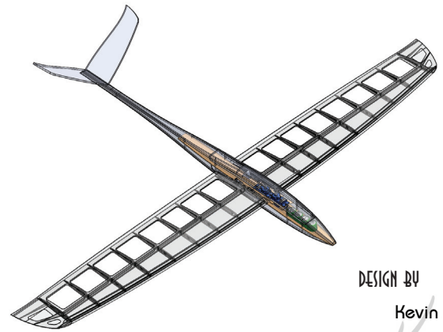
Z33 V2

Construction & Setup Guide

Download the construction manual and 3D content at Zaerotech.com



DESIGN BY
Kevin J. McDonald

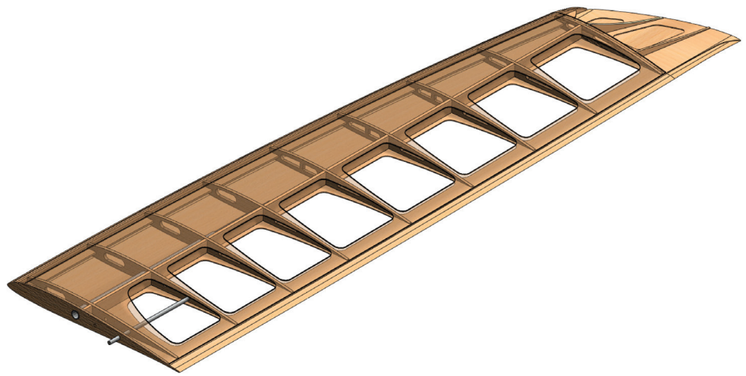
Thank you for purchasing the Z33V2 by Zaerotech. This new version of the Z33 has been designed to give you maximum flexibility in electronic component selection, as well as allowing for an ePower variant in the same kit

I've put a special effort into making this kit technically satisfying for the intermediate to advanced builder. Tolerances are tight, considering the material and its thickness variations. So take your time, dry fit everything first, don't overdue the adhesive, but most of all, have fun

Always check the Z33 product page at www.zaerotech.com for the latest construction manual. It updates about once a month, and is a must, to ensure you have up-to-date information

Fuselage Group

Wing Group



Tail Group

Tips

Separating Laser cut parts:

Parts are designed to break-out easily. You should however, use a sharp #11 blade. Cut both sides of the small bridging tab connecting the wood parts to the sheet

Sanding & Fitting Laser cut parts:

Carefully sand the cut (Black) surfaces with 400 grit . You do not need to remove the black, just sand to remove the cut tabs, and render a cleaner surface for the adhesive. Laser cutting systems share the same tolerance limitations common to all CNC equipment. Wood also varies in thickness. Therefore, you may find it necessary to sand or file some parts to get a flush or aligned fit. Test fit everything before you apply adhesive

Special tools:

Several parts are included to aid in the precision construction of the Zip33. In addition, you should have a small triangle or square approximately 3 inches on the longest side. A small fine tooth saw, and sandpaper with a selection of blocks and pads

Electronics:

Thoroughly test all electronics before installing. The recommended electronics have been chosen based on reliability and robustness. However, testing and centering before installation is a must

Legends & Adhesives

The Zip 33V2 has been designed to take advantage of Cyano based adhesives. However, several substitutes are available such as epoxies and high quality resin glues for wood. Whether you use Cyano based adhesives, or your preferred adhesives, throughout construction, the drop chart will guide you to the quantity of adhesive, and the viscosity required for a given operation. Very little adhesive is required to build this kit, and a fine nozzle is recommended for all viscosities. Weight is critical to light air performance, so be conservative when building

The viscosity Icons are important due to the ability of adhesives to wick to adjacent areas. Several operations require thick viscosities so as not to allow the adhesive to find its way to unwanted areas. They also corresponds to cure times. Some operations require you have a longer working time, so read ahead and prepare for the next operation

Thin Viscosity | Medium Viscosity | Thick Viscosity

Some operations may require the use of accelerators. This is to save you the need for long-term clamping of the structure. When using non cyano adhesives, set up clamping methods and consider tape to hold the parts in place till cured

Accelerator

Throughout this guide you will see "No Accelerants" and "No Adhesive". Plywood retains residual chemicals and the use of accelerators will cause many problems for subsequent operations by causing premature curing

Some operations may require silicone adhesive. If you need to substitute, use a flexible adhesive that can be detached with force

Silicone Adhesive/Sealant

Follow the glue guides:

The Zip33V2 is a complex structure. Don't be tempted into taking shortcuts or substituting glue viscosities

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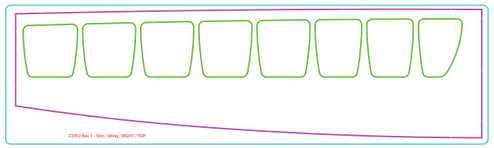
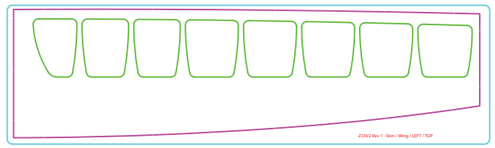
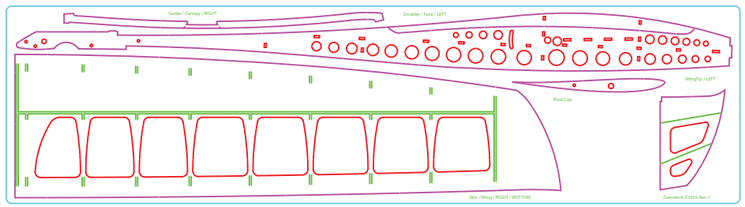
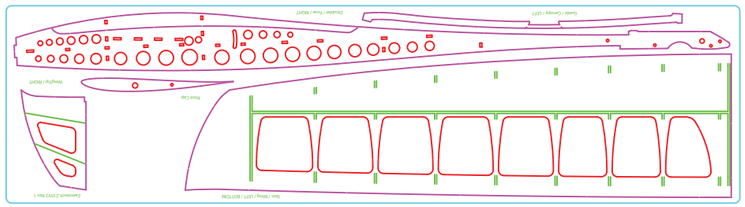
Z33 V2 Part Identification Guide

Plywood 0.4mm

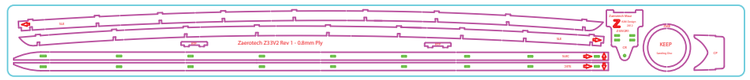




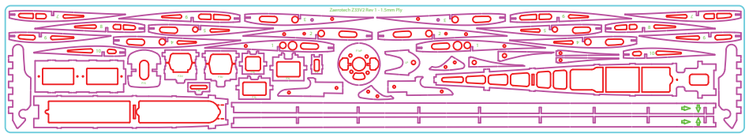


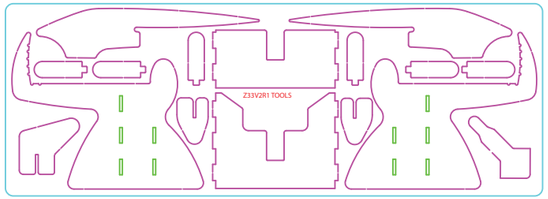


Plywood 0.8mm

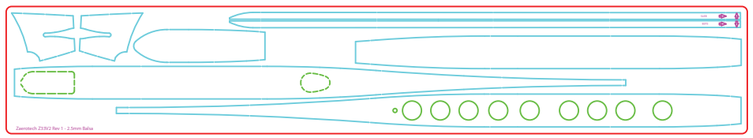


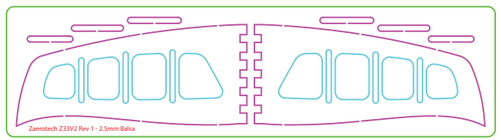
Plywood 1.5mm



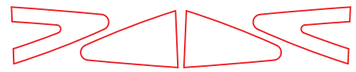


Balsa 2.5mm



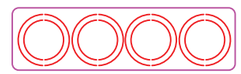


Misc



NoseBlock

Index Dowel



Motor Ring

Basswood Leading Edge

Hardware

Aluminum

(1x) Fuse Pivot Tube

(2x) Wing Pivot Tube

(1x) Crank Pivot Tube

(2x) Wing Dive Tube (Carbon Core)

(1x) Tail Latch Tube

Carbon

(2x) Wing Sub Spar

(1x) Wing Pivot Rod

Delrin

(2x) Drive Crank

Kevlar

(1x) Tail Hinge

Butal

(2x) O-Ring

Steel

(2x) Control Wire

Vendor Supplied

(2x) Ball Link

(2x) Screw

(2x) Ball

(1x) Screw

Prep:

Thoroughly clean all parts of any oils or adhesives. Remove all sharp edges from metal and plastic parts. Do not overdo it. Parts are close tolerance, requiring only minor attention

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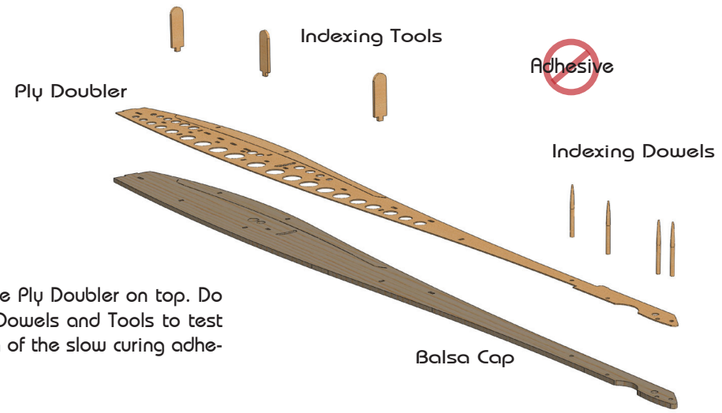
Z33 V2 — Fuselage Construction 1

Side Doubler:

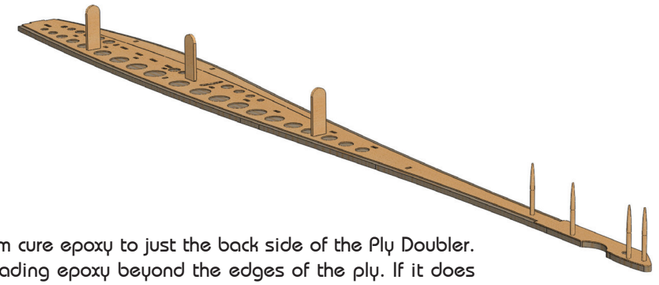
Locate;
- (2)x 0.4mm Ply Doubler
- (2)x 2.5mm Balsa Cap
- (4)x Indexing Dowels
- (6)x Indexing tools



Lay the Balsa Cap on a flat surface, and place the Ply Doubler on top. Do this for both a left and right assembly. Use the Dowels and Tools to test align the Two parts. Once satisfied, decide which of the slow curing adhesives you would like to use to bond them

Four factors are important on your choice of adhesive and method;

1. Slow cure (For working time)
2. Low viscosity (To limit the depth of penetration of the adhesive, to save weight)
3. Perfect alignment
4. Cleanup of excess adhesive



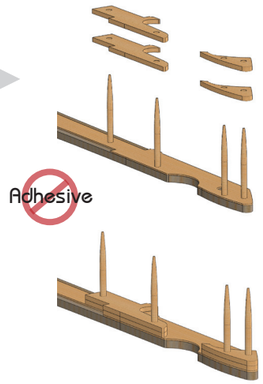
For the best result;
Use a small foam roller to apply a thin coat of medium cure epoxy to just the back side of the Ply Doubler. Carefully lay it on top of the Balsa Cap without spreading epoxy beyond the edges of the ply. If it does spread, clean it up, and check that all the tab slots are not filled with epoxy. A thin film is all you need. Align with the tools and dowels. The extract the Indexing tools and dowels once the epoxy begins to tack

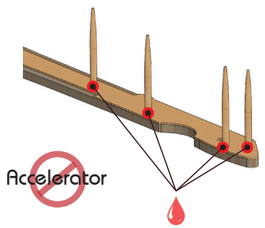
You can then place wax paper over the assembly and use weight to compress it

Tail Bridge Plates:

Locate;
- (2)x 1.5mm Foreward Bridge Plates
- (2)x 1.5mm Aft Bridge Plates
- (1)x 1.5mm 90 Degree Tool

Slip the Bridge Plates onto the Dowels and check fit the alignment. Tweak the dowels to adjust until satisfied

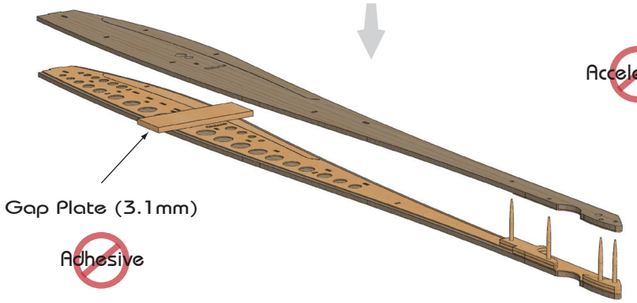


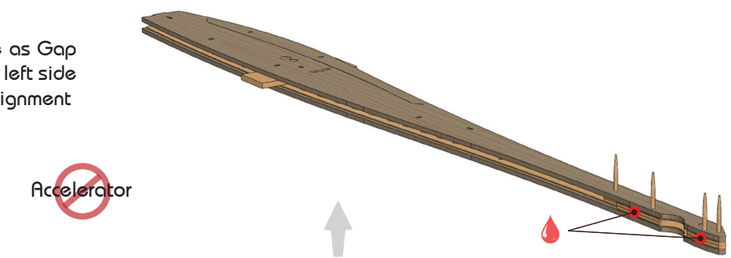


Insert the Indexing Dowels into the holes of the right side assembly. Use the 90 Degree Tool adjust their vertical position, then tack in-place with CA

Joining the Assemblies:

Locate a pair of scrape 1.5mm Ply pieces to use as Gap Plates, and position them as indicated. Slide the left side assembly onto the Indexing Dowels and check alignment





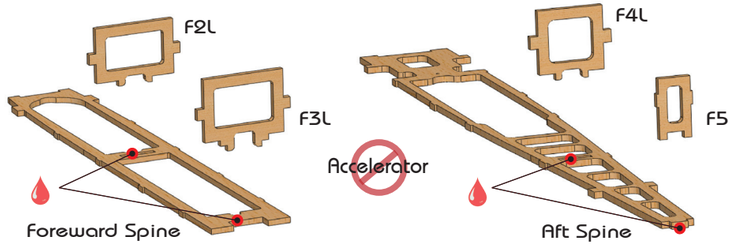
When satisfied, determine whether you will use cyano or epoxy.
Cyano; Wick CA into all contacting areas of the tail assembly. Saturate without pooling
Epoxy; Remove the left assembly and bridge Plates. Apply a thin coat of epoxy to all points of contact, stack and align the parts, and make sure to clean any excess from the tail cavity

Frame Assemblies:

Locate;
- (1)x 1.5mm Foreward Spine (FS)
- (1)x 1.5mm Lower Former (F2L)
- (1)x 1.5mm Lower Former (F3L)
- (1)x 1.5mm Aft Spine (AS)
- (1)x 1.5mm Lower Former (F4L)
- (1)x 1.5mm Former (F5)

When satisfied with the alignment and fit, tack the Formers in-place with CA. Use only enough adhesive to keep them stable while you proceed to the final assembly

Lay the Spines on a flat surface, and fit the respective Formers. Use the 90 Degree Tool to set the vertical angle

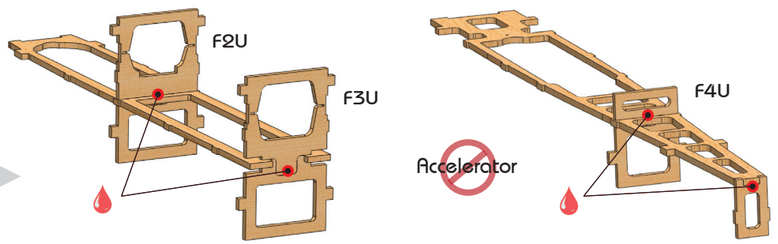


Frame Assemblies:

Locate;
- (1)x 1.5mm Upper Former (F2U)
- (1)x 1.5mm Upper Former (F3U)
- (1)x 1.5mm Upper Former (F4U)

When satisfied with the alignment and fit, tack the Formers in-place with CA. Use only enough adhesive to keep them stable while you proceed to the final assembly

Fit the Upper Formers, and use the 90 Degree Tool to align them. Be careful not to break the bridge between the lower and upper sections



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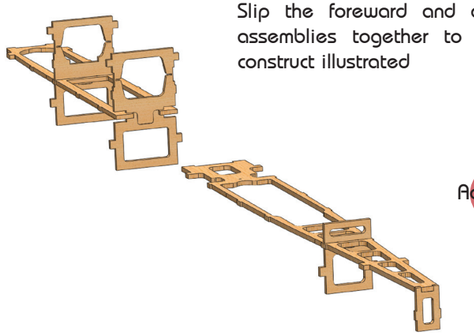
Fuselage Construction 2

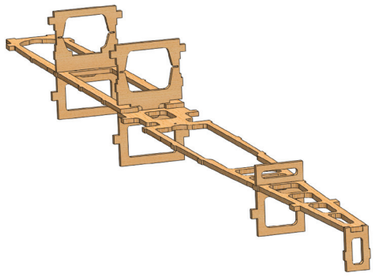
CA GAP

Fit Foreward and Aft Frames:



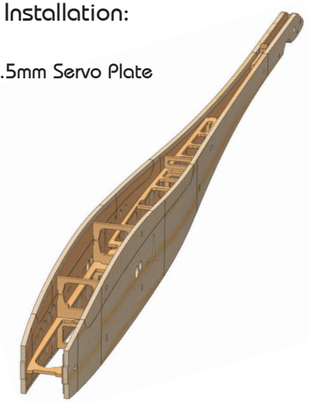
Slip the foreward and aft frame assemblies together to form the construct illustrated

Adhesive



Frame Installation:

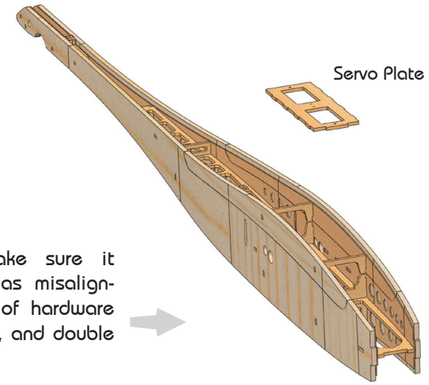
Locate;
- (1)x 1.5mm Servo Plate



Carefully spread the fuselage halves enough to install the completed frame assembly. Line up all the tabs and slots, installing light pull rubberbands to hold the entire assembly together as you go

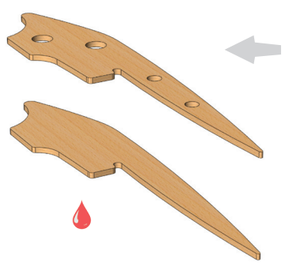
Adhesive

Install the Servo Plate. Make sure it engages the tabs perfectly, as misalignment will hinder installation of hardware later. Square up the assembly, and double check all tab engagement



Tail Alignment:

Locate;
- (2)x 1.5mm Tail Gauge halves

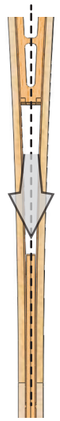


Lay the halves on a flat surface, and apply CA to the bottom half through the holes in the top half. Clamp flat, and apply CA to the perimeter. Let cure, and remove. Check that the construct is flat. Lightly sand if needed on a flat surface

Fit the Tail Gauge into the tail cavity. If its tight, sand lightly until snug

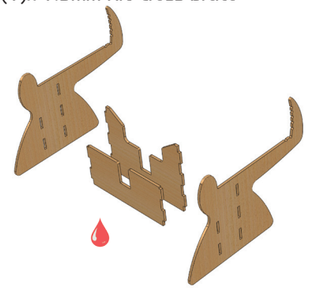
Adhesive

Viewed from the top, you can see that slight tweaking of the structure will affect the tail alignment



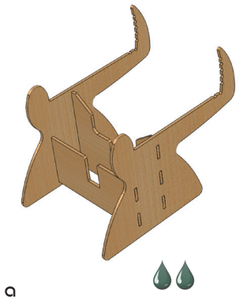
Multi-Jig Construction:

Locate;
- (2)x 1.5mm Multi-Jig Sides
- (1)x 1.5mm Foreward Cross-Brace
- (1)x 1.5mm Aft Cross-Brace

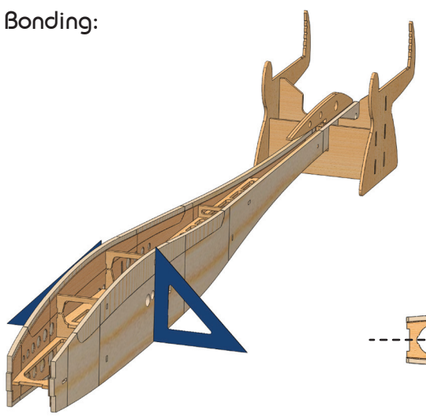


Fit the parts as illustrated on a flat surface, and tack all points of contact

Make sure the entire structure is square, and finish bond all points of contact

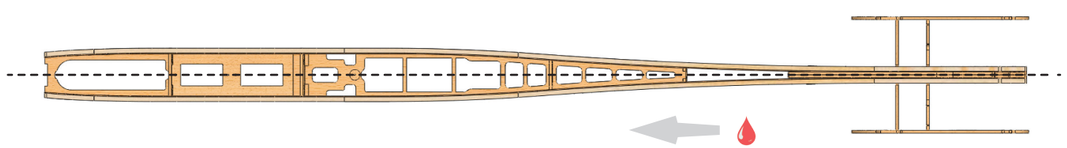


Fuselage Bonding:

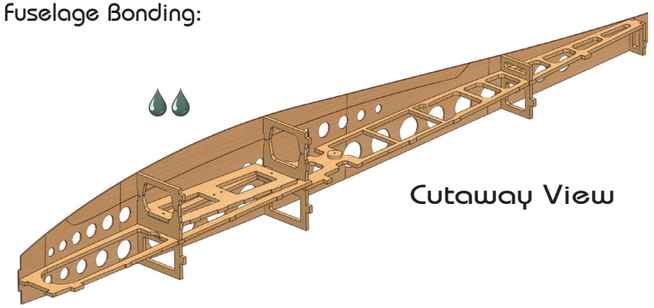


Set the fuselage into the Multi-Jig, and use a pair of 90 degree plates, squares, etc., to aid you in squaring up the structure. It helps to draw a line on the building board and centering the structure by viewing through the frames

Use all the aids to tweak the structure until its completely aligned. When satisfied, start tacking the intersection of frames and formers. Work from the tail, and slowly move foreward, checking for unwanted twist as you go



Fuselage Bonding:



When satisfied with the tacked structure, use a fine tip and GAP, to finish all points of contact. Finish the top side first, while its still squared up, and let cure. Flip it over and do the bottom. Don't overdue it

Fuselage Construction 3

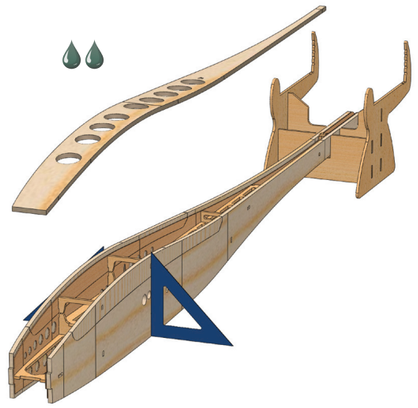
CA GAP

Cap Installation:

Locate;
- (1)x 2.5mm Balsa Cap

Carefully test fit the Top Balsa Cap. Carefully align it as you push it into the fuse cavity. Work from the back to front. It should stop at the edge of the Ply Doubler

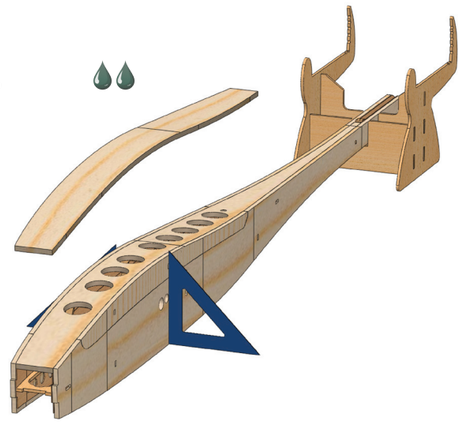
Once satisfied, remove and apply adhesive to all points of contact. Fit the Cap and hold in place until cured



Cap Installation:

Locate;
- (1)x 2.5mm Balsa 2nd Top Cap

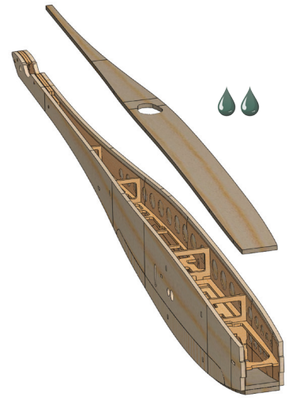
Apply adhesive to the 2nd Top Balsa Cap, and hold in-place



Cap Installation:

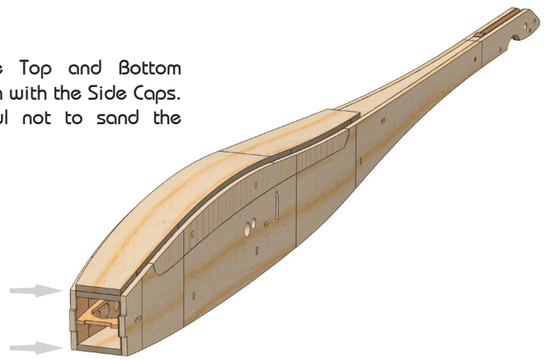
Locate;
- (1)x 2.5mm Balsa Bottom Cap

Before installing the Bottom Balsa Cap, use a fine nozzle to apply adhesive to the inside bottom of the Top Cap. Then apply adhesive to the Bottom Cap



Pre fitting F1:

Sand the Top and Bottom Caps flush with the Side Caps. Be careful not to sand the tabs off

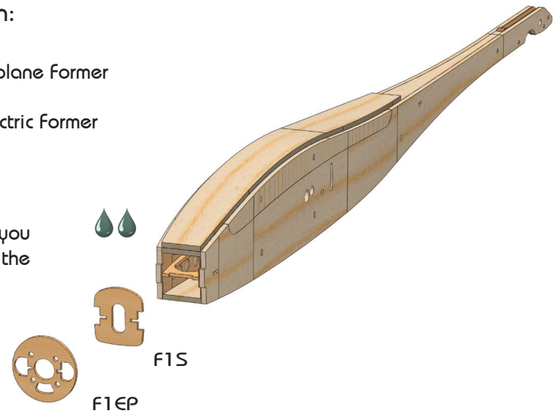


F1S / F1EP Installation:

Locate;
- (1)x F1S 1.5mm Ply Sailplane Former

Optional
- (1)x F1EP 1.5mm Ply Electric Former

Decide which version you will build, and fit the appropriate Former



Cap Installation (EP only):

Locate;
- (1)x 2.5mm Balsa Bottom Cap

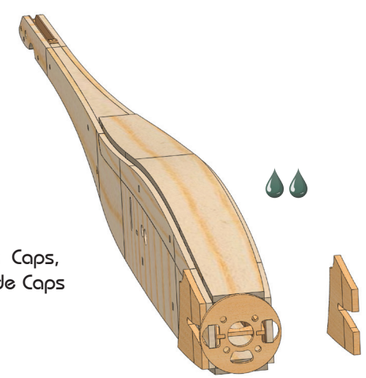
Remove the knock-out on the Bottom Cap. This will increase the foreward volume

Fit the 2nd Balsa Cap

Cheek Cap Installation (EP only):

Locate;
- (2)x 2.5mm Balsa Cheek Cap

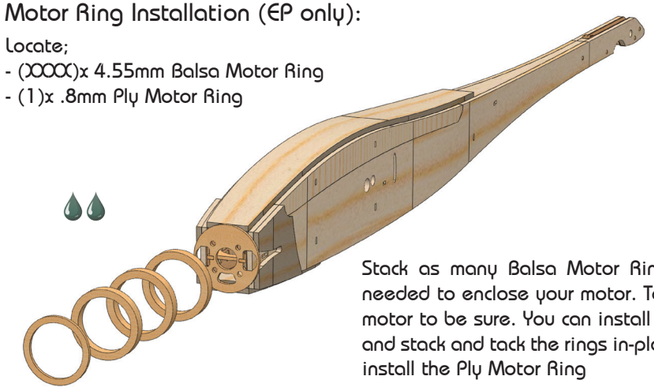
Install the two Balsa Cheek Caps, aligning them to the Balsa Side Caps



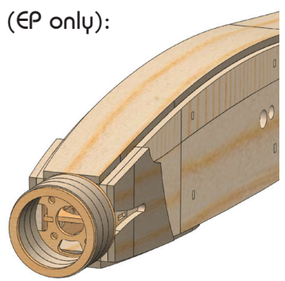
Motor Ring Installation (EP only):

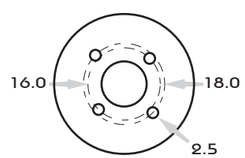
Locate;
- (XXXX)x 4.55mm Balsa Motor Ring
- (1)x .8mm Ply Motor Ring

Stack as many Balsa Motor Rings as are needed to enclose your motor. Test fit your motor to be sure. You can install the motor, and stack and tack the rings in-place. Lastly, install the Ply Motor Ring



Finish (EP only):





With all the nose parts in-place, notice that the Cheek Caps form a cooling air exhaust path. Most 22mm Outrunners will cool very well, with a proportion of the air entering the fuselage, negotiating its way around the ESC and exiting throught the launch-hole aft

Z33 V2 Fuselage Construction 4

CA GAP

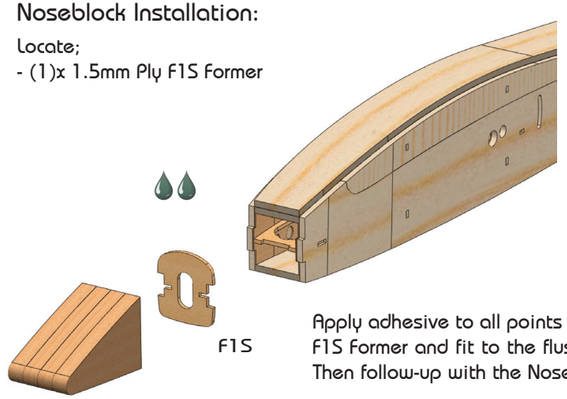
Noseblock Assembly (Sailplane only):

Locate;
- (2)x 4.5mm Balsa Noseblock (Solid)
- (2)x 4.5mm Balsa Noseblock (w/Cutout)

Set the Noseblocks on a flat surface as illustrated. Apply adhesive to all points of contact and align the parts. Clamp or hold till cured

Noseblock Installation:

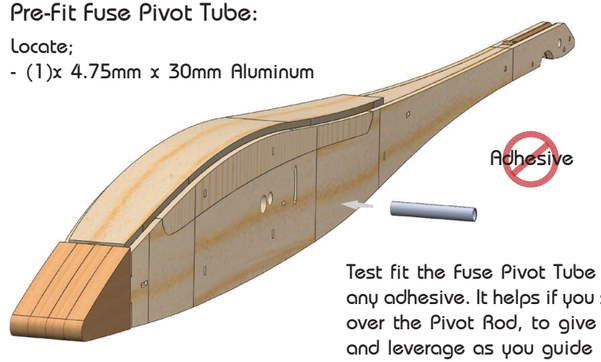
Locate;
- (1)x 1.5mm Ply F1S Former



Apply adhesive to all points of contact on the F1S Former and fit to the flushed Balsa Caps. Then follow-up with the Noseblock assembly

Pre-Fit Fuse Pivot Tube:

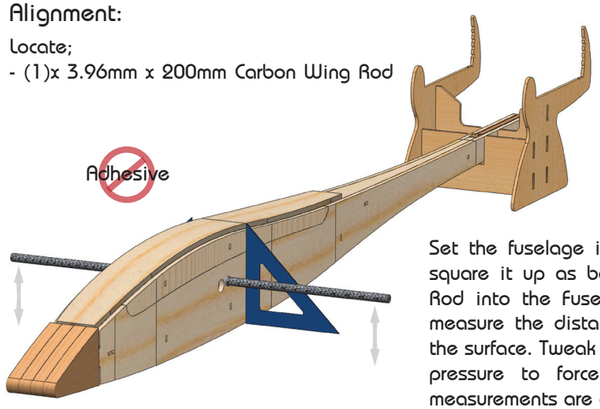
Locate;
- (1)x 4.75mm x 30mm Aluminum



Test fit the Fuse Pivot Tube before you apply any adhesive. It helps if you slip the Pivot tube over the Pivot Rod, to give you some control and leverage as you guide it in. Use a round file if needed, but try to make it a tight fit

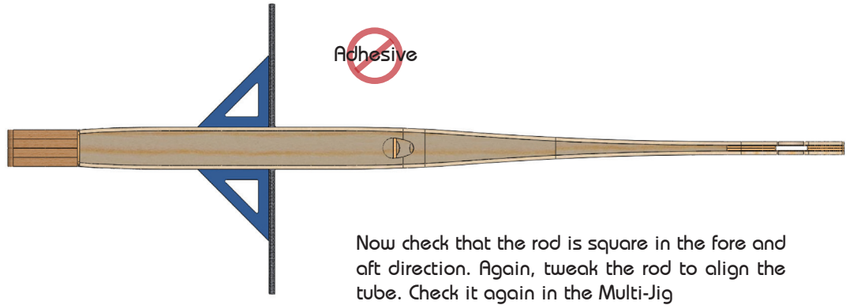
Alignment:

Locate;
- (1)x 3.96mm x 200mm Carbon Wing Rod



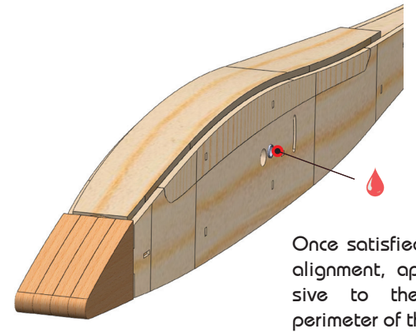
Set the fuselage into the Multi-Jig, and square it up as before. Insert the Pivot Rod into the Fuse Tube, center it, and measure the distance from each end to the surface. Tweak the rod with moderate pressure to force the tube until the measurements are equal

Alignment:



Now check that the rod is square in the fore and aft direction. Again, tweak the rod to align the tube. Check it again in the Multi-Jig

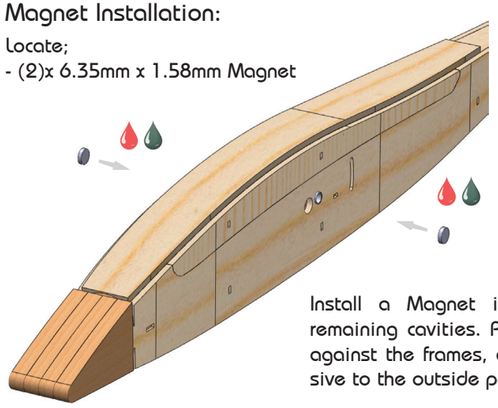
Bonding:



Once satisfied with the alignment, apply adhesive to the outside perimeter of the tube on both sides

Magnet Installation:

Locate;
- (2)x 6.35mm x 1.58mm Magnet



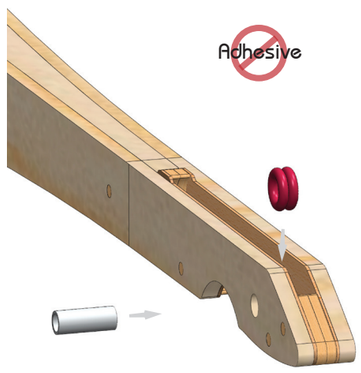
Install a Magnet in each of the remaining cavities. Push them in flat against the frames, and apply adhesive to the outside points of contact

Tail Latch Installation:

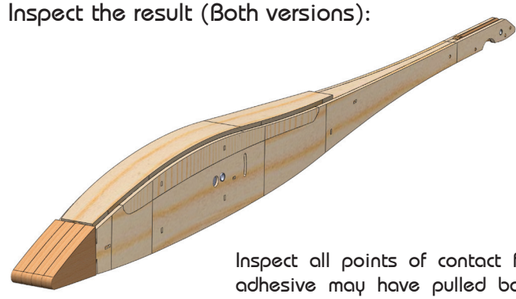
Locate;
- (2)x 6.5mm x 1.5 O-Ring
- (1)x 3.96mm x 9mm Aluminum Latch Tube

Carefully size the hole for the Latch Tube so that you can push it in with moderate pressure from either side

Push the tube in far enough to begin engaging the O-Rings inside the cavity. Push in to capture both O-Rings, and center the tube. Do not Bond



Inspect the result (Both versions):



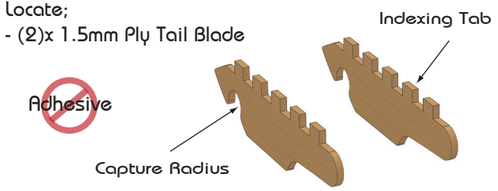
Inspect all points of contact for thin gaps where adhesive may have pulled back, or delamination may have occurred. Note the cavities where the formers and frame tabs fit. They are intentionally shallow to accept fillers. Make sure the entire structure is solid, and ready to fill and sand

Z33 V2 Tail Construction 1

GAP SLOW

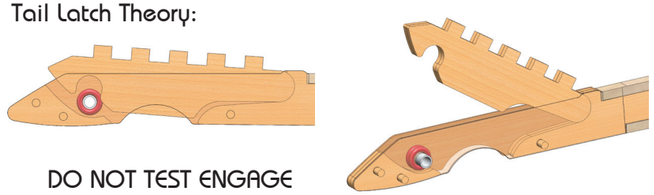
Tail Blade Preparation:

Locate;
- (2)x 1.5mm Ply Tail Blade



Lightly sand the two Tail Blades on a flat surface with 400 grit sandpaper. Then take a small round object, wrap 400+ grit sandpaper around it, and very lightly sand the capture radius. Now lightly sand each part, and remove any sharp edges below the indexing tabs. The tabs will get sanded later, so no need to prepare them

Tail Latch Theory:



DO NOT TEST ENGAGE

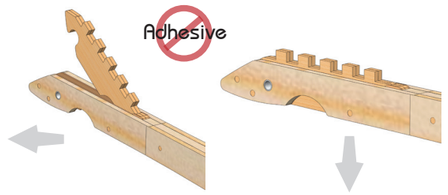
The basic theory behind the tail capture design is simple, but it is very important that you follow the methods here to ensure proper operation. The wood will cut the O-Rings if engaged before preparation, so take your time.

Make sure the Tail cavity is clean, and void of any excess adhesive. Then proceed to the next step

Blade Fitting:

Slip the foreward end of the Blades into the Tail cavity as illustrated. The fit should be snug, but not overly tight. Rotate the aft end down, and stop before you engage the O-Rings. Again, only snug, but easy to push in and extract

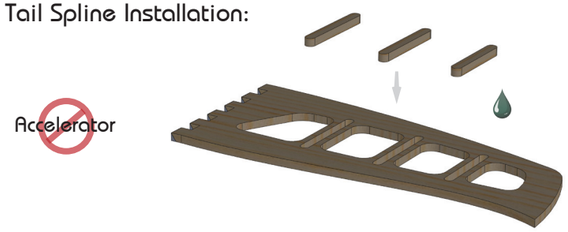
If too tight, sand the blades on a flat surface until they slip in snug



When you are satisfied with Blades fit, rub a little candle wax on the edge of the Capture Radius. A very small amount is enough. Rub it in, and remove any excess. Adhesive will not stick to wax, so don't spread it beyond the edge of the radius that will engage the O-Rings

Gently rotate the Blades down with your thumb, and apply a little foreward pressure when you feel resistance. You should feel the capture engaging, and with a little extra pressure, slip home. The top plane of the Blades should now be parallel to the top plane of the Tail. If not, check for adhesive, debris, sharp corners on the Blade, etc. You can also sand the capture radius slightly, to move the center up, or to loosen it a bit. But more than 0.5mm in any direction means there is problem elsewhere. To release, apply pressure with your index finger

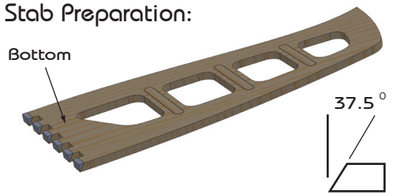
Tail Spline Installation:



Before you remove the Tail parts from the sheet, notice that there is the side with markings (Cut Side), and a side with laser flash scorching

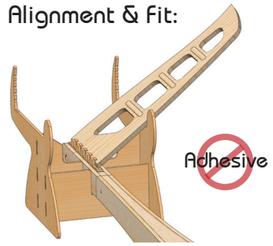
Fit the Balsa Spines in their respective holes, with the Stabs "Cut side" up, and the Spines flashed side up. The laser cuts with a very slight taper. Flipping the Splines will help the fitting. When flush, dab some adhesive into the joint

Stab Preparation:

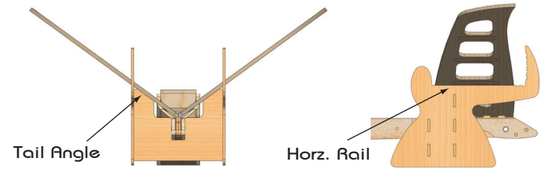


You will be sanding two angles on the indexing tab end of each Stab. The first of these angles (37.5 degrees), illustrated above in gray, will allow you to set the incidence and tracking of each stab. You will fit the left Stab first, and set the alignment as described in the next step. The second angle will be sanded in-process to the fit

Alignment & Fit:



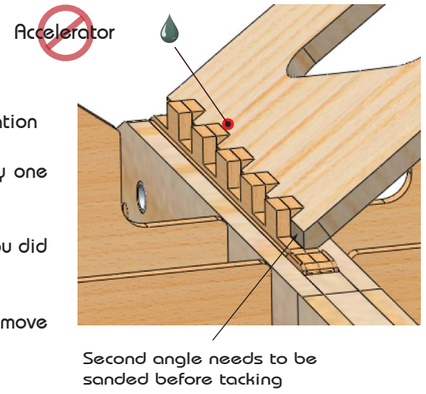
Notice by moving the Multi-Jig fore and aft, you'll find a spot where the Stab will fully fit between the uprights of the horizontal rail. Set up the Multi-Jig and fuselage on a flat surface and ensure that the structure is still straight and not twisted



Now notice when you view it from behind, the rear cross-brace carries the Stab angle. You will reference these aids while sanding and adjusting the tabs on the Stab, until you obtain a snug tab fit and alignment

Carefully fit the Stab and Blade tabs together and let the Stab rest on the Multi-Jig. Check the two angles described above. If the side rail angle is off, you'll need to favor either the foreward or aft end of the angle you sanded, effectively tilting the Stab. The tail angle should be off naturally, requiring you to sand the angle more, effectively moving the Stab down. Take your time, as this alignment is critical. There is no tail trim on a pitcheron, so tracking is as good as your work. When you get the angle set, sand the second angle from the tabs so the right stab can be fit. Approximate this angle on the right Stab before fitting

Tack the Stabs In-place:



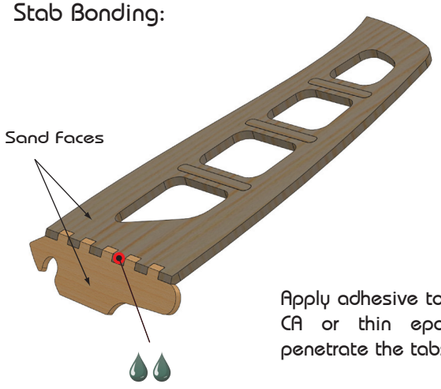
Use only thicker viscosity adhesive for this operation

Above the intersection of each Blade tab, apply one drop of adhesive where the Stab contacts it

Do this for each tab, then check to make sure you did not spread adhesive to the opposite Blade

Repeat with the right Stab. Let them cure, then remove them by using your index finger to eject the tail

Stab Bonding:



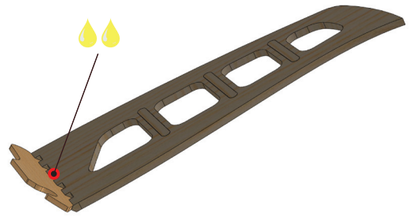
Sand each Blade face to completely flush the surface to the Stab tabs. Then sand the Blade tabs flush with the top surface of the Stab. Finish sand the entire interface

Apply adhesive to the entire interface. CA or thin epoxy works best to penetrate the tabs

Bonding and Finish:

Add a fillet of adhesive to the underside interface

Filled epoxy works best. Alternately SLOW cyano or thickened wood resin. An adequate fillet is essential to a reliable joint



Finish sand both Stabs. Radius the leading edge, and taper the trailing edge to achieve a smooth surface. Sand as far as you see fit, but leave at least a 1mm trailing edge thickness for strength

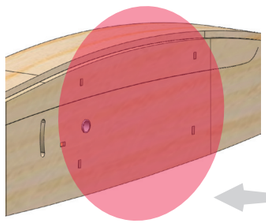
Zaerotech

Z33 V2 — Wing Construction 1

CA GAP

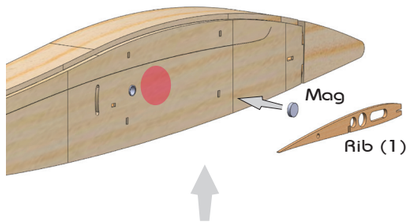
Rib (1) Preparation:

Locate;
- (2)x 6.35mm x 1.5mm Magnet
- (2)x Rib 1



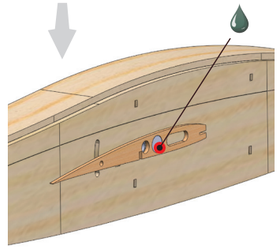
If you have not already filled the tab and magnet cavities, do so now. Use a filled epoxy that mimics the density of the balsa. Or better yet, use any of the water-based light fillers

Use a block sander with 240-320 grit sandpaper to flush the filler and aluminum tube with the flat sides of the fuselage



Place a magnet about 20mm away from the buried magnet in the fuse. Slide it over. If the orientation is correct, you'll know it. If not, flip it over and do it again. Then press Rib(1) onto the magnet far enough to flush the rib to the side of the fuse

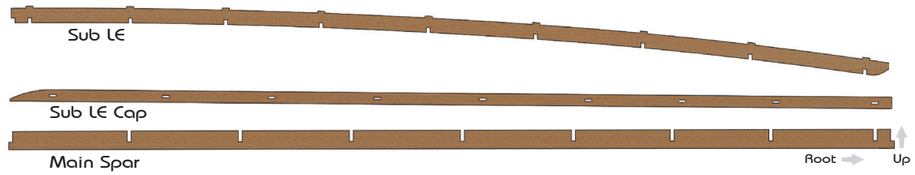
Tack the magnet to the back side of the rib while it is being held in-place. Now switch to the other side and repeat the procedure



Part Preparation:

Locate;
- (20)x 1.5mm Ply Rib
- (2)x 1.5mm Ply Main Spar
- (2)x 0.8mm Ply Sub LE
- (2)x 0.8mm Ply Sub LE Cap

Using 320 grit sandpaper, lightly sand the edges of all parts. Pay special attention to cleanly removing the break-out tabs. Sand only as far as is necessary to remove the laser residue



Layout Preparation:

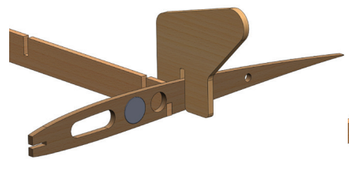
The Z33V2 wing has been designed to build on a flat surface. No jig is necessary, as long as you precisely place all of the components and take your time

The fit of the slots in the Spar and Ribs will vary due to material tolerances, but they should be a little loose. This is to accept enough adhesive to form a glue joint that effectively isolates the wood from its counterpart. The method is to tack the rib in-place using the alignment tools, hold, then follow-up with an application of gap filling adhesive. Pressure and holding strategy is very important to the final alignment of the structure

Prepare a building board and pins. Wax paper is recommended to build on, and is very effective if you are careful with your adhesive application

Make sure you set up a build for both left and right wing structures

Special Tool Use:

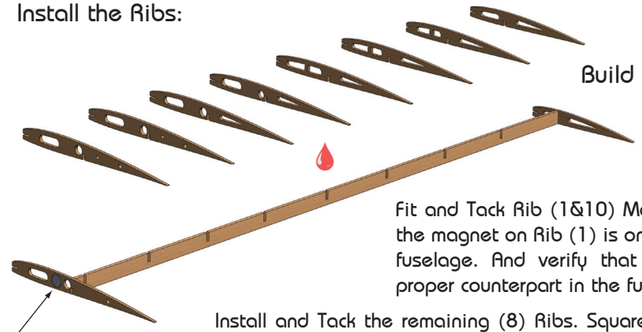


Do Not Finish Bond at this time

Use either of the 90 degree tools to aid in alignment during construction. Be careful not to glue the tool to the work

If you are use cyano adhesives, these tools are good at holding the work while you tack

Install the Ribs:



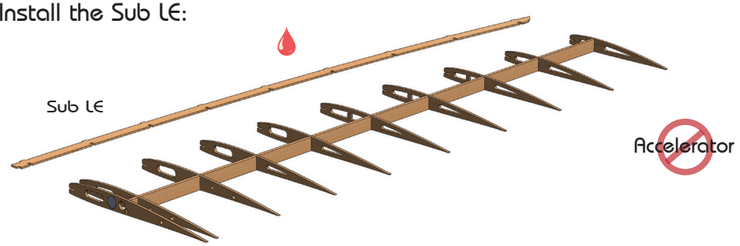
Build both Left and Right

Accelerator

Fit and Tack Rib (1&10) Make sure the flush side of the magnet on Rib (1) is on the Root side, facing the fuselage. And verify that the magnet attracts its proper counterpart in the fuse

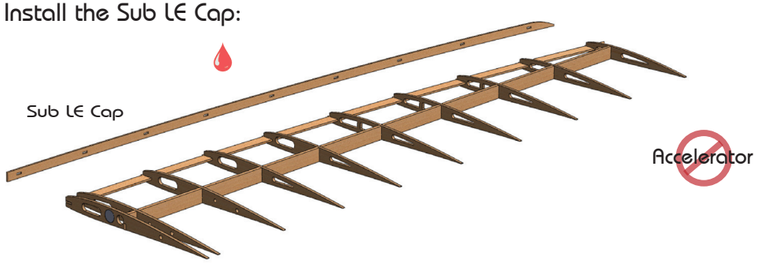
Install and Tack the remaining (8) Ribs. Square them up and make sure they are flush with the Spar on the building surface. You will block-sand the top of the structure later, so the bottom is the main focus for accuracy at this time. Use only enough adhesive to hold the ribs in-place

Install the Sub LE:



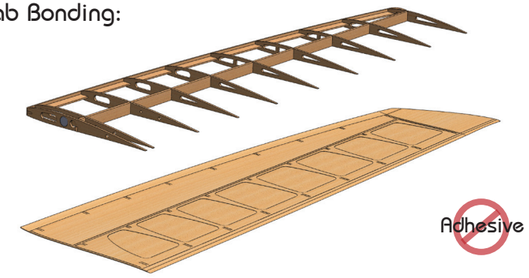
Install the Sub LE by very carefully fitting the slots one at a time. Working from the root to the tip, engage Ribs (1&2) about one-third of the way into their slots. Then move to Rib (3), and so on to the tip. Come back to the root, and engage them another third, and so on. Tack all points of contact

Install the Sub LE Cap:



Install the Sub LE Cap by very carefully fitting the slots one at a time. Working from the root to the tip, engage the tabs as you go. Hold in-place and check that all the tabs are engaged and that the Cap is flush against the Sub LE. Tack all points of contact

Stab Bonding:



Lay a Bottom Wing Skin on your building surface. Set the completed structure on top, and align with the laser markings. Double-check that all the ribs are sequential, and that they will align to all the markings

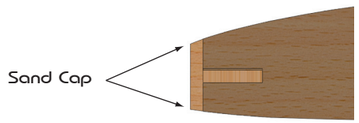
Z33 V2 Wing Construction 2

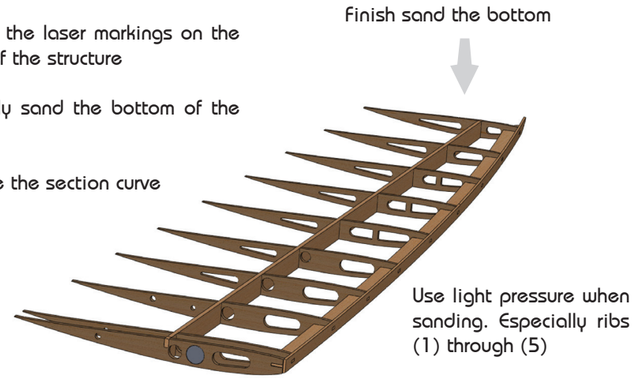
Structure Finishing:

Once you are satisfied that the structure fits the laser markings on the bottom Wing Skin, perform the final sanding of the structure

Use 320 grit sandpaper on a block, to lightly sand the bottom of the structure, flushing the Spar and Ribs

Sand the Sub-LE Cap as illustrated, to continue the section curve





Use light pressure when sanding. Especially ribs (1) through (5)

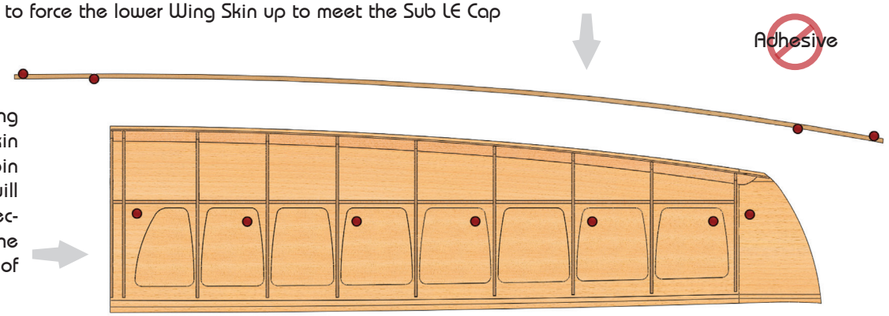
Preparation:

Cut two strips of 1/16th (1.5mm) thick ply from scrap. Ideally, you want them 0.10 (2.5mm) wide, so they bend easily

The strip will be used as a spacer, to force the lower Wing Skin up to meet the Sub LE Cap

Pin the strip as illustrated

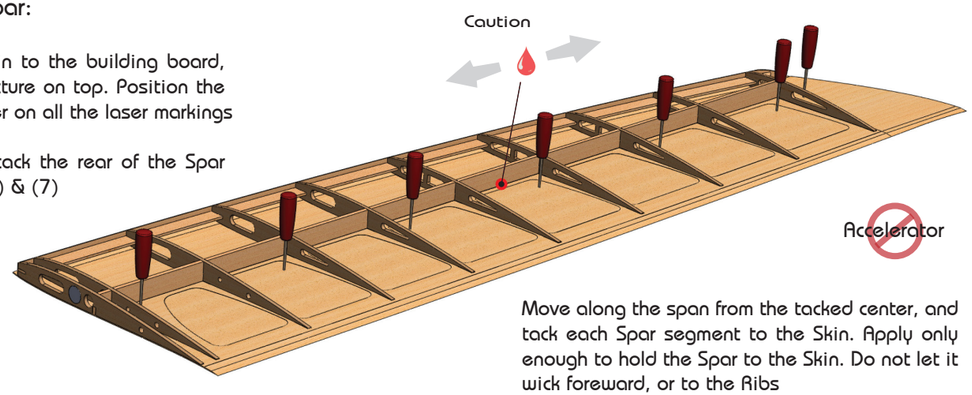
In the following steps, you will bring it all together, and pin the Wing Skin to the building board. Notice the pin locations in the illustration. Most will pin into the cutouts near the connection tab. Two pins are close to the Spar, and pin into the main part of the Skin



Tacking the Spar:

Pin the Wing Skin to the building board, and set the structure on top. Position the structure to center on all the laser markings

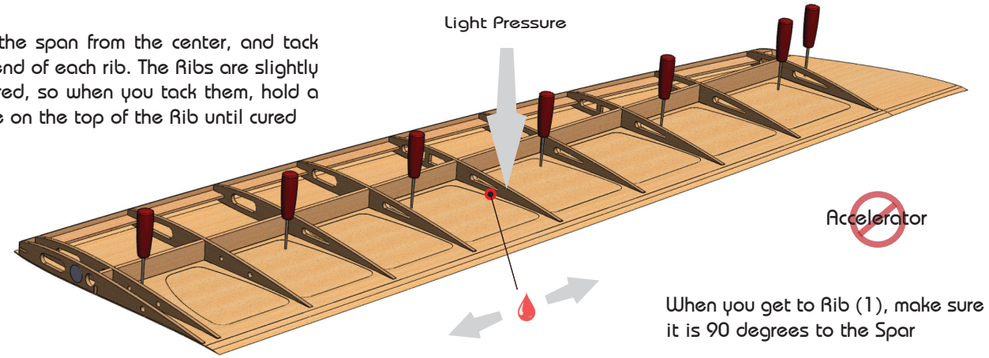
Once satisfied, tack the rear of the Spar between Ribs (6) & (7)



Move along the span from the tacked center, and tack each Spar segment to the Skin. Apply only enough to hold the Spar to the Skin. Do not let it wick foreward, or to the Ribs

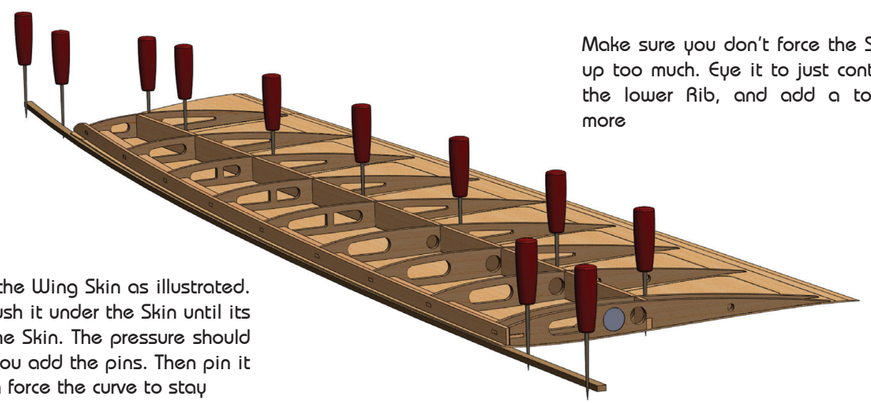
Tacking the Ribs:

Move along the span from the center, and tack only the aft end of each rib. The Ribs are slightly under-cambered, so when you tack them, hold a little pressure on the top of the Rib until cured



When you get to Rib (1), make sure it is 90 degrees to the Spar

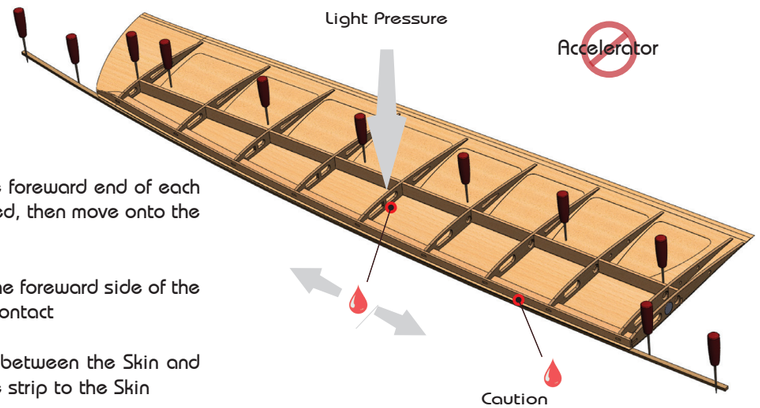
Fit the Spacer Strip:



Make sure you don't force the Skin up too much. Eye it to just contact the lower Rib, and add a touch more

Position the Strip under the Wing Skin as illustrated. You should be able to push it under the Skin until its flush with the edge of the Skin. The pressure should hold it in position until you add the pins. Then pin it as illustrated, so you can force the curve to stay

Tacking the foreward Ribs:



Again, work from the center, and tack the foreward end of each Rib. Apply light pressure to each until cured, then move onto the next

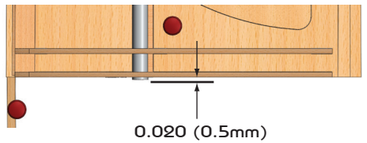
Once you have tacked all the Ribs, tack the foreward side of the Spar to the Skin, and check all points of contact

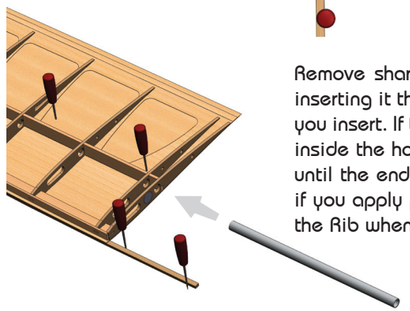
Apply adhesive to the foreward junction between the Skin and Sub LE Cap, but be careful not to glue the strip to the Skin

Z33 V2 Wing Construction 3

Pivot Tube Installation:

Locate;
- (1)x 4.75mm x 100mm Aluminum



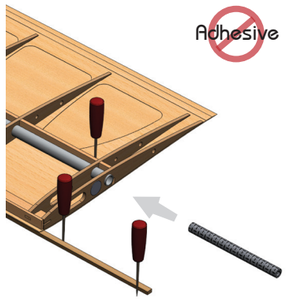


Remove sharp edges from the Tube, and try inserting it through the first two Ribs. Twist as you insert. If the fit is too tight, run a round file inside the holes in the Ribs. Carefully insert it until the end protrudes as illustrated. It helps if you apply pressure on the opposite side of the Rib when you push it through

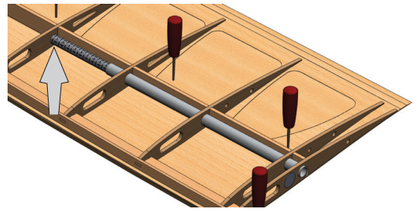
Adhesive

Sub Spar Tube Installation:

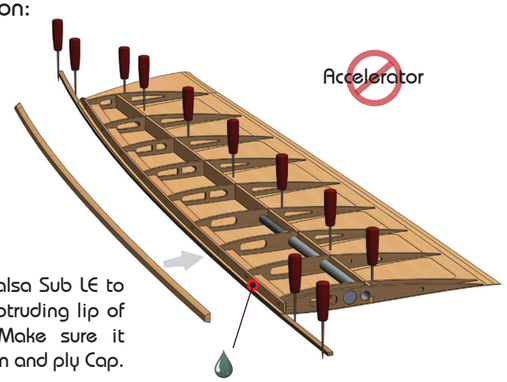
Locate;
- (1)x 4.0mm x 44mm Carbon



Insert the Sub Spar Tube into the Pivot Tube. Locate the carbon Wing Rod, and use it to push the Sub Spar through the tube until it exits at the far end. Align it to Rib (5), and push it through just enough to allow a fillet of adhesive to be applied. About 2mm

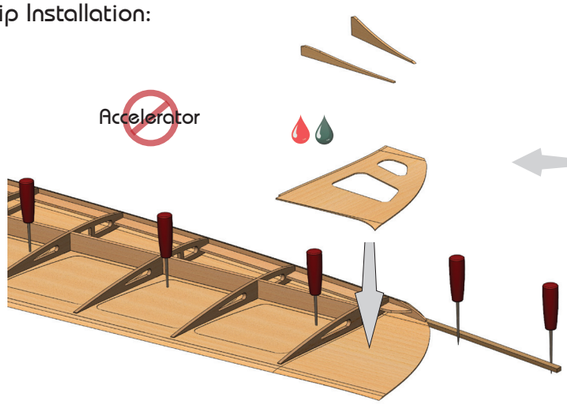


Balsa Sub LE Installation:



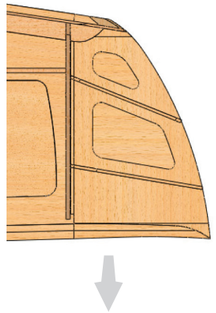
Sand the bottom of the balsa Sub LE to match the angle of the protruding lip of the bottom Wing Skin. Make sure it flushes well to both the Skin and ply Cap. Bond it in-place

Tip Installation:



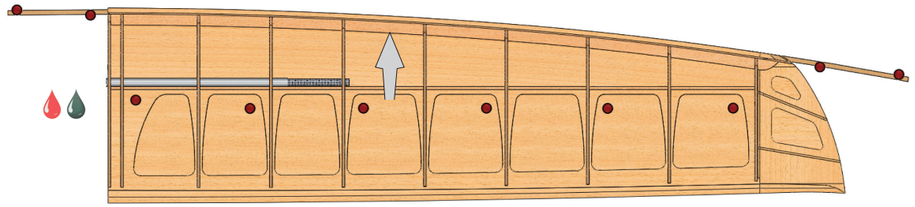
Test fit the Tip Doubler onto the bottom Wing Skin as illustrated. It should nest against Rib (10) and the ply Cap. Once satisfied with the fit, apply adhesive to all points of contact, and with light pressure, allow the doubler to conform to the Skins curve

Fit the Tip Ribs as illustrated



Note the laser markings on the Tip Doubler. Install the Ribs as illustrated, with the markings on the side indicated

Finish Bonding & Cutout removal:

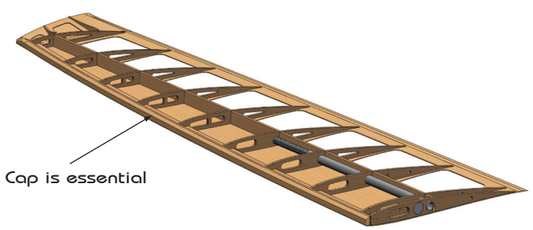


Check the entire structure over, and make sure it is completely flat on the work surface. Apply adhesive to all points of contact on the Pivot Tube and Sub Spar. Form a fillet where the Pivot Tube contacts the ply Spar. Now follow up with adhesive to all points of contact on the entire structure

Carefully remove the Cutouts with a shape hobby knife, and remove the structure. Hold the wing so that the LE is resting on the building board, and apply adhesive to the inside of the Skin to Cap connection indicated by the arrow

Top Wing Skin preparation:

Adhesive



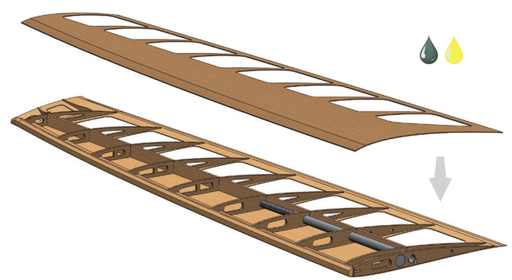
Finish sanding the structure requires patience and a light touch. Using a block large enough to span three Ribs, and approximately 20mm wide works well with 320 grit sandpaper

Lightly sand the entire structure to flush the Ribs to the Spar. Be careful not to modify the section

Special attention to the balsa LE Cap is required to match the curve of the Ribs

Installing the Top Wing Skin:

Attaching the Top Wing Skin requires preparation and a few test fittings. Specifically in clamping logic and alignment. My preferred method of clamping is to use weights. Typically lead bars or plastic tubing filled with sand. Five 25-50mm wide polybags the length of the wing work well. The leading edge is the tricky part. I apply a dozen lengths of tape on the bottom Skin, and lead them out past the LE far enough to wrap over the top



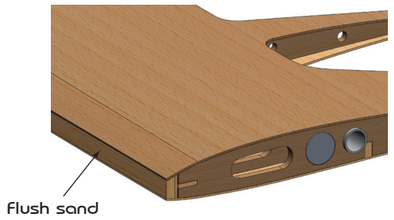
Slow cure epoxy or Slow cyano works best, as you will need some working time. Rolling the adhesive over the structure works best. Rolling on two coats a few minutes apart helps to build up adhesive

Begin by removing the cutouts. Align the Skin by approximating the same distance from the cutout to the Spar as on the bottom. Then adjust the trailing edge so that it is equal distance from root to tip. It should be inboard of the bottom skin. Now wrap the Skin down to meet the LE. It should cover about half of the balsa LE Cap. Check the bottom to see if they are about equal. Adjust until correct, and then mark a line on the bottom Skin, using the top Skins edge as a guide. Remove the Skin, apply adhesive to the structure, align the Skin again, and clamp

Z33 V2 — Wing Construction 4

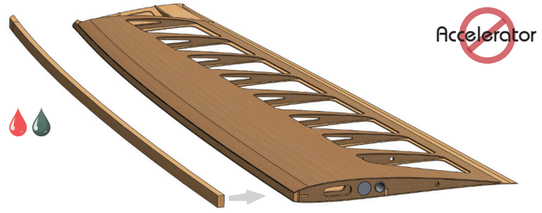
CA GAP Silicone

LE Cap Preparation:



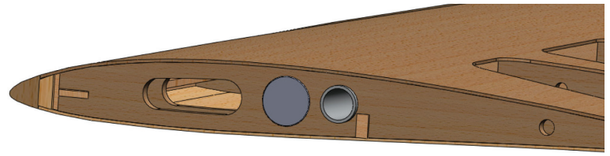
Sand the balsa Cap flush to the Wing Skins, and make sure you produce a smooth curve from root to tip in preparation for the basswood LE. Remove only as much material as required to get a good surface

LE Installation:



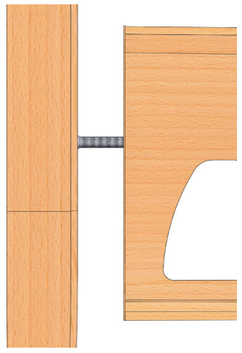
Fit the basswood LE to the balsa Cap. Make sure the LE caps both Skins, and that the alignment is good all the way along the span. Its a close fit, so inspect all points of contact. Apply adhesive and tape the LE to the Cap

LE Sanding:

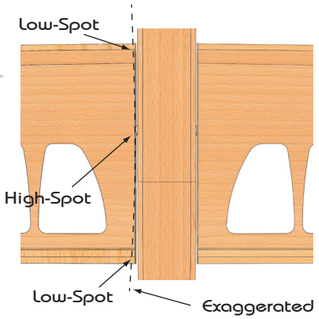


The Z33V2 is a fairly fast ship due to its highly efficient airfoil section. Depending on the version you build, and its intended environment, the LE can be radiused from 1.5 - 2.25mm. Basically, the smaller the radius, the faster the section. The down-side to a sharp LE is in stall characteristics, and on a wingeron, this can translate into "Watch your turns". Wingerons behave differently in the roll axis due to the rotation of the section. If you are going with a sharper LE, try starting with 1.0mm at the root, and progressing to 2.0mm at the tip. For best all-around performance, try 1.5mm at the root, and 2.0mm at the tip

Checking the Wing Root:

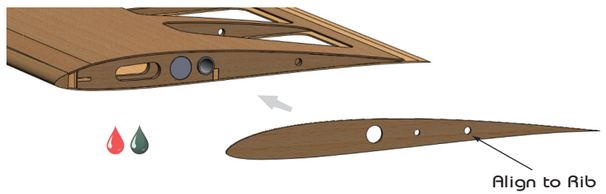


Regardless of the fit, you'll need to sand a very slight curve into the root. The object is to make sure the LE and the TE do not contact the Fuselage. The high-spot of the curve will then be at the pivot point



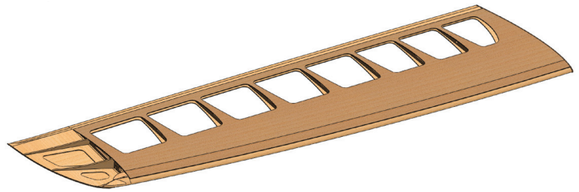
Insert the Wing Rod into the fuselage and fit the wings. Bring each wing up to the fuselage and check the gap between the foreward and aft ends. If everything is aligned properly the fit should be flush. If not, you'll need to sand the Root more than just flushing the Skins

Installing the Root Cap:



Once the Root is sanded and curved as instructed, bond the ply Root Cap in-place. Use a small screwdriver or rod to make sure you align the Drive Rod hole, and remove as soon as possible

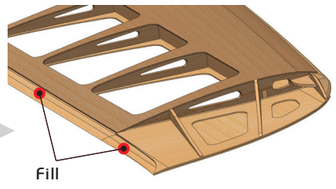
Inspect & Finish Sand:



Inspect the entire structure to ensure there are no loose Skin-to-Rib bonds, and that all joints have adequate adhesive to form a small fillet. Use the same sanding block to lightly knock down the highspots. Be careful not to cut through more than the first ply layer

Trailing Edge Finishing:

The second place where attention to detail can tailor the performance to your environment, is the Trailing Edge. The TE on the Z33V2 can be sanded on the bottom to speed up the section for fast Slope, or sanded on the top to slow the section down a bit for better Thermal performance. The difference is slight, but noticeable. In any case, the top needs to be filled, up to the Top Skin as illustrated. Use light filler balsa filler



Larger LE radius

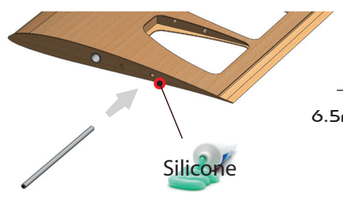
Smaller LE radius

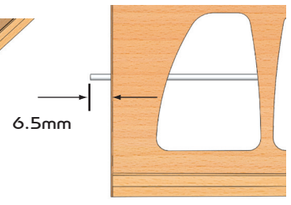
Sand the top to continue the upper curve. This will enhance a slight under-camber in the section

Sand the bottom to continue the lower curve. This will form a slight reflex and reduce the under-camber

Installing the Drive Rod:

I recommend that you cover the entire wing at this point (see covering tips first). However, if you don't mind working around the Drive Rod, Install it now as illustrated. Apply silicone adhesive to just Ribs (1&2), and a small amount on the rod. Install it at the distance indicated, and clean any excess adhesive. Rib (3) does not need bonding



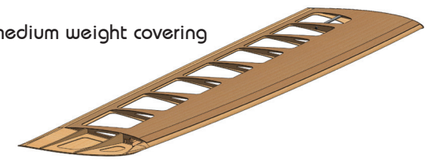


Covering Tips:

Covering a plywood skinned wing can be a challenge in contrast to Balsa. Ply does not breath, so carefully pre-shrinking the covering before pressure bonding is essential to keep bubbles from forming. Use an iron only, with a sock. Seal all edges well before shrinking

If you cover the Pivot hole, puncture it, as this is the breather for the entire structure

Use light or medium weight covering

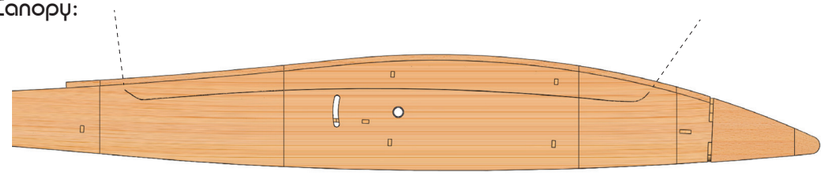


Zaerotech

Z33 V2 — Final Construction 1

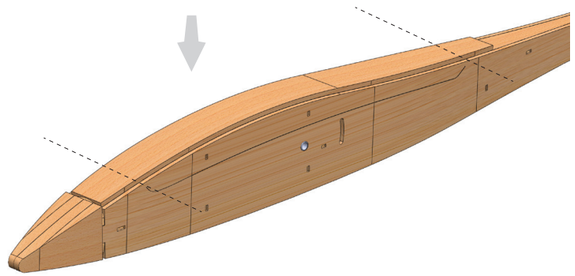
CA GAP

Canopy:



In the illustration above, you can see the cut-line for the canopy in the side balsa Cap. The dashed lines represent the angle you will need to cut. Later, you will cut deep enough to separate the two parts. For now, you just want to cut through the top balsa Cap, and leave the gap. Notice the foreward dashed line continues the natural line of the cutout, while the aft dashed line is at an angle to the cutout. Its best to mark the intended cut with a fine marker, then make the cut

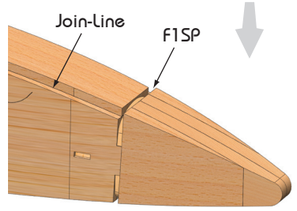
Using a very fine tooth razor-saw, cut through only the top balsa Cap, and stop at the gap



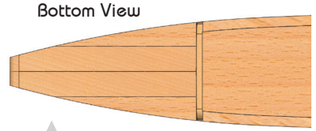
Fuselage Finish:

Use The F1 formers as a guide for how much material you can remove

All along the fuselage, the join-line will serve as a guide to how much to remove. Sand up to the line, then go no further than 1mm deeper



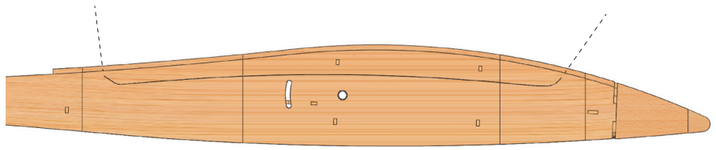
Bottom View



Cut the sides of the Nose-blocks to approximate the curve illustrated above. Be careful not to go too sharp on the nose, as you might cut into the nose ballast cavity of the inner blocks

Rough sand the entire fuselage to shape down to 120 grit

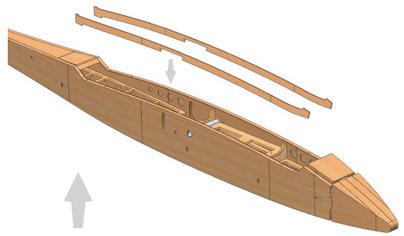
Canopy Separation:



Once you are satisfied with the rough finish of the fuselage, use the razor saw to finish the cut. Then use a #11 blade to carefully cut the tabs connecting the canopy to the fuselage. The side balsa Cap connecting tabs are obvious, but the inner ply Doubler tabs are not, so feel your way along the reveal line, and slice through with a light touch. Do not try to force the separation, just keep cutting along, and twist the blade slightly to see if the two parts pop loose. Be patient, the canopy will just pop off when its ready

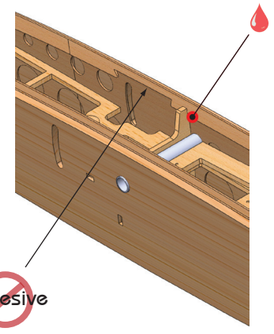
Side Rail Installation:

Locate:
2x 0.5mm Ply Rail

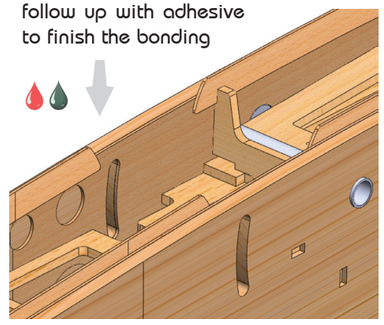


Carefully fit the ply Rails into the fuselage. Flex them as necessary to get the front and back positioned properly. Notice the rails will fit into gaps on formers F2 & F3

Hold the rail against the fuselage and bond in-place. Do not bond the center section

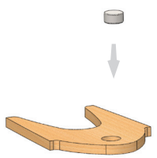


Cut the center section out as illustrated. Then follow up with adhesive to finish the bonding

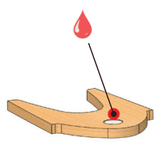


Mag Latch Installation:

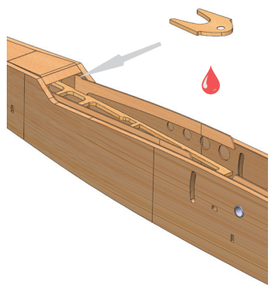
Locate:
1x 3.1mm Magnet



Lay the Latch Plate on a flat surface and press in the Magnet. Bond in-place

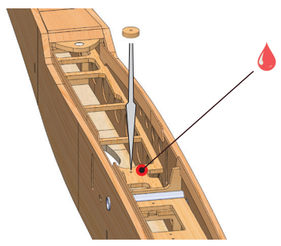


Slip the Latch Plate into the gap between the ply rail and upper balsa cap. Make sure it is flush with the cap, and bond in-place



Crank Rack Spacer Installation:

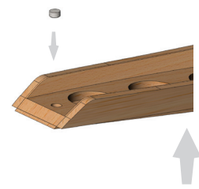
Locate:
1x Ply Spacer (RS)



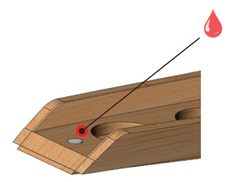
Use a toothpick stuck in the hole of the Spacer to center it with the hole on the horz. spine. Bond in-place

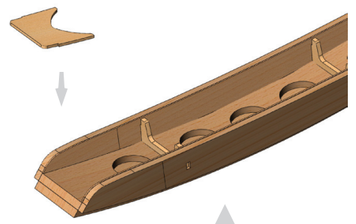
Canopy Tab & Mag Installation:

Locate:
1x 3.1mm Magnet
1x .8mm Ply Latch Tab

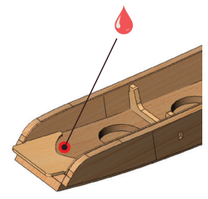


Press the Magnet into the hole in the balsa cap. Make sure its flush, then bond in-place





Position the Tab. Make sure its flush, then bond in-place



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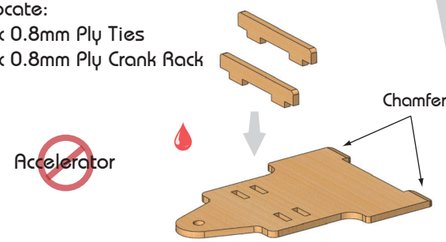
Z33 V2 Final Construction 2

The drive system for the Z33V2 has been designed with several weak links to help save the structure in the event of a crash. The Rack assembly is made from flexible 0.8mm ply, and as such, is delicate when not installed. Be careful not to push on the rack, or bend it. Its function is to absorb shock loadings on the wings. The cranks are also designed to absorb shock loadings. The final link, is the plastic link and wire bond. Follow the instructions and make a good bond here, as in-flight failure is not good. Bonded well, these links will separate under high loads, and save either your servo gears, or the wind drive rod

Crank Rack Assembly:

Locate:
2x 0.8mm Ply Ties
1x 0.8mm Ply Crank Rack

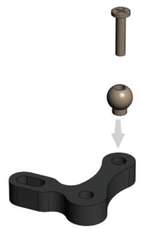


With the Crank Rack Plate on a flat surface, install the ply Ties and bond in-place. Make sure they are 90 degrees to the plate. Sand a small chamfer on the top side of the tabs as illustrated

Crank Assembly:

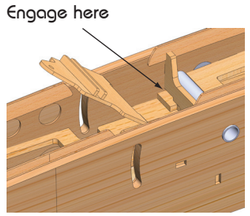
Locate:
2x Machine Screw
2x Ball
2x Delrin Crank (Left & Right)

Note that the Cranks have a larger hole on one side to allow the Ball to seat. Screw the Ball to the Crank carefully and slowly



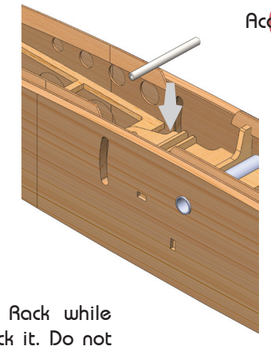
Crank Rack Installation:

Locate:
1x Aluminum Tube

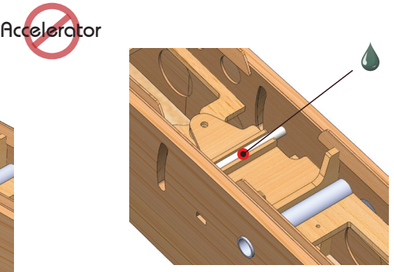


Carefully angle the Rack into the fuselage, and engage the tabs. It should slide right in with the screw holes aligned. Don't force it. Sand the tabs and make sure there is no adhesive in the slots

Drop the Pivot Tube between the Ties. Do not push down to seat it. Remove the Rack and lightly sand the Ties until the tube drops in and seats flush. Install again, and drop the tube in. Lightly test that it is flush



Pushing on the Rack while installed can crack it. Do not press down for any reason



Once centered and flush, apply a single drop of adhesive as indicated. Let cure, remove the Rack, and finish bond

Test the Crank Fit:

Install the Cranks and make sure they rotate freely. If needed, chase the bore on the Crank with a small fine file to size it to the Tube. Do not sand the Tube

Control Wires:

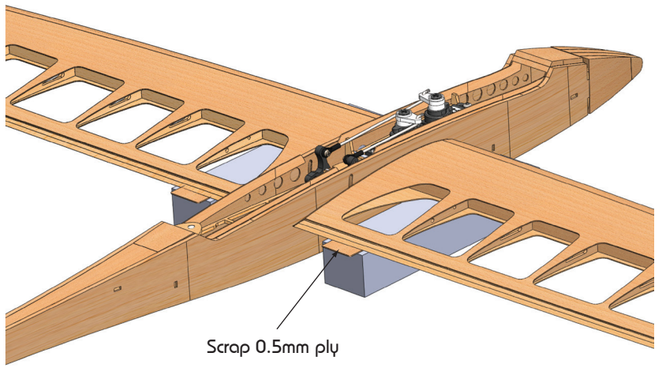
Locate:
2x Plastic Ball Link
2x Control Wire (Short & Long)

Note that there are two lengths of Control Wires. Depending on your servo type, you will need to cut them to length. Once you get the correct length, rough up the end of the wire with a file to help adhesive to bond. Carefully follow the next steps to determine the distance

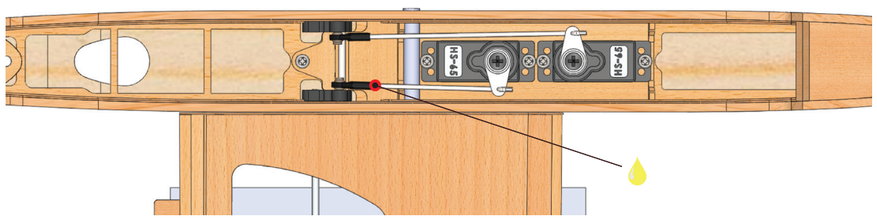
Control Wire Length:

Set the fuselage into the Multi-Jig with the wings attached. Slide blocks under the wings tall enough to touch the bottom of the wing at its lowest point. Alternatively, you can block up the wings as illustrated at any height, and measure the distance from the surface to the bottom of the fuselage. Then use this distance to block up the Multi-Jig. In either case, you need to establish the proper angle of the fuselage, and that is achieved when the fuselage is sitting on a flat surface with the tail in the Multi-Jig

Use two pieces of 0.5mm ply to space up the trailing edge as illustrated. With the wing drive rods engaged in the cranks, install the plastic ball links on the cranks. Note that the links have a larger opening on one side. Press the larger side on to the ball and install the wires into the servo arms



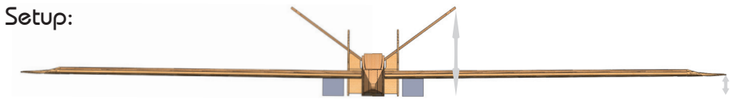
Bond the Links:



Center your servos and sub-trims before sizing the wires. Install the servo arms on the wires, install the arms, and lay the wire ends on top of the plastic links. Measure 5mm aft of the plastic link end. This is the distance the wire will go into the link, so measure carefully. Better long than short. Mark this point, remove the wire and cut the end

Now slip the wire into the link and reattach it to the servo. The arm should be centered as illustrated. Adjust the length until its perfect. Remove the wire, rough up the end, and use Slow cyano or epoxy to bond the wire and link. Install the assemblies and let cure in-place.

Setup:

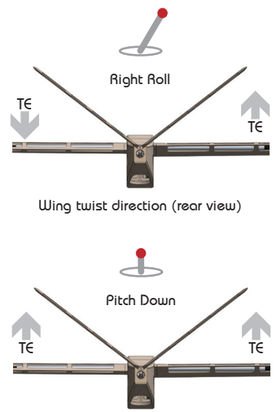


Once the wires are cured, install the tail, and check both wing and tail tip distances as illustrated

Set mixing in the Tx for Elevon, and leave travel adjustment to 100% for now. Set aileron differential to 50%

Check wing direction as indicated

Set travel to maximum, and watch for any binding or collisions when both full foreward and full left or right aileron is applied. Adjust to get the maximum travel in pitch



Zaerotech