the pilot. Three hinges are used on the elevator. Bend three hinges #302 to shape. Place the carbon tube #205 on the plans. Remember you are using scale hinges, which means there is now a sequence to assembly. In that, the hinges and control horn need to be secured and located prior to adding the elevator ribs. Position the hinge

#302, related hinge parts #319 and 320 and control horns on the carbon tube #205. Make sure you have the control horns oriented correctly in regards to the thin center hole wall. Test fit this assembly to the stabilizer. Once you are happy with the hinge locations; use #153 drill bit and secure the hinge collars to the carbon tube using brass pin #109. Make sure the hinges move freely. Refer to the hinge instructions for more detail. The control horns will be glued in position after the ribs are positioned and glued. Cut two 4-1/2 inch pieces of brass tube #230 and insert one in each end of the carbon tube. DO NOT glue in place yet. Test fit the laminated outline and ribs onto the carbon tube. Notch the balsa in the laminated outline like you did on the rudder for the elevator ribs. Position and glue the elevator ribs to the carbon tube and outline. Before you glue the forward rib #71, test fit that rib in place while the elevator is temporarily positioned to the stabilizer. This way you can ensure you have the correct gap and rib angle. Once you're satisfied glue rib #71 in place. Go ahead and notch the outline where the brass tube #230 will be positioned. Crush the ends of the brass tube to the same height of the elevator outline. Glue the brass tube to the carbon tube and the laminated outline. The control horns can now be glued into position. Ensure the control horns are perpendicular to the elevator test fitting the elevator to the stabilizer, helping the alignment. Once you're happy with the control horn position and angle use some CA glue and secure them in place. Place the elevator onto the stabilizer. Cut two small notches in the stabilizer trailing edge dowel for the control horns. Mark the three hinge hole locations on the stabilizer trailing edge. Drill three 1/8 inch holes for the hinge screws at these mark locations. Test the elevator onto the stabilizer. Ensure the elevator moves freely. Make any needed adjustments. This completes the elevator.

Subwing and landing gear struts

The subwing is straight forward and the incidence (zero) is taken care of for you. Glue the two plywood ribs #32 together, keep the holes aligned. The struts will mount to the inside of these as well as the cross bracing cable fitting #309. The box spar parts #34, #35 snaps together. Glue the box spar #34, #35 together. Cut the axle to length for the wheels you plan on using. If you are using the 1/3 scale Dubro wheels with Dubro wheel collars the axle will be 27-5/8 to 27-3/4 inches long. Cut the axle to length for the wheels you plan on using. Dry assembly the ribs #23, 32 onto the spar box; then add the dowel #47 thru the ribs. Once satisfied with the location of the ribs and dowel glue them in place. Trim nails #33 to length and epoxy them into position on the rib #32, these nails support the bungee cords. The nails do not go past the inside of the rib #32; they should be flush with that edge. Remember the landing struts will be against the inside of this rib. The bungee cord #702 system is functional and is required for landings. Once the subwing is built access to the

bungee cord will be limited; although, you can create two access doors on the bottom if desired. You need two nine inch pieces of the bungee cord. The brass tubes #711 is used to crimp the bungee cord into place. Using the tubes and bungee cord, wrap the bungee cords around the nails, axle crimping the tubes #711. The bungee cords should be tight enough for some shock effect with the axle, don't over tighten them. Test fit the struts #307, 308 in position. You might have to adjust the struts to get them to fit. Use screws #116 to hold them in place. You need to cut slots in the upper plywood covering #36 and 39. The trick I found was to use a pencil and mark the inside of the rib #32 where the struts exit the rib. So, when the plywood covering #39 is in place you will know where to cut the slots for the struts. Mark the locations of the struts on the inside of rib #32. The struts should be test fitted to the belly of the fuselage. You might need to bend the struts a little to get them properly positioned. Once satisfied with the angle of the struts, it's time to install the music wire #310. Insert some cotton into each landing gear strut. This will prevent the JB Weld from running down the strut. Follow the instructions on the JB Weld and mix up a batch and add it into the strut ends. Add the music wire #310 where the shorter end goes into the end of the strut. Wrap the ends of the strut and music wire with some masking tape. While the JB Weld is setting test fit the struts to the fuselage. This should align the music wire to the right angle. Let the JB Weld set over night. Remove the struts; you might want to paint them now before they are permanently set into the subwing. You need to cover the subwing now. Join the covering pieces #36 and #39 together first. You should slightly sand the edges of the plywood #36 and then the mating edge of plywood #39. These edges when joined should overlap each other by 1/8 inch. Start on the top and in the rear and work your way forward stopping a little past the forward strut #307. Remember to keep the plywood centered on the subwing. The outside rib #106 will be added later. Cut the slots in the plywood for the struts, don't make them too large. Add the landing struts now before you wrap the plywood covering around the bottom. You should have the music wire in the struts which has been test fitted to the fuselage mounting blocks. The struts are intended to be mounted to the double ribs #32 semi-permanently, in that, you should not need to remove them unless you have a mishap. Use a little Loc-tite to secure the screw/nuts holding the struts in place. Position the fitting #309 on the inside of the front struts #307. Using screws #116 and nuts #103 secure the struts in place. Add the outside rib #106 in place. Now continue gluing the plywood cover by wrapping the plywood around the nose of the ribs and onto the bottom of the ribs. Before you continue with the subwing (adding the turnbuckles and cable) the fuselage should be all framed up. The landing gear struts will be mounted with j-bolts; then the bottom belly shroud will be put in place. Add the turnbuckles #709 to fitting #309 using screw #40 and hex nut #108. You should use loctite to keep the nut #108 from coming loose. You should twist the turnbuckle ends out so they extend to their

maximum length. This way when you twist the turnbuckle tight it pulls these ends in as well as tightens the cable. The cable #708 is functional and it is very important to keep guitar tight. You should check the tension before each flight. The cable goes around the strut #307, so, when the cable gets tight it will pull that strut inward. Cut the cable to length and add the swage #720. Crimp the swage tight. Thread the other end of the cable thru another swage running the cable thru the turnbuckle and back thru the swage. Pull the cable tight and crimp. Adjust the turnbuckle #709 and secure the adjusted turnbuckle with the safety wire #38. The subwing is complete and ready for painting.

Bottom Wing

The bottom wing will be built as one piece. The root rib is two pieces because the nose of the root rib needs to be tilted to clear the rear landing gear strut. You can work around this until you fit the bottom wing to the fuselage. The Dr1 spar is the main component on the wings. It is large and strong. The spar webbing is pre-cut allowing for easy assembly of the wing. The rear of each rib has a curved cut in the event you want to use a plastic cable versus the balsa trailing edge supplied. The building of the spars is sort-of critical as they will dictate how well your wing comes out. Take your time and keep the wing flat and warped-free. As you put the pieces together ensure that you have the proper parts positioned correctly.

Some things to remember -

1. The balsa spar webbing is exactly cut to the proper size.
2. The spruce/balsa spars might need sanding to fit into ribs.
3. The rib capping will go over the spars.
4. Work from the inner wing (root) towards the wing tip.
5. The rib capping goes on the left and right side of the rib.
6. Wing tip follows the centerline of the outer rib.
7. Bottom wing needs to be fitted to fuselage before finishing.
8. Root nose rib is added after landing gear is in position.
9. Saw-tooth pattern goes top side of wing.
10. Keep the wing flat and straight.

The spar is made up of a combination of spruce and balsa. You will notice two spars on the plan. They are built identical but the balsa part of the spar will face outwards. The spar is an I-Beam design which is covered by the balsa spar webbing. The two spar holes in each rib is cut exactly; which means you might have to slightly sand the spars so they can fit snugly into the ribs. This also means you need to build the spars straight with no gaps between the wood. It is recommended that you use a

straight piece of aluminum "L" channel that you can support the spars you are going to build. A piece of metal about 4 feet long will be fine. The I-beam spars use balsa on one side of the I-beam, reference view B-B on plan sheet 3. Notice how the spruce pieces make the I-beam and the balsa support is on the outside. This makes it easy to build. You will build the spars with the I-beam rotated 90 degrees. Place the balsa #51 on the building table, then add two spruce #50 on each side of the balsa #51 and one over the top of the balsa #51. Basically, you are rotating the spar drawing found in the reference view B-B. Using wood glue such as, Tite-bond; glue these parts together clamping them to your metal support keeping them straight and flat. Ensure that all pieces are straight and seated well. Create three more spars this way. Note that the wing is about 71-1/4 inches long; two spars add up to 72 inches long. This means the spar splice for this wing needs to be no longer than 3/4 inch long. Splice two spars together using plywood support #18 over the splices which will go on the opposite side of the balsa #51. Keep spars straight and flat. Trim spars to length. Keeping the balsa #51 part of the spars facing out; slide ribs #20 and #27 onto the spars. You might consider securing the spars over the building plans as you locate each rib. Test fit (Don't glue at this time) the balsa spar webbing #B1-8 in position; this will help locate the ribs. Remove the balsa spar webbing; keeping the ribs straight and in position glue them into place. Remember to leave the nose rib #27 off the wing until you fit the landing gear in the fuselage. Add the stringer #30 and balsa trailing edge #146-153 to the ribs. If desired you can substitute the balsa trailing edge with some cable, such as, plastic fishing wire. Just keep it a little loose so when the fabric tightens you will get the scallop effect desired. Add the nose rib supports #20A to the two ribs as shown on the plans. Add the rib capping #26 to both sides of the rib as seen in reference view A-A on plan sheet 4. Note that only the one side of the root rib should have rib capping as shown on the plans. Locate the wing skid fittings #314 and 315. First, add plywood support #18 on the inside of the spars where these fittings will go. Adding support #18 will be done at all fitting locations on all the wings. Follow the plans and mark the holes needed for these fittings. Using a 1/8 drill bit; drill the holes required. Make sure that these fittings will protrude properly past the bottom of the wing. Reference view B-B on plan sheet 4. Notice that the screw heads are on the inside and which gives you access to the hex nuts once the spar is covered up. This is just like the original. You probably will not need to gain access to the screws but you will have easier access to the hex nuts if needed. Repeat this process for the interplane fittings #300; these fittings protrude out of the top of the wing the same distance fitting #301 protrudes out of the middle wing as shown in reference view F-F on sheet plan 3. Drill and mount these fittings #300 into position. The alignment of these fittings will become important as you will want the interplane struts straight. Position and glue the spar webbing #B1-8 to the top and bottom of the spars. For example, #B8 would go on top and

bottom of the spar at the outermost spar location see plans. Do not glue the center plywood #C3-C4 yet; you will do that after you fit the wing to the fuselage. Add wing tips #13 with supporting balsa #28 reference view A-A on plan sheet 4. The wing tip should follow the center line of the outer rib. Add the ribbon tape #15 now. You can start at the root rib and work your way out around the wing tip and back to the root. Notice on the plans where the ribbon tape should go. The ribbon tape goes up and under the ribs. The ribbon tape is a simple way of keeping the ribs from twisting. You can add a little glue at every other rib location if desired. The ribbon tape should be a little tight. Add the balsa leading edge #110 to the wing. You can sand this balsa #110 by protecting the nose ribs with masking tape and then using a T-Bar shape the balsa. The saw tooth plywood #89 and #90 needs to be oriented properly. Notice on plywood #90 the area that goes over the root rib has a large angle, different than the rest. Try not to get the plywood mis-oriented. Test fit into position. The plywood should line up with the ribs. Remember the plywood is laser cut exactly. You might need to adjust the plywood slightly if the ribs are a wee-bit off. You must "wet" the plywood before adding it. This will soften the wood so it can be wrapped around the leading edge without cracking. You can add a little ammonia into the warm water which will loosen the glue in the plywood. Soak the saw tooth plywood #89 and #90 for 10 minutes in warm water. Starting on the underside of the wing, the side which the straight edge side goes which starts where the underside rib capping stopped. Using slow CA glue will help you align the plywood. Start wrapping the plywood around the rib noses; glue as you go. Try to keep the plywood tight and aligned as you go. Before you attach the saw tooth plywood to the top of the spar, cut the balsa stick #16 and glue them in position first. Then continue with wrapping the saw tooth plywood around gluing to the balsa #16. This will keep the saw tooth plywood below the top of the rib and the fabric, which is correct. So, when the fabric is added you should only see part of the saw tooth pattern on the top of the wing. You will have to trim the plywood #90 when you add the nose rib #27. That nose rib will be tilted so it will clear the landing gear strut about a 1/8 inch. Glue two plywood supports #46 together, which comes in two different sizes. If you reference view C-C on plan sheet 3 realizing that is for the mid-wing; the bottom wing is opposite as the support #46 is on the top not the bottom as shown in view C-C. Position the wing into the fuselage ensuring it is centered and equal lengths on both sides of the fuselage. Follow the plans for the position of supports #46 and epoxy to the spars. The plywood spar webbing #C3 and #C4 when installed should have the spar webbing with the larger hole on the bottom of the wing and the smaller hole on the top of the wing. The larger hole will allow you to get better access to the screw head inside. A trick is to cut a small piece of fuel line and add it to the threads of the screw #100 that protrudes out the wing. This will help keep the screw in position when you un-screw the bottom wing. Test fit the wing into the fuselage; ensure the two screws

#100 align properly and that the supports #46 and plywood spar covering #C3-C4 align correctly. This completes the bottom wing.

Middle Wing

The middle wing will be built as one piece. The root rib is two pieces because the rear of the root rib needs to be tilted to clear the rear cabane strut. You can work around this until you fit the middle wing to the fuselage. The Dr1 spar is the main component on the wings. It is large and strong. The spar webbing is pre-cut allowing for easy assembly of the wing. The rear of each rib has a curved cut in the event you want to use a plastic cable versus the balsa trailing edge supplied. The building of the spars is sort-of critical as they will dictate how well your wing comes out. Take your time and keep the wing flat and warped-free. As you put the pieces together ensure that you have the proper parts positioned correctly.

Some things to remember -

1. The balsa spar webbing is exactly cut to the proper size.
2. The spruce/balsa spars might need sanding to fit into ribs.
3. The rib capping will go over the spars.
4. Work from the inner wing (root) towards the wing tip.
5. The rib capping goes on the left and right side of the rib.
6. Wing tip follows the centerline of the outer rib.
7. Middle wing needs to be fitted to fuselage before finishing.
8. Root rear rib is added after cabane strut is in position.
9. Saw-tooth pattern goes top side of wing.
10. Keep the wing flat and straight.

The spar is made up of a combination of spruce and balsa. You will notice two spars on the plan. They are built identical but the balsa part of the spar will face outwards. The spar is an I-Beam design which is covered by the balsa spar webbing. The two spar holes in each rib is cut exactly; which means you might have to slightly sand the spars so they can fit snugly into the ribs. This also means you need to build the spars straight with no gaps between the wood. It is recommended that you use a straight piece of aluminum "L" channel that you can support the spars you are going to build. A piece of metal about 4 feet long will be fine. The I-beam spars use balsa on one side of the I-beam, reference view B-B on plan sheet 3. Notice how the spruce pieces make the I-beam and the balsa support is on the outside. This makes it easy to build. You will build the spars with the I-beam rotated 90 degrees. Place the balsa #51 on the building table, then add two spruce #50 on each side of the balsa #51 and one over the top of the balsa #51. Basically, you are rotating

the spar drawing found in the reference view B-B. Using wood glue such as, Tite-bond; glue these parts together clamping them to your metal support keeping them straight and flat. Ensure that all pieces are straight and seated well. Note that the middle wing spar is about 78-1/2 inches long; two spars add up to about 72 inches long. This means you are short and will need to use some extra spar material. You need to make two extra spars and cut 12 inch long piece from those spars leaving the 24 inch long piece for the top wing. Using one 12 inch and two 36 inch spars splice them together using 1-1/2 inch long splices. Glue plywood support #18 over the splices which will go on the opposite side of the balsa #51. Keep spars straight and flat. Trim spars to length. Keeping the balsa #51 part of the spars facing out; slide ribs #20 and #22 onto the spars. You might consider securing the spars over the building plans as you locate each rib. Test fit (Don't glue at this time) the balsa spar webbing #M1-8 in position; this will help locate the ribs. Remove the balsa spar webbing; keeping the ribs straight and in position glue them into place. Remember to leave the rear rib #22A off the wing until you fit the cabane struts in the fuselage. Add the stringer #30 and balsa trailing edge #139-145 to the ribs. If desired you can substitute the balsa trailing edge with some cable, such as, plastic fishing wire. Just keep it a little loose so when the fabric tightens you will get the scallop effect desired. Add the nose rib supports #20A to the two ribs as shown on the plans. Add the rib capping #26 to both sides of the rib as seen in reference view A-A on plan sheet 4. Note that only the one side of the root rib should have rib capping as shown on the plans. Locate the interplane fittings #301. First, add plywood support #18 on the inside of the spars where these fittings will go. (Adding support #18 will be done at all fitting locations on all the wings.) Follow the plans and mark the holes needed for these fittings. Using a 1/8 drill bit; drill the holes required. Make sure that these fittings will protrude properly past the top and bottom of the wing. Reference view F-F on plan sheet 3. Notice that the screw heads are on the inside and which gives you access to the hex nuts once the spar is covered up. This is just like the original. You probably will not need to gain access to the screws but you will have easier access to the hex nuts if needed. The alignment of these fittings will become important as you will want the interplane struts straight. Position and glue the spar webbing #M1-8 to the top and bottom of the spars. For example, #M8 would go on top and bottom of the spar at the outermost spar location see plans. Do not glue the center plywood #C1-C2 yet; you will do that after you fit the wing to the fuselage. Add wing tips #13 with supporting balsa #28 reference view A-A on plan sheet 4. The wing tip should follow the center line of the outer rib. Add the balsa leading edge #110 to the wing. You can sand this balsa #110 by protecting the nose ribs with masking tape and then using a T-Bar shape the balsa. The saw tooth plywood #57 and #58 needs to be oriented properly. Notice on plywood #57 the area that goes over the root rib has a large angle, different than the rest. Try not to get the plywood mis-

oriented. Test fit into position. The plywood should line up with the ribs. Remember the plywood is laser cut exactly. You might need to adjust the plywood slightly if the ribs are a wee-bit off. You must "wet" the plywood before adding it. This will soften the wood so it can be wrapped around the leading edge without cracking. You can add a little ammonia into the warm water which will loosen the glue in the plywood. Soak the saw tooth plywood #57 and #58 for 10 minutes in warm water. Starting on the underside of the wing, the side which the straight edge side goes which starts where the underside rib capping stopped. Using slow CA glue will help you align the plywood. Start wrapping the plywood around the rib noses; glue as you go. Try to keep the plywood tight and aligned as you go. Before you attach the saw tooth plywood to the top of the spar, cut the balsa stick #16 and glue them in position first. Then continue with wrapping the saw tooth plywood around gluing to the balsa #16. This will keep the saw tooth plywood below the top of the rib and the fabric, which is correct. So, when the fabric is added you should only see part of the saw tooth pattern on the top of the wing.

The fuselage needs to be framed up at this time. The middle wing sits in two saddles #216 which has the wing incidence built in. These saddles #216 are permanently mounted to the top of the removable floor #95. You can see this set up on the fuselage side view; plan sheet 1. It is recommended that you locate the saddles #216 as shown. Temporary mount the middle wing on these saddles and get the middle wing centered onto the fuselage. It is also important to notice the forward location of the wing saddles #216 as that helps determine where the mid wing wooden interplane struts attach to the top and bottom wings. Mark the locations of the wing saddles and the middle wing location on the spars with a pencil. Glue two plywood supports #46 together, which comes in two different sizes. Reference view C-C on plan sheet 3. Follow the plans for the position of supports #46 and epoxy to the spars. With the middle wing in position on the fuselage; drill two 3/16 inch holes into the saddles #216 using supports #46 as a guide. This also will put the two holes into the removable floor #95 and the strut support #159. You can add the blind-nut #98 to support #159 as shown on the plans. At this time go ahead and locate the other two forward holes on the removable floor #95 and drill them like you did here. The plywood spar webbing #C1 and #C2 can be installed now per the view C-C on plan sheet 4. A trick you might consider is to cut a small piece of fuel line and add it to the threads of the screw #100 that protrudes out the wing. This will help hold that screw in position when you remove the middle wing. Remove the middle wing and now add some epoxy to the saddles #216 which will now permanently mount the middle wing. Re-seat the middle wing onto the saddles #216. Once you add and locate the cabane struts you can then add the rear of the root rib #22A. The rib #22A should clear the cabane struts by 1/16 inch. You can now add the arch on either side of the middle wing. Use cardboard #60 as a pattern and like the

rudder or elevator laminate (using wood glue) parts #248 and #249 together. You should alternate the parts making up a five layer lamination. So, it would go like #248, 249, 248, 249 and 248. Tape the lamination to the cardboard #60. Once dry, sand and place into position, reference the plans. Add the ribbon tape #15 now. You can start at the root rib and work your way out around the wing tip and back to the root. Notice on the plans where the ribbon tape should go. The ribbon tape goes up and under the ribs. The ribbon tape is a simple way of keeping the ribs from twisting. You can add a little glue at every other rib location if desired. The ribbon tape should be a little tight. Test fit the middle wing back onto the fuselage; ensure the two screws #100 align properly and that the supports #46 and plywood spar covering #C1-C2 align correctly. This completes the middle wing.

Top Wing

The top wing will be built as one piece. The Dr1 spar is the main component on the wings. It is large and strong. The spar webbing is pre-cut allowing for easy assembly of the wing. The rear of each rib has a curved cut in the event you want to use a plastic cable versus the balsa trailing edge supplied. The building of the spars is sort-of critical as they will dictate how well your wing comes out. Take your time and keep the wing flat and warped-free. As you put the pieces together ensure that you have the proper parts positioned correctly.

Some things to remember -

1. The balsa spar webbing is exactly cut to the proper size.
2. The spruce/balsa spars might need sanding to fit into ribs.
3. The rib capping will go over the spars.
4. Work from the center of the wing towards the wing tip.
5. The rib capping goes on the left and right side of the rib.
6. Wing tip follows the centerline of the outer rib.
7. Saw-tooth pattern goes on the top side of the wing.
8. Keep the wing flat and straight.

The spar is made up of a combination of spruce and balsa. You will notice two spars on the plan. They are built identical but the balsa part of the spar will face outwards. The spar is an I-Beam design which is covered by the balsa spar webbing. The two spar holes in each rib is cut exactly; which means you might have to slightly sand the spars so they can fit snugly into the ribs. This also means you need to build the spars straight with no gaps between the wood. It is recommended that you use a straight piece of aluminum "L" channel that you can support the spars you

are going to build. A piece of metal about 4 feet long will be fine. The I-beam spars use balsa on one side of the I-beam, reference view B-B on plan sheet 3. Notice how the spruce pieces make the I-beam and the balsa support is on the outside. This makes it easy to build. You will build the spars with the I-beam rotated 90 degrees. Place the balsa #51 on the building table, then add two spruce #50 on each side of the balsa #51 and one over the top of the balsa #51. Basically, you are rotating the spar drawing found in the reference view B-B. Using wood glue such as, Tite-bond; glue these parts together clamping them to your metal support keeping them straight and flat. Ensure that all pieces are straight and seated well. Note that the top wing spar is about 86 inches long; two spars add up to about 72 inches long. This means you are short and will need to use some extra spar material. You need to make two extra spars and cut 24 inch long piece from those spars leaving the 12 inch long piece for the mid wing. Using one 24 inch and two 36 inch spars splice them together using 1-1/2 inch long splices. Glue plywood support #18 over the splices which will go on the opposite side of the balsa #51. Keep spars straight and flat. Trim spars to length. Keeping the balsa #51 part of the spars facing out; slide ribs #17, #20 and #21 onto the spars. You might consider securing the spars over the building plans as you locate each rib. Test fit (Don't glue at this time) the balsa spar webbing #T1-11 in position; this will help locate the ribs. Remove the balsa spar webbing; keeping the ribs straight and in position glue them into place. Add the stringer #30 and balsa trailing edge #125-131 to the center ribs. If desired you can substitute the balsa trailing edge with some cable, such as, plastic fishing wire. Just keep it a little loose so when the fabric tightens you will get the scallop effect desired. Add the nose rib supports #20A to the four ribs as shown on the plans. You will use spar material #50 for the trailing edge at the aileron bay area. You will need two pieces of #50 and the trim you cut off will be used for the cabane mounts shown on the plans. Test fit trailing edge #50 in position and trim to length. The trailing edge #50 will need to be tapered to the rib contour. Place #50 so it will be flush with the bottom of the ribs #21. You can easily determine the taper angle needed by pressing #50 against rib #17. You will see that #50 extends over rib #17; this is the area that needs to be removed by sanding. You can use a pencil to mark that angle at the end of #50 and then sand the complete length that angle. Glue #50 into position on the back of the ribs #21. The extra pieces of #50 you have leftover from trimming the trailing edge will be used for the cabane mounts. Notice on the plans where the four cabane supports #50 will go. The front #50 cabane support will go into the slots found in the plywood ribs #17. Cut the front #50 support to length and epoxy into place. The rear support #50 will be flush with the bottom of the ribs #17 and go in-between the two ribs #17. Cut the rear support #50 to length; do not install yet. To locate the rear support properly you should use the steel joiner #7. Using the steel joiner #7 locate the rear support #50; epoxy this support #50 into position. With the two cabane

supports #50 in position carefully locate and drill the two 6-32 holes needed for the screws #228. Test fit the steel joiner #7 in place with screws #228. Now you can add the rib capping #26 to both sides of the rib as seen in reference view A-A on plan sheet 4. Locate the interplane fittings #300. First, add plywood support #18 on the inside of the spars where these fittings will go. (Adding support #18 will be done at all fitting locations on all the wings.) Follow the plans and mark the holes needed for these fittings. Using a 1/8 drill bit; drill the holes required. Make sure that these fittings will protrude properly past the bottom of the wing. Reference view A-A on plan sheet 3. Notice that the screw heads are on the inside and which gives you access to the hex nuts once the spar is covered up. This is just like the original. You probably will not need to gain access to the screws but you will have easier access to the hex nuts if needed. The alignment of these fittings will become important as you will want the interplane struts straight. Position and glue the spar webbing #T1-11 to the top and bottom of the spars. For example, #T1 would go on top and bottom of the spar at the outermost spar location see plans. Add wing tips #24 with supporting balsa #28 reference view A-A on plan sheet 4 as this is similar to the bottom and mid-wing wing tips. The wing tip should follow the center line of the outer rib. Add the balsa leading edge #110 to the wing. You can sand this balsa #110 by protecting the nose ribs with masking tape and then using a T-Bar shape the balsa. The saw tooth plywood #52 thru #56 needs to be oriented properly; test fit these pieces into position. The plywood should line up with the double nose-ribs. The saw tooth plywood should butt up against each other as you work your way out. Remember the plywood is laser cut exactly. You might need to adjust the plywood slightly if the ribs are a wee-bit off. You must "wet" the plywood before adding it. This will soften the wood so it can be wrapped around the leading edge without cracking. You can add a little ammonia into the warm water which will loosen the glue in the plywood. Starting with the center soak the saw tooth plywood #54 for 10 minutes in warm water. Starting on the underside of the wing, the side which the straight edge side goes which starts where the underside rib capping stopped. Using slow CA glue will give you time to align the plywood. Start wrapping the plywood around the rib noses; glue as you go. Try to keep the plywood tight and aligned as you go. Before you attach the saw tooth plywood to the top of the spar, cut the balsa stick #16 and glue them in position first. Then continue with wrapping the saw tooth plywood around gluing to the balsa #16. This will keep the saw tooth plywood below the top of the rib and the fabric, which is correct. So, when the fabric is added you should only see part of the saw tooth pattern on the top of the wing. Continue working your way out to the wing tips. Add the ribbon tape #15 now. You can start at the root rib and work your way out around the wing tip and back to the root. Notice on the plans where the ribbon tape should go. The ribbon tape goes up and under the ribs. The ribbon tape is a simple way of keeping the ribs from twisting. You can add a little glue at every

other rib location if desired. The kit includes servo supports #14 for your servo mounting. You can mount the servos facing down so if you need to cut into the wing to access the servos you can cut the fabric on the bottom side. Some builders put servo access doors in, but with today's technology this is probably not needed. Although, it is up to you. This completes the top wing.