55% Pitts Challenger 2

Elevator and Rudder Assembly

Thank you for purchasing the Skip Model Designs 55% Pitts Challenger 2.
If you have any issues, questions, concerns or problems during assembly, please contact us : Info@skipmodeldesigns.co.uk 0r 0844 818 0290 10am-5pm GMT Monday thru Friday.

SAFETY in Assembly

During assembly of this aircraft, you will be asked to use sharp knives and hobby adhesives. Please follow all safety procedures recommended by the manufacturers of the products you use,and always follow these important guidelines:

• ALWAYS protect your eyes when working with adhesives, knives, or tools, especially power tools. Safety glasses are the best way to protect your eyes.

• ALWAYS protect your body, especially your hands and fingers when using adhesives, knives, or tools, especially power tools. Do not cut toward exposed skin with hobby knives. Do not place hobby knives on tables or benches where they can roll off or be knocked off.

• ALWAYS have a first-aid kit handy when working with adhesives, knives, or tools, especially power tools. ALWAYS keep hobby equipment and supplies out of the reach of children.

• SAFETY in Flying! This is NOT a toy! It is a very high-performance RC airplane capable of high speeds and extreme manoeuvres. It should only be operated by a competent pilot in a safe area with proper supervision.

• ONLY fly your aircraft in a safe, open area, away from spectators and vehicles and where it is legal to fly. NEVER fly over an unsafe area, such as a road or street.

• NEVER fly near overhead power or utility lines. If your airplane ever becomes stuck in a line or a tree DO NOT attempt to retrieve it yourself. Contact the authorities for assistance in retrieving your aircraft. Power lines are DANGEROUS and falls from ladders and trees CAN KILL!

• Never fly too close to yourself or spectators.

• Spinning propellers are DANGEROUS! Never run your motor inside a house or building with the propeller attached Remove the prop for safety. • • • Always fly within your control.

• Always follow manufacturers instructions for your radio system.

•Always preform a pre-flight check of your aircraft to be certain of the aircraft's airworthiness.

•Always obtain proper insurance before flying. Always fly model aircraft in accordance with the Academy of Model Aeronautics (AMA) Safety Code and BMFA/ LMA. Please visit These websites easily found in major search engines.

Limits of Responsibility
Skip Model Designs provides high-quality aircraft and components to it's customers and end users. These aircraft and components are assembled by the end user to produce a flying model. It is beyond skip model design's to monitor the end user's completed aircraft. Therefore, Skip Model Designs in no way accepts or assumes responsibility or liability for damages resulting from the end user assembled product. The end user assumes all responsibility and liability in use of Skip Model Designs and components

Required Items
• Masking or painters tape
• Hobby knife with #11 blades.
• Fresh 30 minute & 15 Minute epoxy.
• Plenty of both Medium and Thin CA.. Activator can also be used.
• Electric drill with an assortment of small drill bits.
• Small flat head and Phillips head screw drivers.
• Standard and needle nose pliers.
• Hammer, Hacksaw and other basic Hobbiest Tools
• Metric ball driver or allen key set.
• Sanding block and sandpaper. Hobby Plane
• 16 x 25kg (min) torque Digital Servos.
• 1 x standard size servo for the throttle.
• 7" Spinner
• 210cc to 250cc gas engine and recommended prop.(Ideally a ZDZ OR ZDz 250 RVJ

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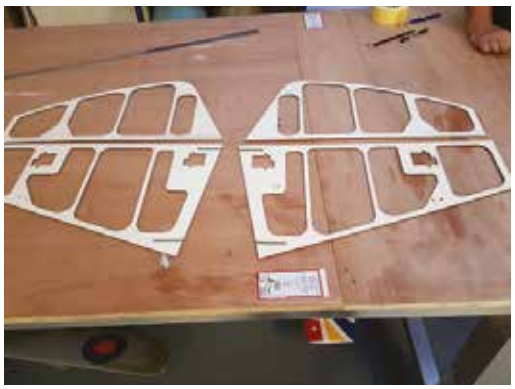
Make sure that you range check your R/C system thoroughly before the first flight. It is absolutely necessary to range check your complete R/C installation first WITHOUT the engine running. Leave the transmitter antenna retracted, and check the distance you can walk before 'fail-safe' occurs. Then start up the engine, run it at about half throttle and repeat this range check with the engine running.

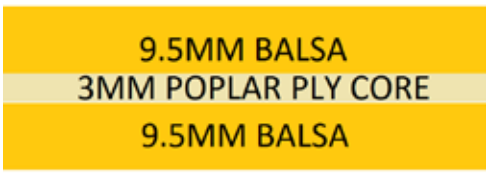
Make sure that there is no range reduction before 'fail-safe' occurs. Only then make the 1st flight. If you feel that the range with engine running is less then with the engine off, please contact the radio supplier and the engine manufacturer and DON'T FLY at that time.

Check for vibrations through the whole throttle range. The engine should run smoothly with no unusual vibration. If you think that there are any excessive vibrations at any engine rpm's, DON'T FLY at this time and check your engine, spinner and propeller for proper balancing. Due to the models construction (Been Light) it is very important to have everything running smoothly.

DANGER ZONES

Secure the plane before starting the engine.





It is worth at this point trial fitting a servo of the type you are going to fit. Making mods to fit at this point will save you time later. ALSO AT THIS POINT YOU NEED TO HAND THE REAR STABS ie RH and LH. Please give consideration to cable runs of servos.

With Any model build, It is important to test fit components together before gluing (Where applicable). 5 Minutes test Fitting can save hours of Unpicking.

To build **ANY COMPONENT** of this model, Please make sure you have a large enough area to work safely, and that your work bench for the next few months is clean, tidy and most importantly **FLAT**

First Part of the build is the elevator and Stab(The most simple parts to build on the model)

Inside the kit you will find 4 Parts which are made from 3mm Poplar Ply (They look like the attached picture In Shape)

These are the cores of the elevators and stab.

To Begin the build, Put all the parts flat on a Board and find the 6.5mm x 9.5mm Balsa Strips and the 6.5 x 9.5mm Spruce strips

When building the elevator and stab. You have to do **1 side** of the elevator and Stab at a time (**DO NOT,** Keep turning the parts over as this could warp the elevator and stab)

The spruce strips are for the **REAR** of the elevator Stabs & rudder fin..

We recommend you glue these with 30 minute Epoxy. 1 Strip of 6.5mm x 9.5mm Spruce will do both sides of 1 Stab. Glue the 6.5mm x 9.5mm Spruce Strip upwards, so that the 9.5mm Side is Vertical (90 Degrees) to the 3mm Core.

To be sure, Think a Standard servo is normally 21mm Thick... So 9.5mm (Spuce) + 3mm(Core) + 9.5mm (Spruce) = 22mm (Finished Part Size)

After you have glued the spruce to the rear of the stab, It is the matter of cutting and Sticking the Balsa Strips to the Stab and elevator..... We used Super-glue for this. Again the 9.5mm Side of the Balsa is Vertical (90 Degrees) to the 3mm Core.

Please Glue all Balsa wood to the elevator and stab Like the Image.

With the Few off cuts of spruce you will have from the rear of the Elevator Stabs. Use small Blocks to make the Servo Supports (Please see image)... These are to be glued with EPOXY!. Do not glue with super glue or white glues. This area is going to take alot of load from the servos!

You will need to put these blocks both sides of the elevator Stab and to both servo locations.. (Please note Image shows servos in seperate locations, 2018 onwards models will have 2 servos inline.

Once you have done one side of the elevator and stab. Flip

The rear of the elevator is made up by cutting 23mm Strips of 2.4MM balsa wood. You will need 5 Strips per elevator Trailing Edge and Stab Leading EDGE.

Soak The Balsa with water and apply to TE of elevator using aliphatic resin or White Glue. Set to one side and allow to dry. When dry round to shape, at the same time round LE of stab.

The Front of the Elevator is to have a 45% chamfer to each side. This will give you 45 Degrees Of Movement, Please Adjust to your Flying Style, But we do not recommend more than 50 Degrees or less than 30 Degrees. as this is a very sensative surface.

The Hinges for the Elevators are Made by Robart. You will need 5 Hinges per elevator and Stab (These are included in the kit).

Simply mark out where the hinges are going to be fitted and drill the Inner core with a pilot drill first. Test Fit the Hinges in to the stab and elevator.. Do not GLUE at this point (Final Fitting of the Hinges will be done after covering. We recommend using a few pieces of scrap balsa to reinforce around hinge area to strengthen 3mm core

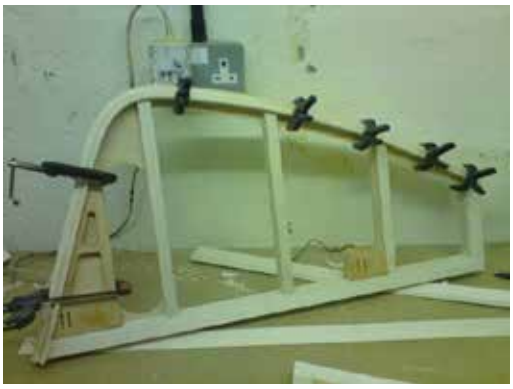
Next we will Build the Rudder And Fin.

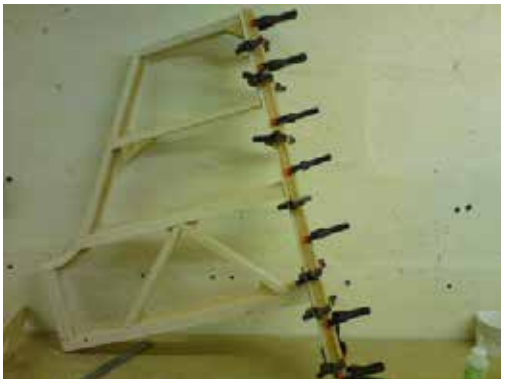
Construction is similar to elevator using the same 6.5mm x 9.5mm Spruce and 6.5mm x 9.5mm Balsa. Please Ensure the Finished thickness is 22mm.

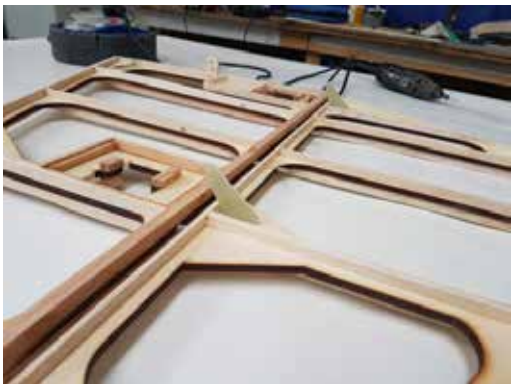
The Fin Rear is to have the Spruce Glued to it with epoxy. Do NOT CUT EXCESS OFF. You will need approx 300mm to extend past Fin at bottom which will fit in to fuselage later.

Please note : At base of Fin there are 2 holes of 8 mm diameter, these correspond to the holes in horizontal stab (Please see attached Image on 65% Version) , they are set to 1.5 degrees of incidence. It is important you drill these holes as you cover them with balsa strip otherwise you will loose location of rear stab

Again. the TE, TOP LE OF stab and rudder is to be made up of 5 Strips of 23mm, 2.4mm balsa which is to be wet and Glued.. Once dry, these are to be rounded.





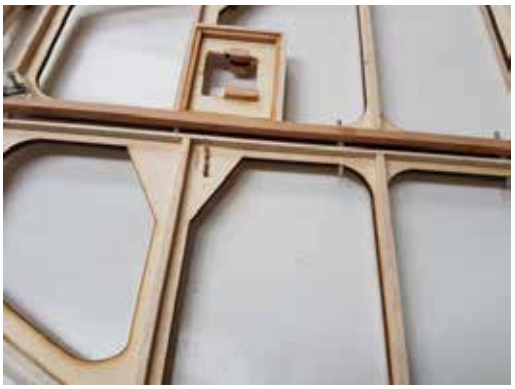


Once you have build both these parts. you will now need to put the supporting blocks and Control horn blocks in place.

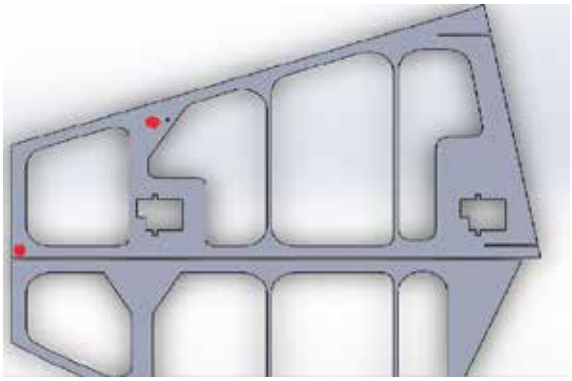
Lets Start with the elevator control horns

Place a servo in the slots in the elevator fin to mark out the correct position on the elevator for the horns. These are only single horns on the elevator.

When you have the correct position marked, Cut a slot in the 3mm core on the elevator big enough to get the horn through



Temporarily Align the control horn in place so that the pivot point is over the hinge line and Pack either side of the horn with 6.5mm Balsa to secure the horn in place (top tip.. Do not glue the horn in place at this point) if you do. it will be difficult to cover the model later..
Use Epoxy Glue to stick the Balsa in place.
Once Dried, you need to add a 3mm Piece of Plywood over the top to make the correct 9.5mm High. (2018 Models onwards have this part precut from balsa and ply)



Once dried, remove the horn. You need to do this 4 times in total (2 times per elevator, both sides)

The Elevator Stab support blocks have to be made up of 6mm Ply again (Location Marked on image in red)

These are done like the following pictures (Both Sides)...
Please use epoxy Glue to put these in place.. Once Dried. you need to use a 3mm drill to drill through the blocks so you can secure the anchor points..
The Location of the rear Mount is very close to the spruce. you will need to add a small triangulated piece of Plywood at this location.

The Rudder Control Horn Mount is located like the photos.

Once you have glued the 2x 6mm ply blocks in place with epoxy.. Simply Drill a hole to suit the horns approx 1 inch up from bottom of elevator. Making sure that the pivot point is over the hinge point.

There are 2 horns on the rudder. they are to be spaced approx 6mm Apart

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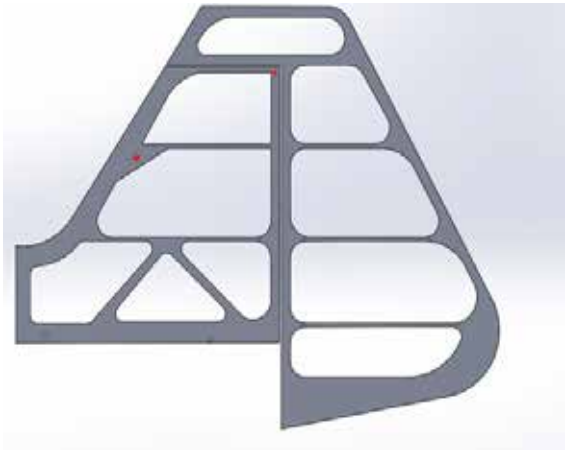
You also need to add the same points to the Rudder fin using the same methord.

The positioning is detailed in the photo (Shown in red).. Again use Epoxy to glue in place.

The Top Mounting point is through the spruce at the rear of the Fin. Be Careful not to splinter the Spruce! A sharp drill is needed



You can now add servo hatches in the elevator to suit your requirements/ Building Style.

Our Preferred Method is the following
Use a 1mm Plywood Core. Covered it with 3/32 balsa then sanded to shape of elevator stab... we then cut the Slot for the servo control horn to come through.

Once we have done this, we made a sub frame around the servo with a few off cuts of balsa and spruce for the hatch to sit in (See photos).

The Servos hatches are not detailed as part of the kit because there are many different ways of doing them.

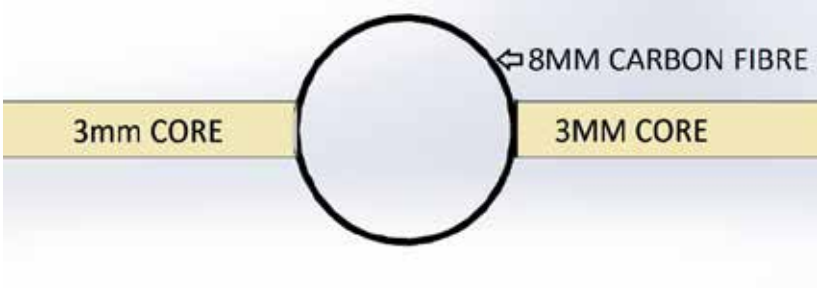
You now need to Glue the elevator stab carbon phenolic tube in place. Make sure the 8mm Carbon Tube will fit in the 2 holes that are in the stabs. This is for the tails to be removable. (the 6mm Carbon slides inside the 8mm)

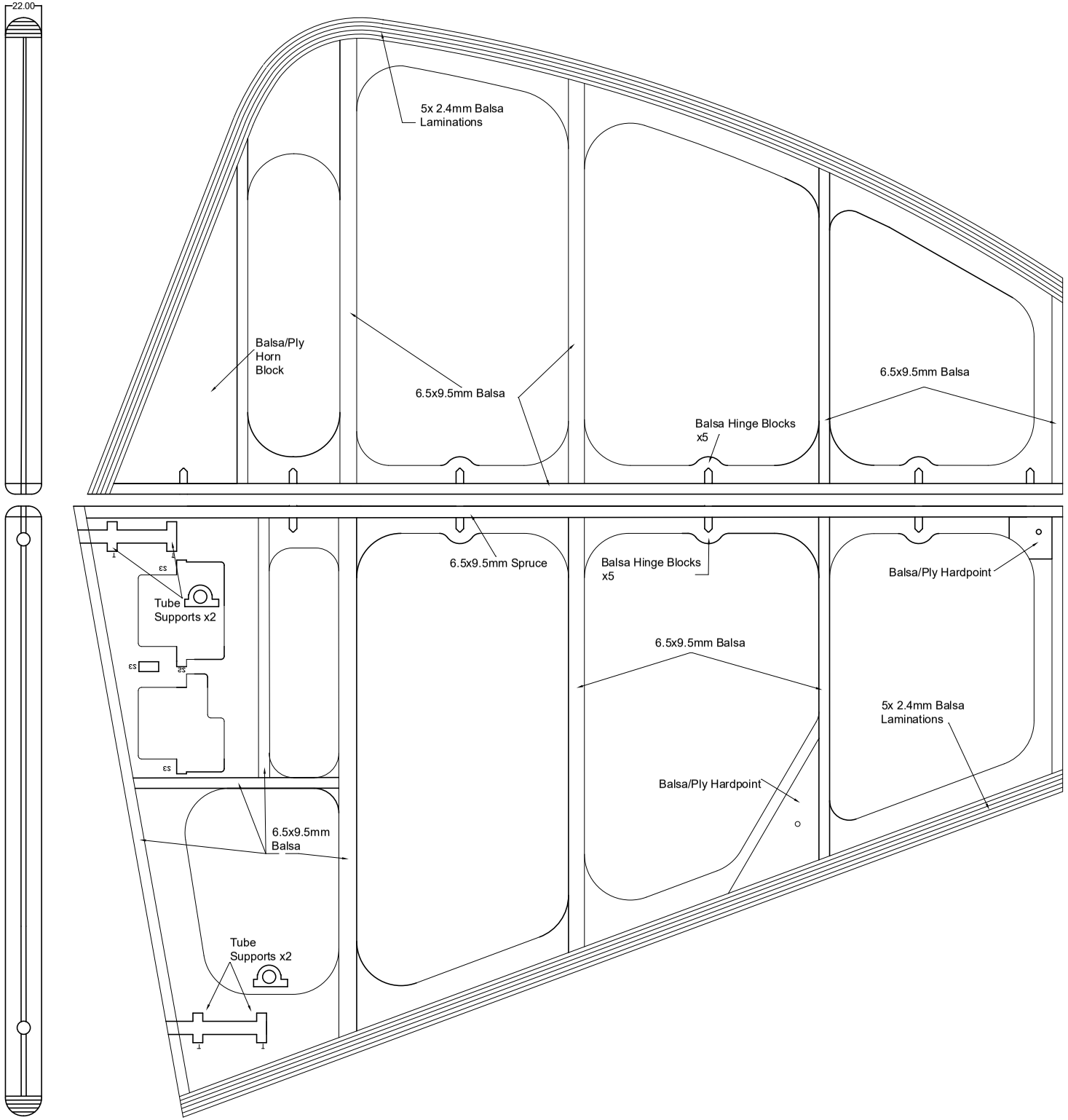
You will need to jig up both elevators along a bench edge making sure that are aligned perfectly with ONLY THE 8MM Carbon located in slots, once you have these aligned, you can glue in place with epoxy and add epoxy fillets (Aeropoxy Can also be used) The 8mm Carbon should sit centrally in the 3mm Core. (See image below for clarification)

Once all have been glued, You can cut the carbon at the elevator Stab edges. Keep the centre bit as this is needed for the fuselage.

Once you are happy with this... Put the elevators and rudder to one side.. Sit back... and admire the first completed parts of your 55% Challenger 2...

Pretty Cool Right?

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5x 2.4mm Balsa
Laminations
Balsa/Ply
Horn
Block
6.5x9.5mm Balsa
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Balsa Hinge Blocks
x5
6.5x9.5mm Spruce
Balsa Hinge Blocks
x5
Balsa/Ply Hardpoint
Tube
Supports x2
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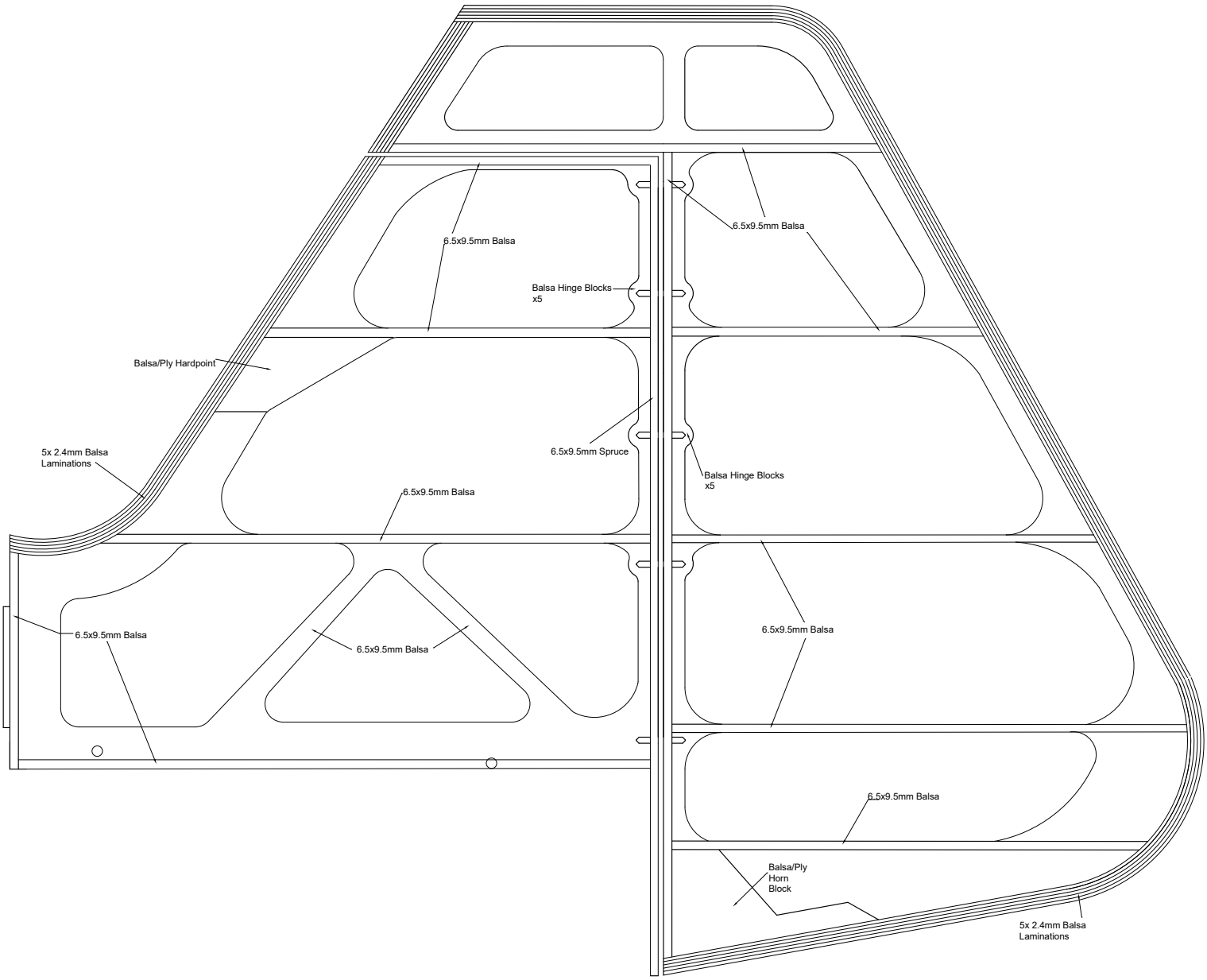
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SKIP MODEL DESIGN
10-10-220
Est.2011

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Secure the plane before starting the engine.

In The fuselage, You will find alot of parts Labled with acronym's. Once you get the hang on how they are labled, and meanings like SD (Servo Doubler), MUCP (Main UnderCarriage Plate) it will be easy.

So you have built the elevators and rudder? Congrats.. If not... Go back and start the build with easy parts :D

The fuselage is relatively Simple..... Other than the first 4 Ribs... PLEASE be very patient when building the front end of the model!. All Parts **DO** go together.. But are an extremely good fit.. You will require a Rubber Hammer

We could have made this part a little sloppy going together, however, all the forces of the undercarriage, Wing wires and engine all go through these parts!.

We accept everyone will curse us when putting this together!..... But its for the good of the model!

The first 4 ribs are a while away...So lets start off with some easy bits first.

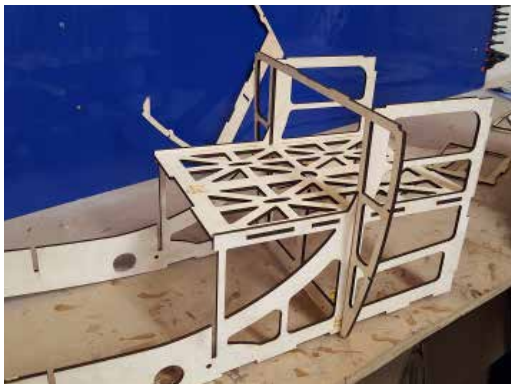
First of all. You need to join a few parts of the fuselage together.

FS (Fuselage Sides)
Fuselage Top (3mm Ply).

The fuselage top can be glued together with Superglue

FS Should be glued together with Epoxy.

These parts can only be glues together 1 way



Ok.... So we may have lied about not doing the first 4 ribs first, We thought we would put your mind at ease..... Then Jump Straight in to it!..... Element of surprise :)

Next you are on to the first 4 ribs. There is an order for this to go together correctly.

We highly recommend dry fitting all these parts first to make sure you understand how this all goes together....

You will need. A wood file.... A hammer...And 30 Minute Epoxy...

Lets Start.
Firstly, Find F2 AND both fuselage Sides, Glue mating faces to F2 AND wipe Excess off.... While the glue is still setting. You need to get the Fuel Tray In Place (Labelled FT)

You may need to chamfer the locking tabs on the Fuel Tray to get in place... The fuselage Sides will bend slightly to the Fuel Tray in place!

While Everything is still gluing.
You need to put F3 in place.
Again Glue all with 30 Minute epoxy.
Ensure a good fit is achieved

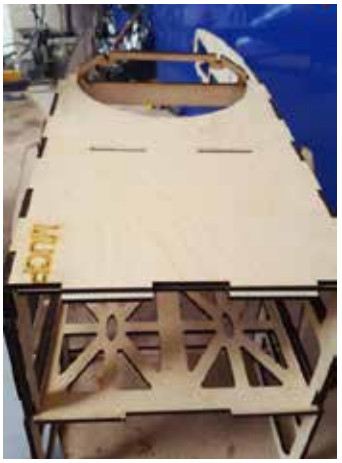
You now need to add the Fuselage Side Doubler (Labelled MUPDS)
Again Glue with Epoxy and Clamp in place
Make sure everything is a positive Fit.

Once all Glue has gone off.

You can Now add the MUPD (Main Undercarriage Plate Doubler)

Now all of these parts have gone off. You need to add the main Uc Plate (MUCP)

You need to Use 30 Minute Epoxy and plenty of clamps... Glue all mating faces and all of the UCPD. then Put the MUCP in



Now the Final Part of the Front End Assembly.

F1. This is probably the trickiest Rib to get in place. You will need to angle the bottom Slots to get the MUCP AND UCPD through.

Use 30 Minute Epoxy on all mating faces... A hammer is useful at this point to make sure it all goes in place... Use clamps to hold in place while Gluing.

You can now add.. F4, F5 and F6. Please use epoxy

It is now time to mount the whole front end structure to the 3mm Fuselage Shape.

Again Use Epoxy to do this on all mounting faces. Make sure it is it is done on a flat surface! This is very important as will make the plane very accurate in Knife Edge,

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Once all Glued. Add F7 & F8 to fuselage 3MM Shape (Super Glue is fine for this)

Make sure these Formers are GLUED at 90 Degrees to 3mm Fuselage Shape

You now need to add The Rear UC Plate Sides, F9 AND RUCP (Rear Undercarrage Plate)

Use 30 Minutes Epoxy to do this.. Clamp in place while Gluing

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Once Done, You can add the Servo Tray (ST) and Servo Tray Support (STS) this fits between F5 AND F6

Epoxy is recommended, However Medium CA Will be fine

Next you need to Glue Together Both FB1 AND FB2.

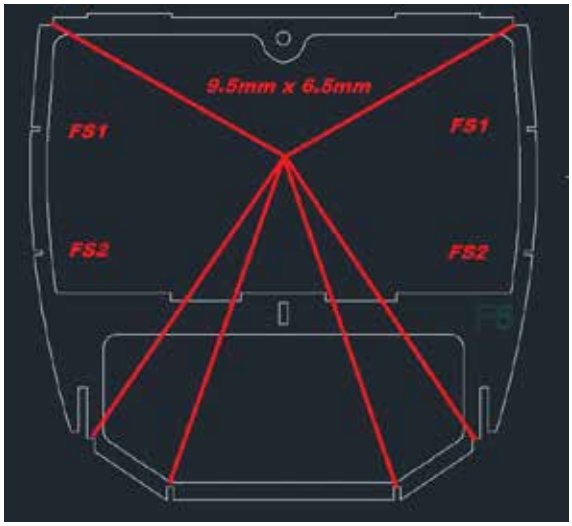
.
We recommend using Epoxy to glue this together... Use a small Scrap piece of 3mm Ply to go over the Joints to add strength.

Before you Glue FB1 AND FB2 in place.

You need to get the 6 x Spruce Strips in place.

The spruce strips are 6.5mm x 9.5 x 2100mm

You need to keep the Fuselage weighted Down and add these Struce Strips to these notches in fuselage. See pivture Below.



Where a Rib is, you may need to slightly notch the 6.5mm Side of the spruce to fit the Ribs (Or open the Ribs Slightly to fit snug) Use epoxy to glue in place. In a perfect world, you will not need to do this, However, when the spruce is cut at mill, It can vary by up to 1mm!

Please imagine the whole assemble is the correct way up

The 2 Bottom Spruce Strips Go from F2 and extent past F9.(Shown in picture) we finish the end with a scrap piece of balsa from the Elevators. This just helps with covering once shaped. The Lower Right Spruce and Lower Left Spruce Finished as F3, There is a notch in the MUCP for the spruce to fit in to and end. The Top Spruce extends the length of the fuselage.

!!!!!! Important !!!!!!!!

The Top Spruce Strips must Sit flush with the Fuselage 3mm Shape from F9 TO F6.

Between F6 AND F1 you must make sure the Spruce strip Sits 2.4mm Inside the 3mm Fuselage Shape. This is for Sheeting Purposes Later.

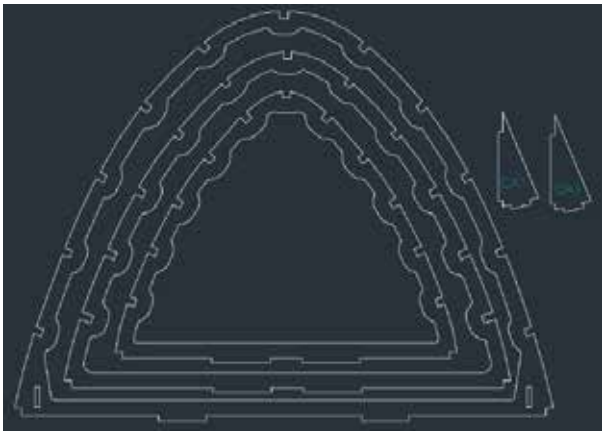
Once all Has glued! You can Flip the fuselage over and Admire you boat Hull... She is a Mighty Fine vessel.. But needs a mast to catch the winds!

Time to start Building the Top of the fuselage.

Glue in place F2A, F3A and F4A With Epoxy.

When you have these in place. you can also slide in the 2 TWM (Top Wing Mounts).. Glue all with Epoxy.

It is worth while test fitting the 1m Bottom phenolic tube in the fuselage. The holes may need a little sanding to make sure the phenolic slides in. DO NOT Glue in place. As when you align the wings you may need to adjust.



In the Kit. You will find 3 Ribs Taped Together and 2 X CA These 3 ribs are for the Turtle Deck.

CA is to get the angle for the First Rib at cockpit.

The other 2 Ribs are to be glues at 90 Degrees to fuselage.

Super Glue is fine for Gluing these parts in place.

Once in place. You now need to glue the Rudder stab in place..

The Rudder Needs to Be at 90 Degrees to 3mm Fuselage Shape and perfectly aligned. We assume as a builder, you understand how to do this correctly and the importance of the Rudder Fin to be in place correctly.

We highly recommend using a laser level to get the stab 100% True.

You will need to notch the 3mm Fuselage Top to fit the spruce and also Chamfer the Spruce you left extended to fit in the rear of the fuselage.. It Must attach to the Rear Undercarriage Plate. Pack if required.

It will also be worth Slightly Chamfering the Rear Undercarriage Plate Sides so the Spruce fits snug.

Use 30 Minute Epoxy on all mounting surfaces.

Time to add balsa Stringers :)

You can add the 5mm x 5mm Balsa Stringers to the front Top and the turtle deck.. Make sure you extent the 5mm x 5mm Balsa Strips past F8 top to the end of the Fin. This will help with sheeting.
Super Glue is A great choice for gluing Stringers in place.

While you are doing the stringers. You need to add a few pieces of balsa block to the rear of the fuselage and shape to fuselage sides. Make sure you mark where the 8mm Carbon will come through. (Shown in picture)

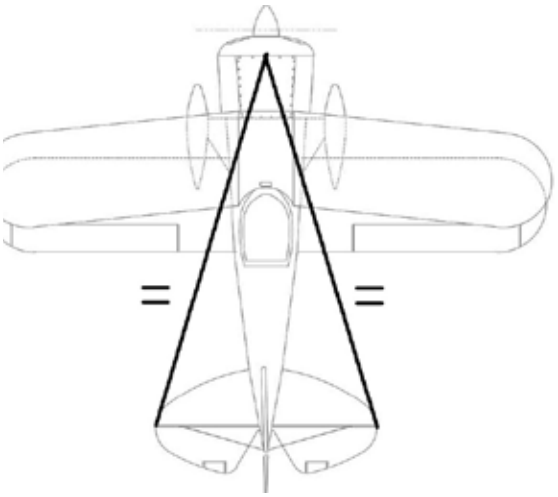
In the Kit, there is also a Elevator Alignement tool. This is used to make sure all Holes Line up correctly both Sides.. This part does not need to be Glues in place as it is a tool, But you can if you would like. The Elevator Alighment tool lines up parallel to the rudder fin. Please use the 8MM Carbon Tube to get in correct position. DO NOT GLUE THE 8MM CARBON IN PLACE YET!

You will notice at this point that the front 8mm carbon is raised compaired to the rear. This is perfectly normal. As the wings are set at 0 Incidence to each other, the rear stabs have 1.5 degrees incidence. This is a feature that keeps the rear end from sagging in flight.

In the kit you will find 2 x 100mm x 50mm x 900mm Balsa Blocks.

This need to be cut and shaped and fit between F2 AND F6.

This will be the bottom wing Seat when complete.
Ideally you will need to draw the Shape OF W1 in the correct position on the balsa block and cut this area out.



Once you have this cut out. It is the matter of plaining the Excess block down and shaping to fuselage... LOTS OF MESS :D
Keep the off cuts of the Block. As you will need this for the next step.

This needs to be glued with epoxy.

Jig up the elevator stabs and fuselage

Using the 8mm Carbon in the fuselage and the 6mm Carbon. Slide the elevators on to the fuselage.

Ensure the Elevator Stabs are at 90 Degrees to the rudder post and also ensure that the distance from the furthest tips of the Stab to a fixed point at front of fuselage are equal. Adjust Holes in Alignment tool and rudder to get all measurements equal....

Also check that the Incidence on the tails are approx 1.5 Degrees. Once all measurements are equal and correctly aligned. you can glue the 8mm Carbon in the Fuselage with epoxy. DO NOT GLUE the 6mm Carbon in.

It is recommended to only put a few drops of epoxy in certain places where 8mm Carbon meets parts. Once this has glued. Then remove elevator stabs and 6mm Carbon and glue in place correctly.

You should have very few parts remaining in your kit of parts for the fuselage.The one part should be what we called as the POWERBOX Royal shelf. This part will have the Skip Model Designs Logo and your name on it (If you have requested your name on it)

This part Glues on place on FB2 just forward of the Rudder servo mount (See photo on cockpit frame below to see). Between F4 AND F5

The canopy Frame is very simple to assemble.. Find all remining parts and add greece proof paper to the cockpit area. This is to prevent the canopy frame sticking to the body.

Clamp all of cockpit frame in place. Use superglue to fix each rib in palce. Add pieces of balsa (Scrap pieces of 5mm x 5mm) between C1 and C2 to aid with sheeting.

In our kits, we do not give a shape for the canopy frame sheeting, This is due to the PITTS model having many shapes of canopy hatch. You can customise this part to suit your requirement. However, please make sure what you are doing will suit the canopy shape.

Undercarriage and steel work location is detailed on the plan..

In the Kit, You will also find 4 pieces which will act as a bottom cover for the Undercarriage and steelwork., These go together only 1 way correctly, This cover can be fixed in place in a methord to suit your requirement.

On the 1 Piece, there is a slot. This will give you the Main UC location. Adjust Slot to Suit UC size.

You can now start sheeting the Fuselage :D . Sheet the model as the picture shows for now. you will need access to TWM later in the build. You will sheet this setion when the top wings are aligned.

You need to fully sheet the rear Turtle deck and the front end of the model... You will need to get a good fit on the elevator stab to the turtle deck Simply sand down the elevator stab to get a snug fit.

We have supplied all 2.4mm Balsa for this. Please only Use the 1220mm Long Balsa for sheeting of fuselage, as the longer Balsa is for wings.

Please note. We have added 6mm Carbon cross section on this model. This is an optional extra and is not included in kit... However, you do need to add the Small section of balsa in the lower section at rear of model so that the close loop cable will exit the plane neatly. (Shown in Picture)

While you are sheeting the front and rear
of the model. It my be worth thinking of your colour scheme. You may need to add few strips of balsa wood to the Spruce,FB1 OR FB2 so that you can join 2 or 3 colours of covering as the rear of the model is open,

Wasn’t that bad right?
 Time to move on to wings!. These are fully annotated and Pictured plans. Take your time!

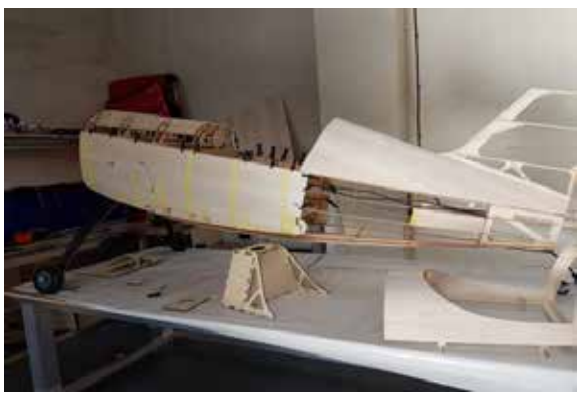
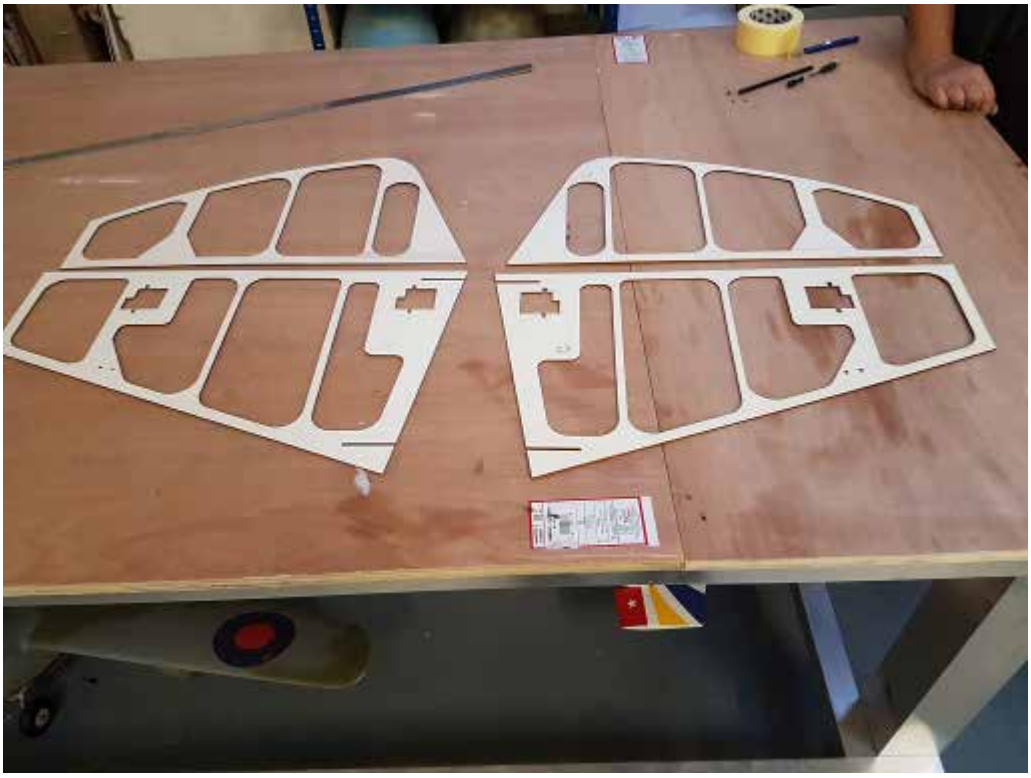
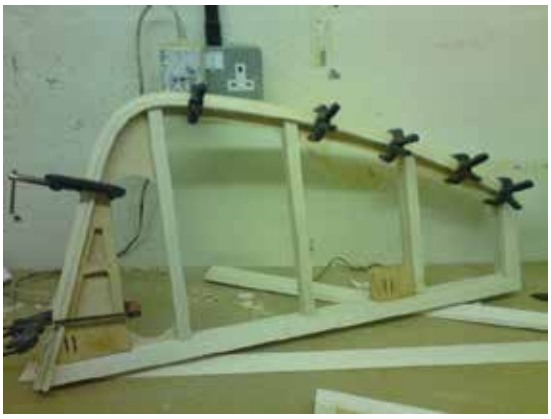
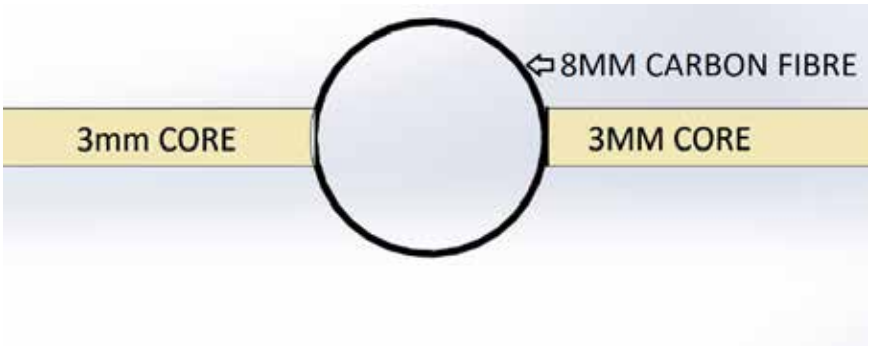
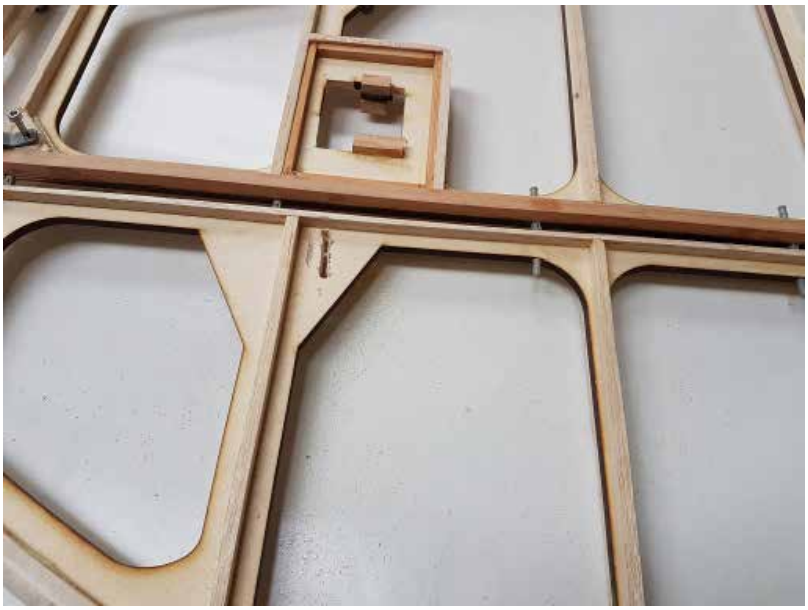


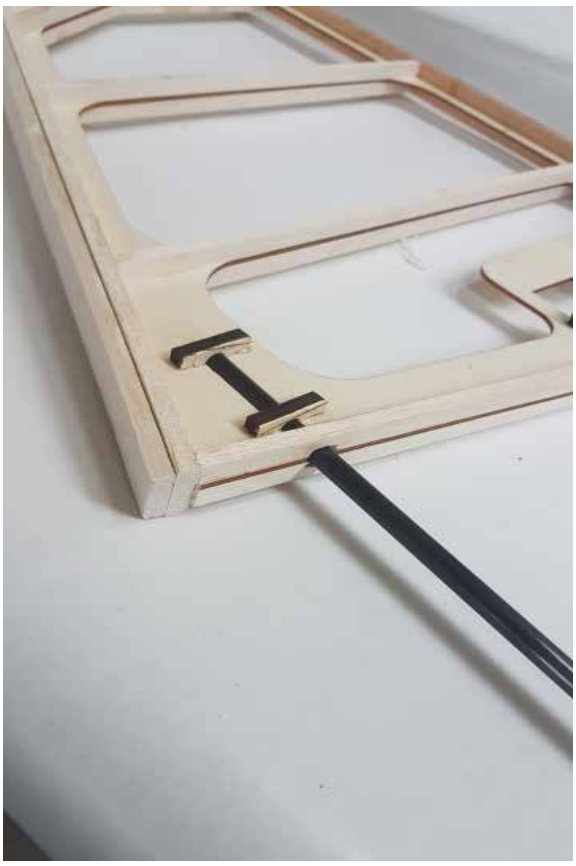
PHOTO SHEET (NOT IN ORDER OF BUILD. ONLY FOR REFERENCE)



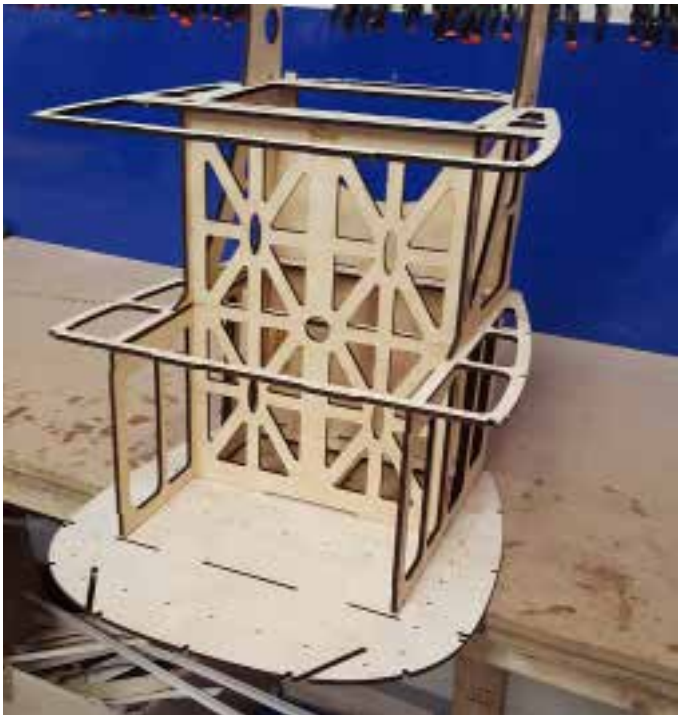


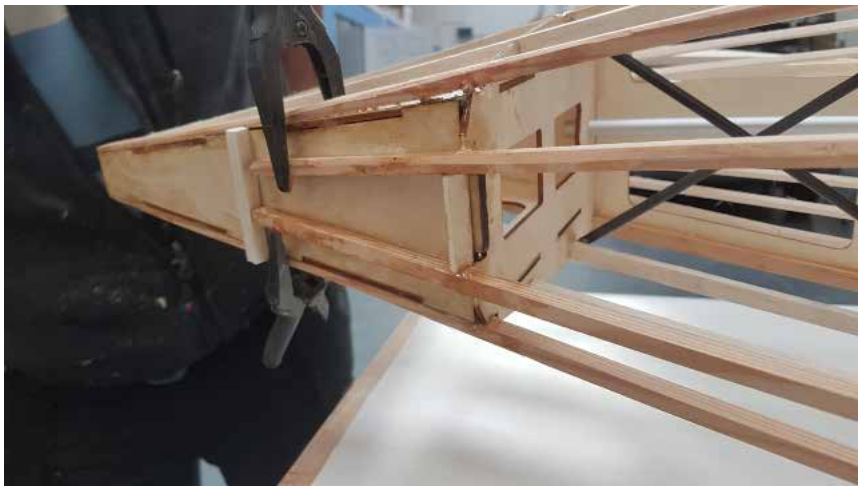

8MM CARBON FIBRE
3mm CORE
3MM CORE

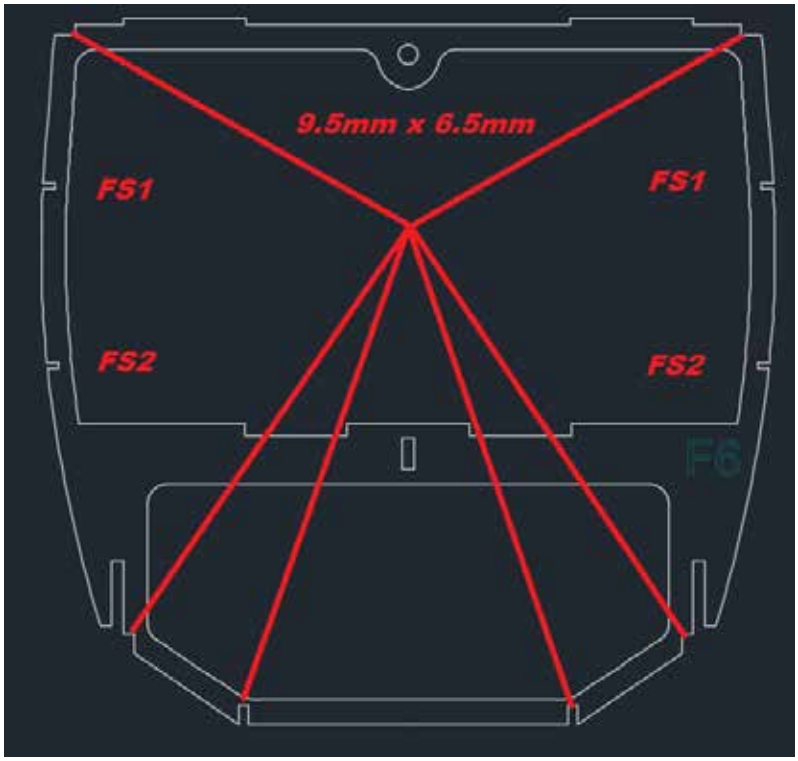


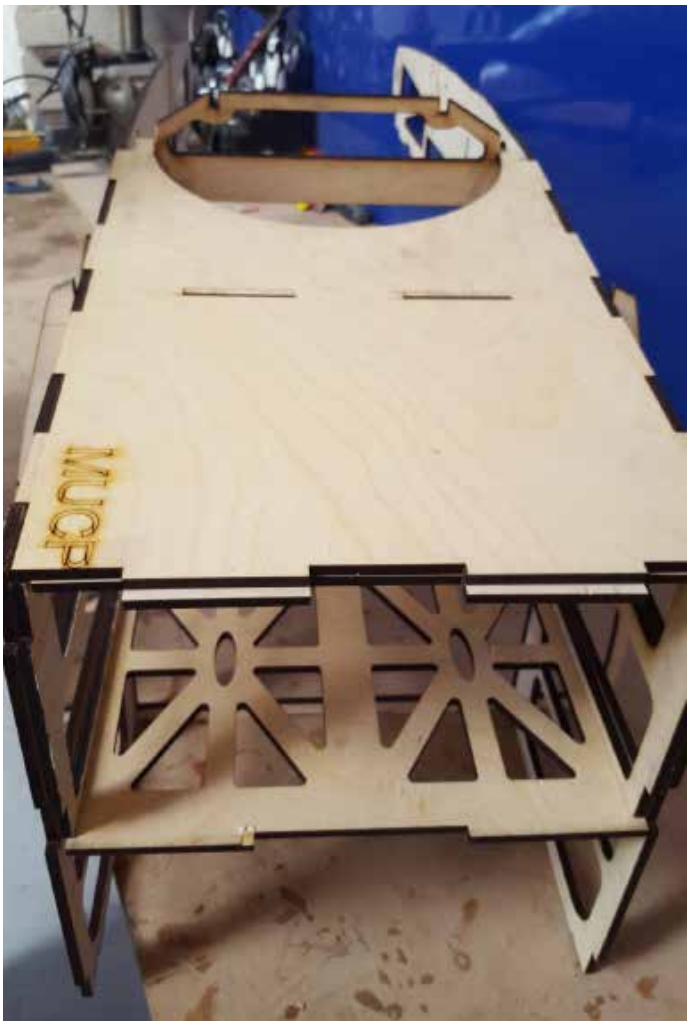



S1






9.5mm x 6.5mm
FS1
FS1
FS2
FS2
F6


MUCP