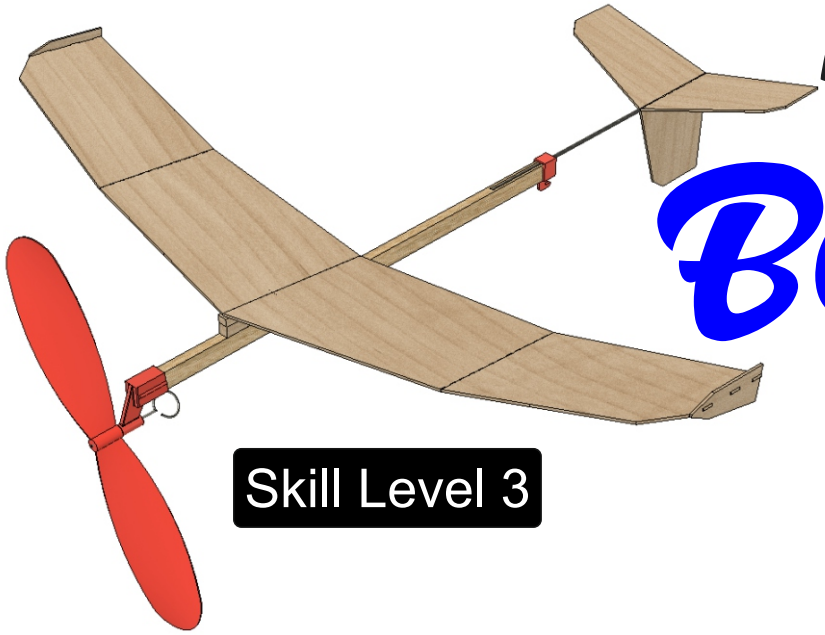
ANGELWING DESIGNS

FLITE SKOOL

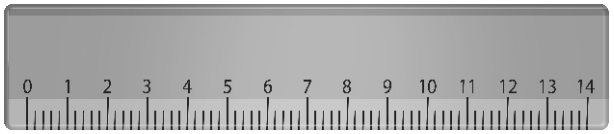


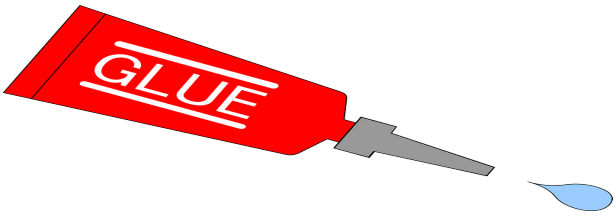
Band-it

Skill Level 3

This is not a toy and adult supervision is required for building and operating this model.

You will need a small ruler, Superglue or wood glue, and a non stick surface. A polythene bag or tape can be used as your non stick surface.

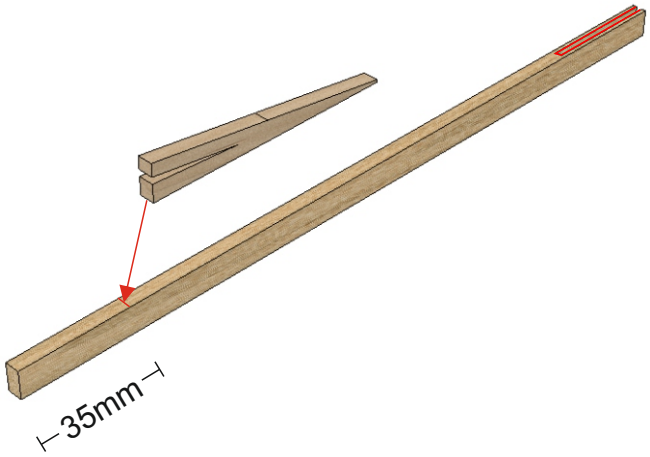




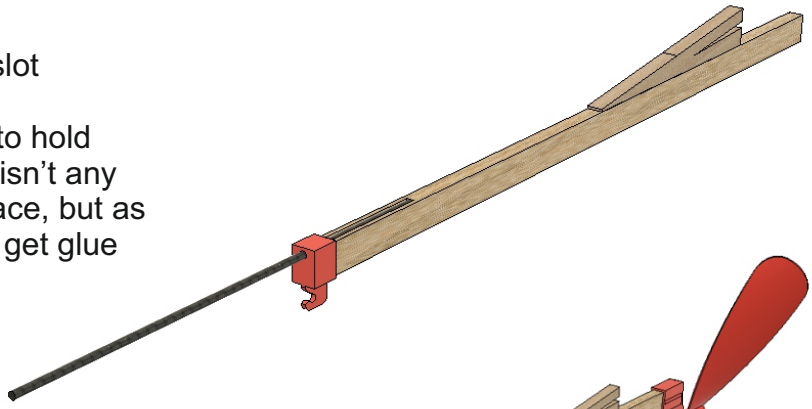
Part 1 : Building the aircraft

Identify the back of the main motor stick.
This has the slot cut into the back on the top side the image highlights this area in red.

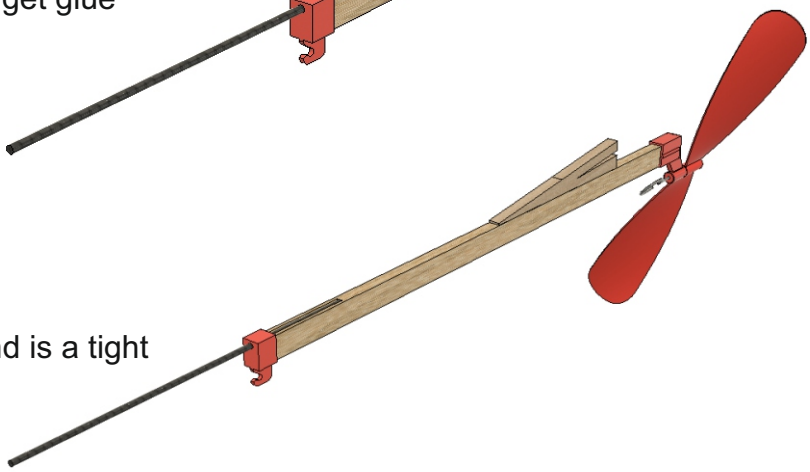
Measure back 30mm from the front of the motor stick using a ruler. Tack glue the triangular shaped wing mount with the tall edge against this line. Only use a tiny spot or 2 of glue as we may need to crack this part off later to make changes to the balance and improve the flying. If you prefer you can hold the wing mount in place using selltotape or masking tape.



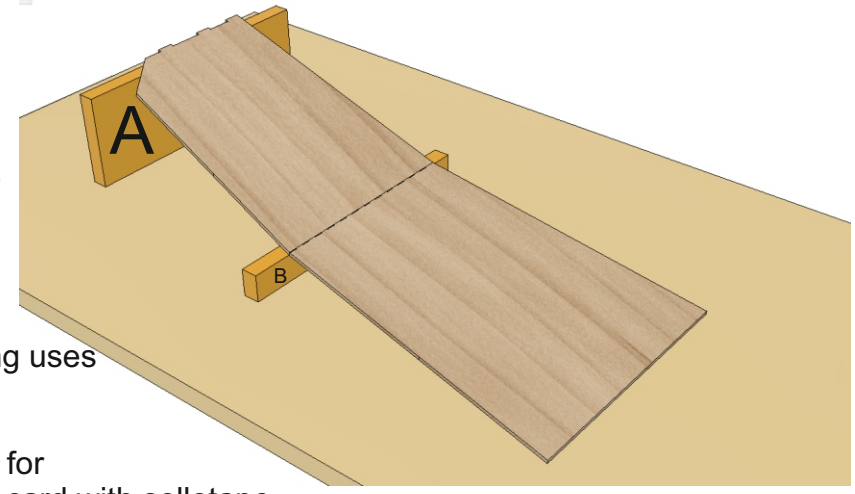
Glue the carbon fibre stick into the pre cut slot in the rear of the motor mount.
You can use the plastic rubber motor hook to hold the rear in place while the glue sets. There isn't any need for the motor hook to be glued into place, but as we will not be removing it don't worry if you get glue on the hook.

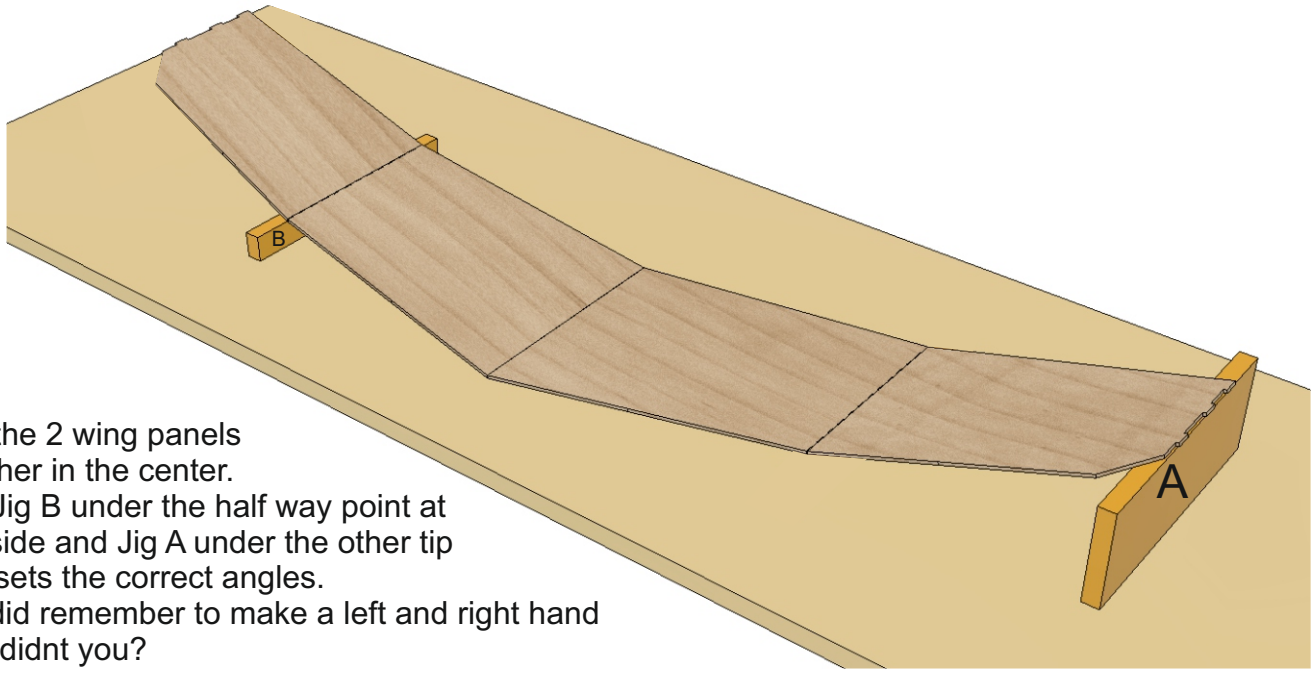


Slide the propeller assembly onto the front of the main motor stick. This is not glued and is a tight push fit onto the wooden stick.



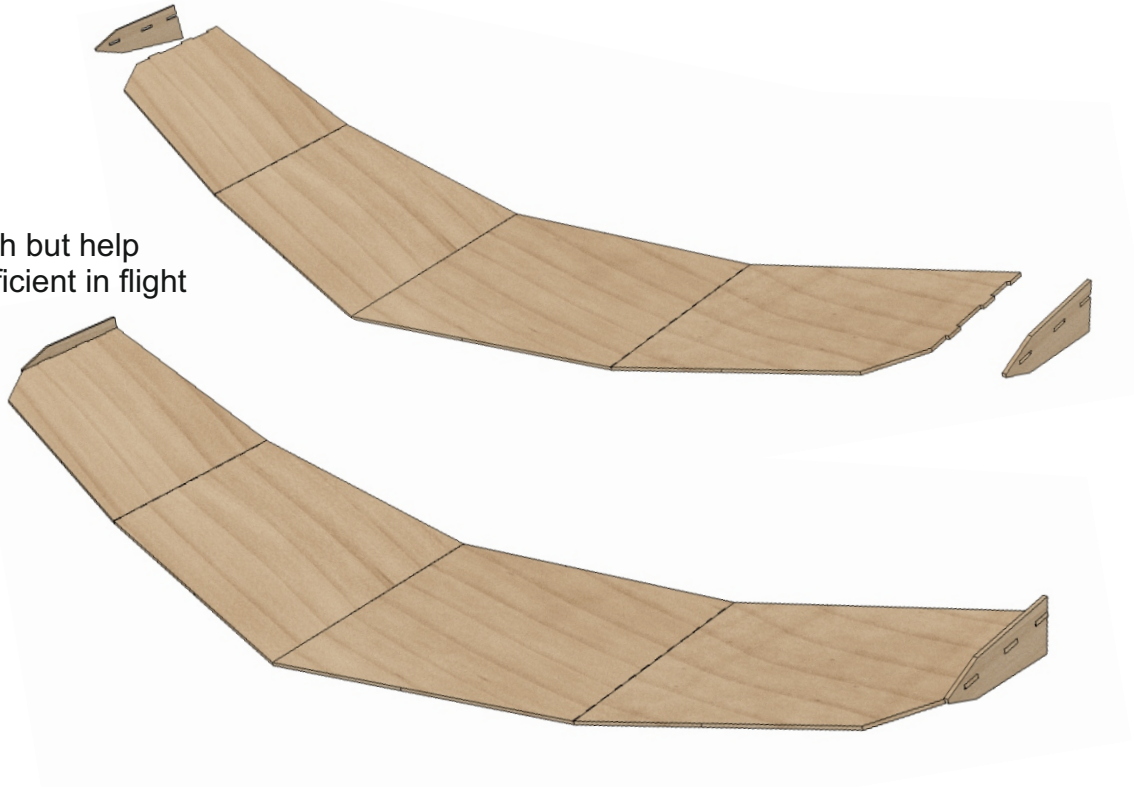
The main wing is supplied in 2 pieces
There is a perforated dotted line roughly half way along each wing half.
Gently Lay your ruler across and crack the wing here to allow an angle to be formed.
You do not need to seperate the parts.
Using the pre cut cardboard jigs A and B you can set the correct angles of the wing.
This is called the **Dihedral angle**. This wing uses what we call **Poly-dihedral**.
All you need to do to set this angle is to run glue into the cracked joint. Repeat this for both wing halves. Don't forget to cover the card with sellotape or polythene to prevent the balsa wood wing sticking to it.
Remember to make a Left and Right wing!

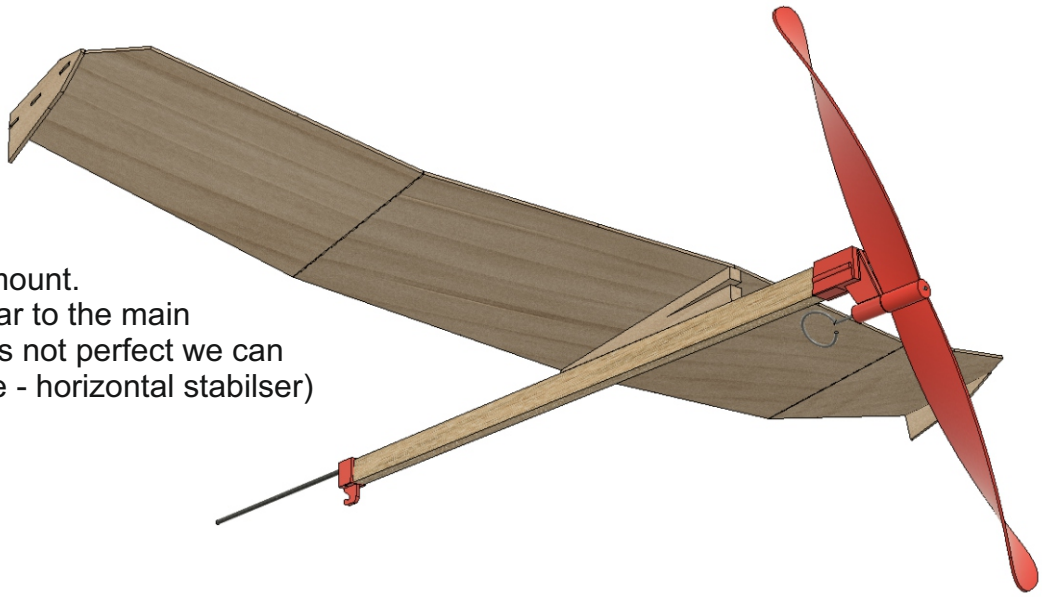




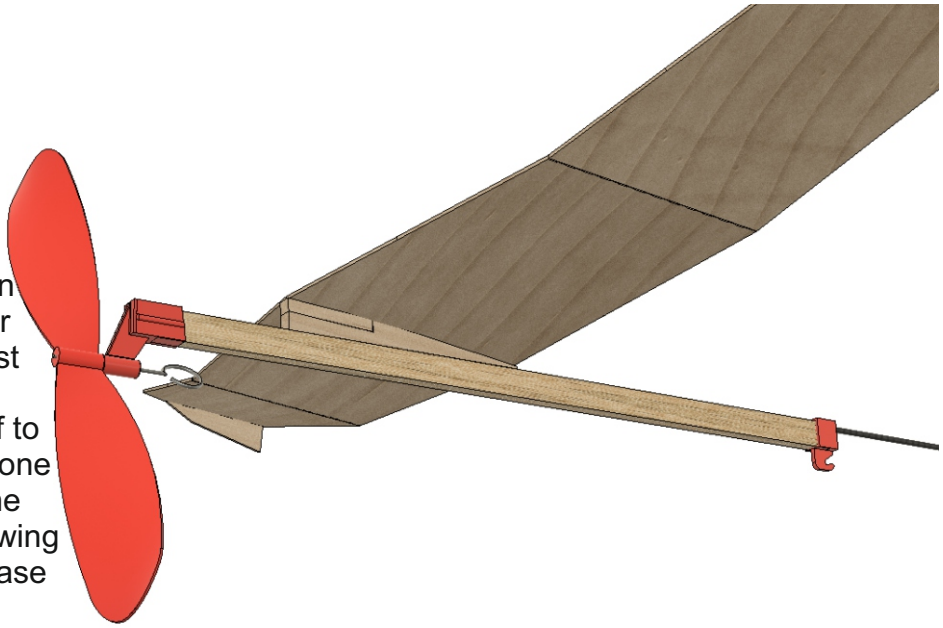
Join the 2 wing panels together in the center.
Use Jig B under the half way point at one side and Jig A under the other tip
This sets the correct angles.
You did remember to make a left and right hand wing didnt you?

Glue the wing end caps
to the end of each wing.
We call these ***Winglets***.
They not only add strength but help
make the aircraft more efficient in flight



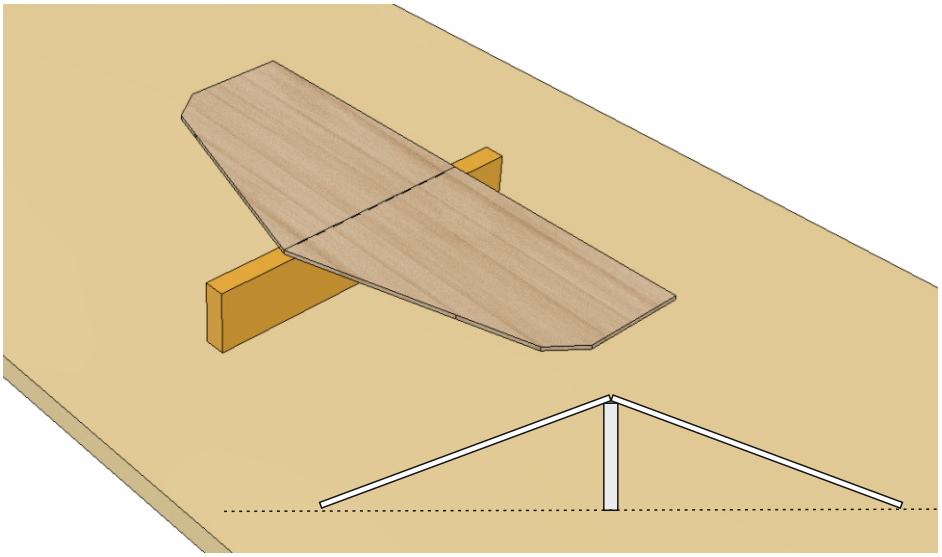


Glue the wing to the wing mount.
Make sure it is perpendicular to the main
motor stick. Don't worry if its not perfect we can
glue the rear wing (tailplane - horizontal stabilser)
to match the wing

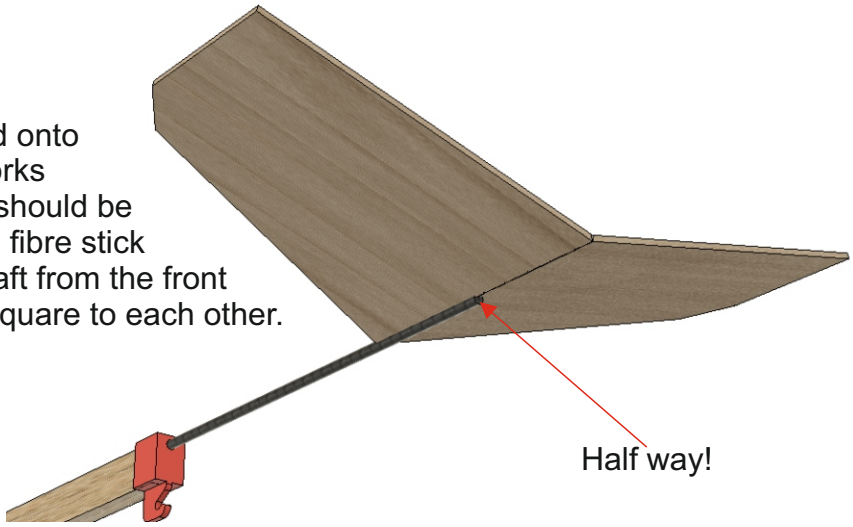


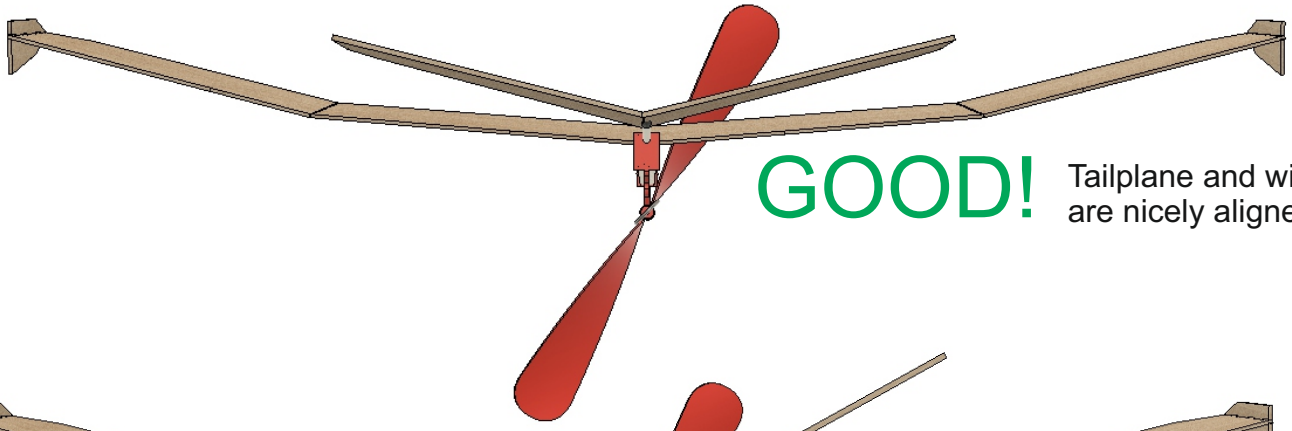
Did you wonder what the slot
was for in the wing mount?
Well now we get to squeeze down
on the front of the wing and motor
stick and close the gap. Its easiest
to use superglue to do this, just
be careful you don't stick yourself to
the aircraft. What we have now done
is add **Camber** to the center of the
wing. This camber will make the wing
stiffer, but more importantly increase
lift.

Just like the wing, the tailplane is perforated along the center Gently crack the join and set the angle using Jig C. Note that the tailplane is made upside down here and the outer edges of the tailplane should touch the surface that the jig is sitting on.

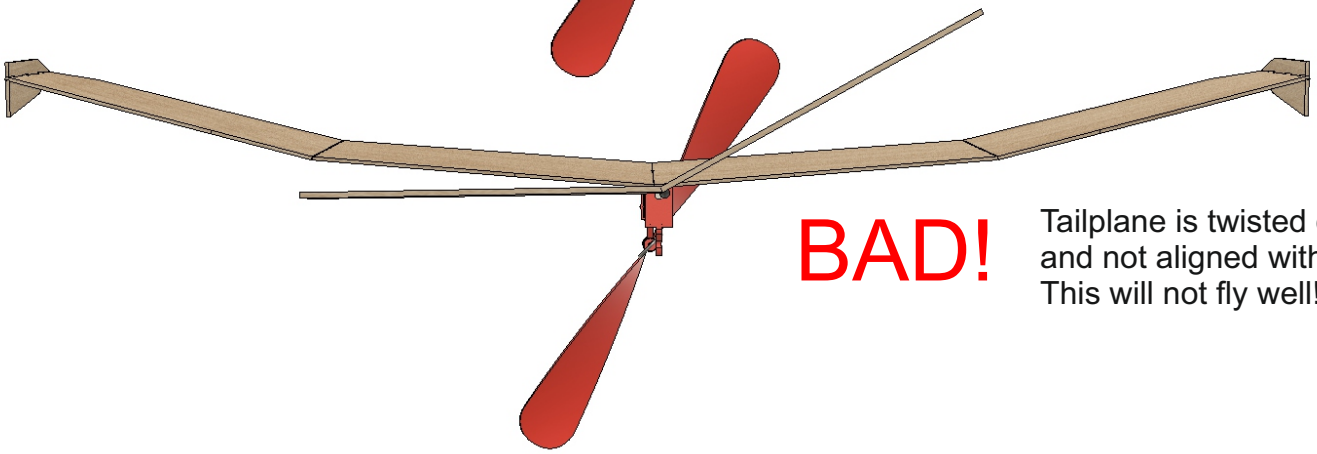


The tailplane assembly is now glued onto the carbon fibre stick. Superglue works best! Please note that the tailplane should be glued so that only half of the carbon fibre stick is glued. You can “eyeball” the aircraft from the front to make sure the wing and tail are square to each other.



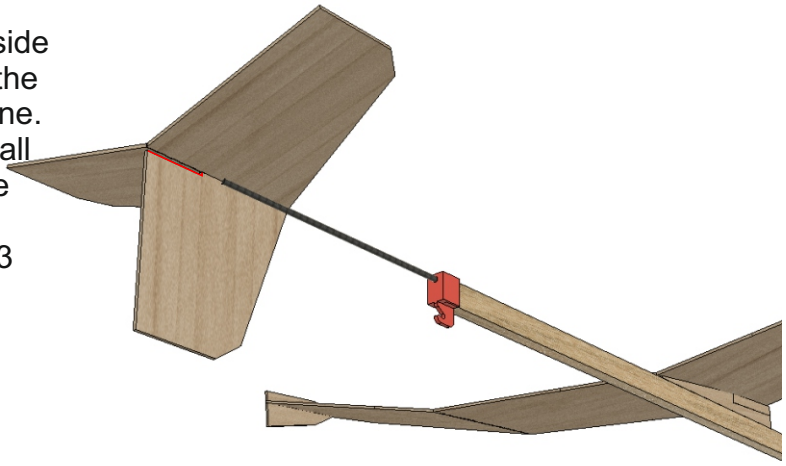


GOOD! Tailplane and wing are nicely aligned



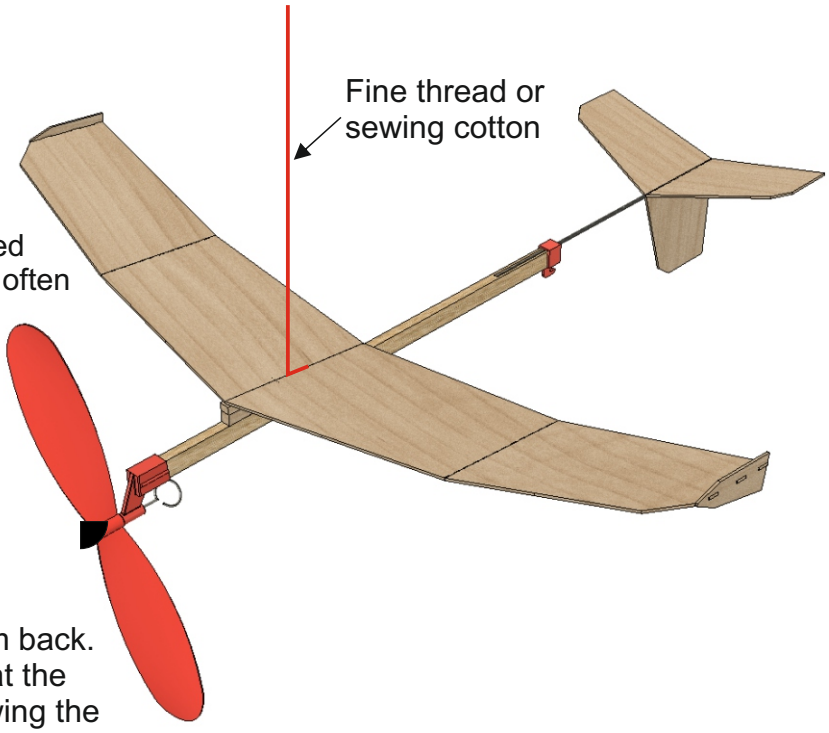
BAD! Tailplane is twisted over and not aligned with the wing. This will not fly well!

Glue the **Fin (vertical stabiliser**) to the underside of the tailplane. The fin is glued to one side of the carbon fibre rod and also onto the balsa tailplane. Note the area highlighted in red. There is a small intentional gap here. This allows us to bend the rear of the fin to control the flight path of the finished aircraft. This will be discussed in Part 3 of the instructions “Flight Trimming”



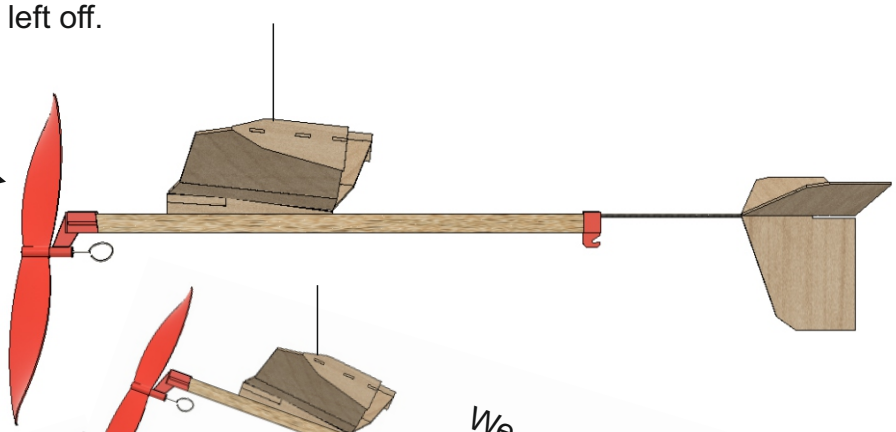
Balancing the aircraft: The aircraft needs to be balanced to fly correctly. The most important point of balance on aircraft is referred to as the **Centre Of Gravity**. You will see this often written down as **CG**, or **C of G**. Many model aircrafts plans show this as a symbol.

Centre of Gravity Symbol

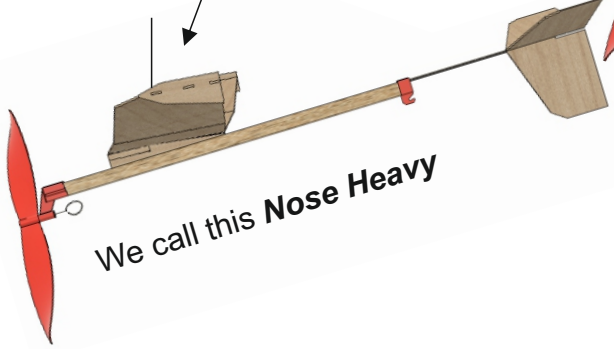


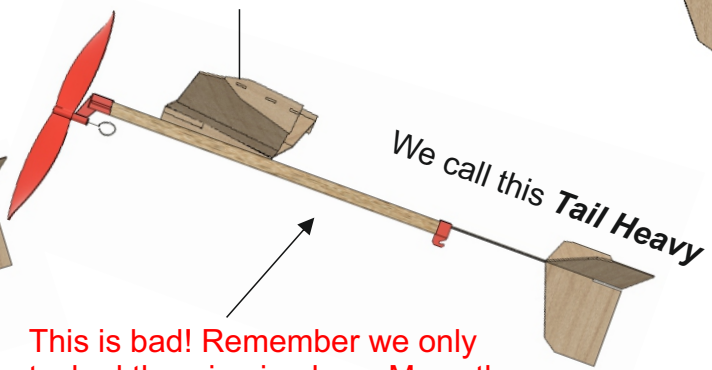
On this aircraft the model should balance with the main motor stick horizontal to the horizon at a point measured 35mm to 36mm back. From the front edge of the wing measured at the center of the wing. We call the front of the wing the **Leading edge,** the back edge of the wing the **Trailing edge** and the center of the wing the **Wing root.** A really good way to check this is to hang the aircraft from a piece of thread at the correct point. The thread can be attached with a piece of tape and removed after checking and adjusting. You might notice we are doing this with the rubber motor left off.

This is just what we are looking for.
or a slight nose down attitude



This is bad! Remember we only tacked the wing in place. Move the wing forward 2mm and try again





This is bad! Remember we only tacked the wing in place. Move the wing back 2mm and try again

Part 2 : The Rubber Motors Deluxe Edition only

The Band-it deluxe kit is however supplied with a 1 metre length of high quality FAI Tan Rubber. This high quality latex rubber provides better power and increased motor run time than a simple rubber band would. Cut the rubber strip into 2 x 440mm lengths. There is enough rubber provided to make 2 rubber motors. The Motors should be removed when not in use and kept out of sunlight to preserve the life and performance of the motor. Each length of rubber is simply knotted at one end. A small O-ring can be added to the motor if you wish to wind the motor using a mechanical or electric winder.

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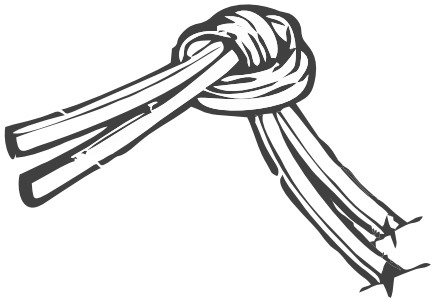
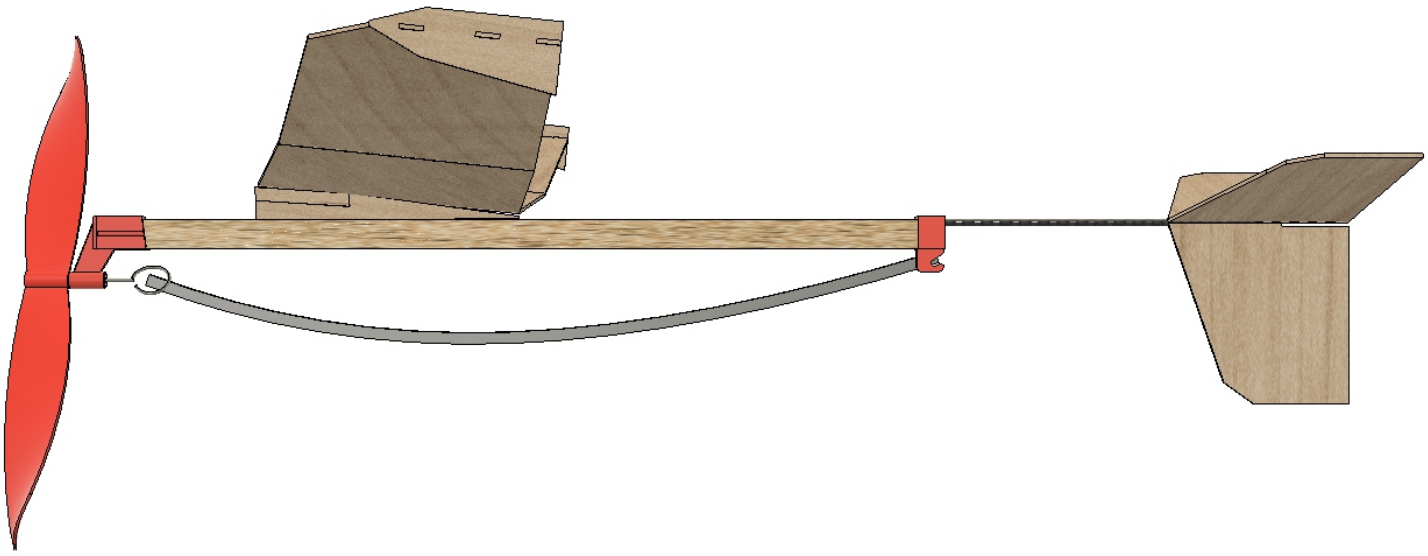


Scan the QR Code for an example of how to make a rubber motor

SCAN ME

In your kit you have been supplied with a 3ml Syringe of a Glycerine soft soap as a lubricant for the rubber motors. 0.5ml of lubricant should be applied to one of the rubber motors, You can store the spare motor for future use. This really does improve the performance of the rubber motors and also the life of the motors.

The knotted end of the motor is used at the back! this prevents the loose ends hitting the plastic propeller hub which generates nose and a loss of power.



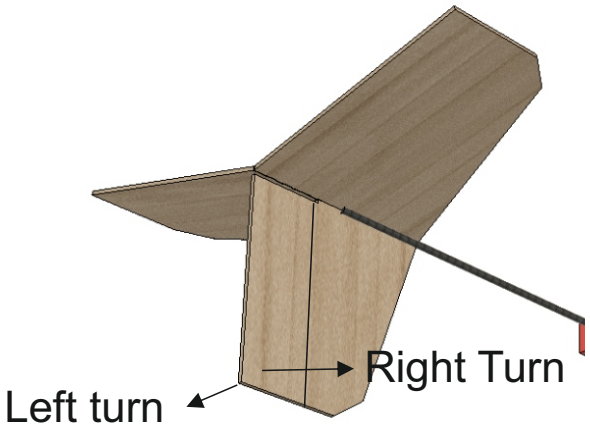
Part 3: Flight and Trimming

You are now ready for your first flights. Its really important to think about the weight of this aircraft. Its not designed to cope with any wind. Whilst a very gentle breeze is acceptable you really want to pick a still day, Dusk and Dawn are often ideal times for flight testing as the air is more stable.

Wind on 150 to 200 turns of the rubber motor. Turning the propeller in a clockwise direction. Observe the flight path carefully. Gently launch the aircraft forwards moments after releasing the propeller. The Aircraft should be launched as horizontal as possible.

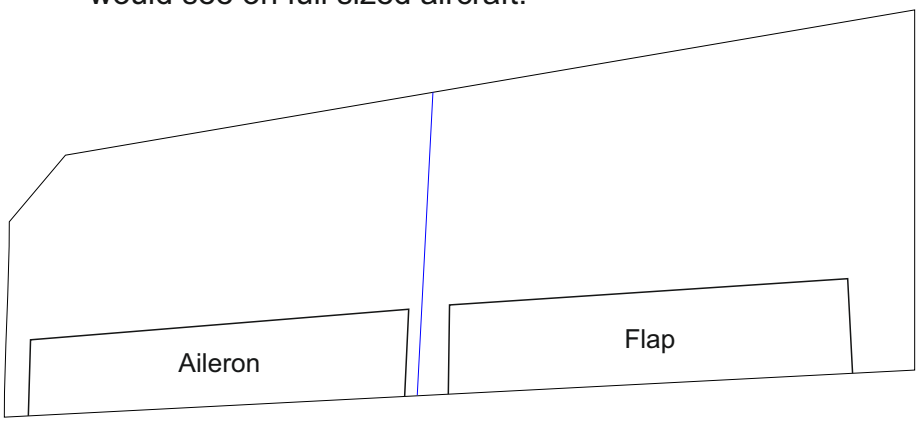
We found our versions of this aircraft prefer to turn left. if we think about physics there is a rule that says **"Every action has an equal and opposite reaction"** So in our case to turn the propeller in an anticlockwise direction the rubber motor that is attached to the aircraft tries to roll the aircraft in a clockwise direction. This is why our examples prefer to turn left. We call this the **Torque** reaction.

So hopefully your example also turned to the left. we can control how tight the turn is by adding **Rudder** trim to the fin. Wet your thumb and forefinger and gently bend the rear end of the fin to the left to increase the rate of turn, or to the right to decrease the rate of left turn.



You may want to keep your aircraft flying in a small space. When we want to turn tightly not only do we create **YAW,** we also create a rolling action. Think of yaw in the same way as sitting on a swivel chair. You turn in a vertical axis but do not lean left or right. **Roll** is easy to think of as leaning, if we continue to lean further and further we would fall over. So we need to stop this happening. There are 2 ways to do this. Lets think about the wing we have made, and add imaginary flight control we would see on full sized aircraft.

Ailerons and Flaps. These common control surfaces on an aircraft wing are ways to change the lift the wing makes. If we lower one of these control surfaces we Increase the lift on that part of the wing, If we Raise the surface we lower the lift.



What do we want to do to the stop the model rolling to the left, and why does it happen? When the aircraft yaws to the left the right hand wing is travelling faster than the left hand wing so creates more lift. We have two options then, reduce the lift on the Right hand wing or increase the lift on the Left hand wing. We don't want to take any lift away though, so we want to add lift to the left hand wing. So lets think about what is causing the roll. The **Torque** reaction from the propeller! The propeller is blowing fast moving air over the centre part of the wing, and over where the Flap is positioned. This is the best place then for us to create extra lift. Just like the **rudder trim** we added to the fin can bend the **Trailing Edge** of the wing down where we want flap trim. We now have move lift on the left hand wing especially when the rubber motor is generating its power. This helps keep the left wing up.

Hopefully you can see a lot can be learnt from a simple "rubber band" model aircraft. Aerodynamics is a very complicated and very fascinating subject. If you're like me, you learn more by trying things than you do by reading about them. You can now start adding more turns to the rubber motor. The sad thing is when you have it flying just right you launch into a **thermal** and that could be the last time you see your masterpiece.