



# The Arrow

by  
Canterbury Sailplanes

Thank-you for purchasing the Arrow, we're confident that you'll really enjoy flying this model. The Arrow has evolved from our successful Jazz models, initially designed as a first 'wing' model for beginners, it's quickly proven to be an excellent all round model, ideal for Slope racing and Fun Flying as well as learning to fly with.

## **GENERAL NOTES**

- One big difference between the Arrow and the Jazz is that the servos are positioned in the fuselage. This keeps all the radio gear together and increases the survivability in a crash as well as improving the roll rate by removing the servo weight from the wings. Refer to the sketch at the rear of these instructions for the recommended radio installation layout.
- The kit box contains all the model parts. To complete the Arrow ready to fly, you'll need a 2-channel radio control set, an elevon mixer (if you don't have mixing capability on your radio set), a can of spray-on contact adhesive (3M Spray 77 or Ados F2), a sharp knife and some basic tools.

- Most Hardware stores or Automotive accessory outlets have 3M Spray 77 adhesive or Ados F2. The spray on adhesive really helps the tape to bond to the EPP so do try to get some.
- Gorilla Glue is included in the kit, this is a great all purpose adhesive. Using it is a little different from most glue as it foams while curing. Note the following points;
  - Read the instructions on the packet.
  - Spray or wipe the surfaces to be glued with a damp cloth
  - Use a minimal amount as the glue foams and expands when curing. Wipe off any excess before it sets, with a damp cloth.
  - You'll get a better finish by taping over the spars as soon as you glue them in, producing a smoother finish once the glue has cured.
  - When gluing the fin and wings in place, the expanding glue may push the sides apart & to prevent this, clamp or tape the parts together while the glue cures.
  - Any excess can be sanded or cut off.
  - It works well on tape & such as gluing the wings on.
- The kit includes coloured Polypropylene tape and strapping tape, (fibreglass reinforced) make sure you use the correct tape as specified in the instructions. There are 50 meters of coloured tape and 24M of strapping tape. Other Colours of tape are available - Blue, Black, Green, Red & Yellow, contact your local model shop or Canterbury Sailplanes if you require extra colours for your Arrow.
- It's also worthwhile investing in a Lost Model Alarm, if you land/crash in trees, bushes or long grass, your model may be hard or even impossible to find. With a lost model alarm you can locate your model much easier. The alarm will sound for up to 2 days. Our LMA also sounds off as the battery pack in the model runs down, so you can gauge how long you can safely fly your model. Ask your model shop or check out our website for details.  
(Note: LMA's aren't compatible with PCM radio gear)
- Another useful item is a servo extension lead so you can easily 'switch' the model on/off and charge the batteries in the model without having to remove them.
- Unlike the Jazz, the Arrow fuselage has a cut-out to take the standard square battery pack. You can still use a flat battery pack, but you'll have to cut a suitable hole for it in the same section of the fuselage. Orientate it with the battery cells standing vertical along the center line of the fuselage.
- When applying tape, take great care not to apply it under tension, as this will cause the wings to bend and twist.
- When applying the spray adhesive to the model; spray onto the model and leave it a minute or two, waiting until the glue on the surface is -aggressively- tacky, before laying the tape onto the glued surface. Once it's on however, it's difficult to remove - so take care. Only a light mist of spray adhesive is required, you should expect to use about  $\approx$  -  $\frac{3}{4}$  of the can building the Arrow.

- We'll be continually improving these instructions, the very latest versions - as they develop, will be available online at: <http://www.flycs.co.nz>

## SOME EXPLANATIONS:

- The bottom of the wing is the flatter of the upper and lower surfaces.
- The spar slots are the grooves cut in the top and bottom surfaces of the wings.
- The spars are the four 3.5mm diameter fibreglass rods in the kit.
- ELEVON is the name for the control surfaces on a flying wing, derived from Elevator & Ailerons.

## BEFORE YOU BEGIN ASSEMBLY

- 1) Check that all the parts as per the parts list page are packed in the box. You will note that the parts list page also has pictures of some items to help you identify them. This will help you later when reading the assembly instructions.
- 2) Other tools that you will need include:
  1. Electric or hand drill with 1.5 mm & 2.5mm drill bits
  2. Small ruler or tape measure
  3. Sharp knife, scalpel or modelling knife
  4. Scissors to cut tape
  5. Marker (a ballpoint pen will do)
  6. Small phillips head screwdriver (for the servo's)
  7. Small screwdriver (for the control horn screws)
  8. Needle nose pliers (or strong tweezers)
  9. Soldering iron for melting out foam(not needed but can be helpful)
- 3) It's probably also a good idea while you're getting these items ready; to make sure you have enough batteries for both your Transmitter and for the radio gear to be installed in the Arrow. If you have rechargeable batteries, ensure they're charged as you'll need them to be ready prior to fitting the servos into the Arrow.

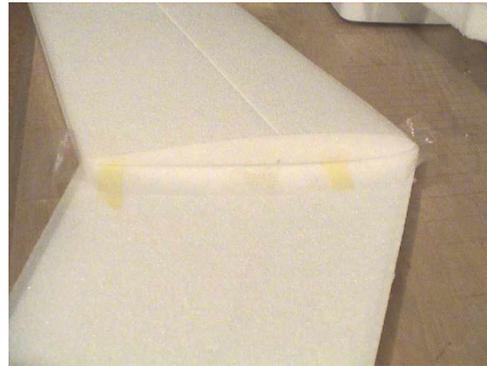
## On with the construction!

1. Shape the wing tips.
  - Remove the wings from the surrounding EPP foam.
  - Mark out a radius of 100mm from the leading edge to the wing tip.
  - Cut along the line with a sharp knife and then sand an even radius (from the top to the underside of the wing) right around the wing tip, using a sanding block with 40 to 80 grit sandpaper.



## 2. Joining the wings.

- Cut the foam wing surrounds apart so you have the two outer sections for the bottom of the wings.
- Lay the wings bottom down on your bench or table. Butt the two wing roots together to check the alignment. Due to the varying thickness of the EPP blocks we use, it is possible the roots will not line up perfectly, if this is the case, pack the lower one up with some paper to get them to closely match.
- Join the wing halves using Spray adhesive, apply a liberal amount to both surfaces, wait 5 minutes and push together. ⚠ Be careful handling the wings until the spar is installed



## 3. Join the fibreglass rods to make a top and bottom spar.

- Insert a fibreglass rod into the middle of the alloy joiner tube and glue with Gorilla glue or CA.
- Repeat the process to complete the 2 spars.
- Carefully crimp the alloy joiner onto the spars with pliers.



## 4. Lay one spar on the bottom of the wing, mark the location of the joiner tube in the centre of the wing and cut away a minimal amount of foam to allow it and the spar to sit in the slot in the wing. Repeat for the top spar.

## 5. Glue the spars in place with Gorilla glue. (Put tape over the spars in the wing for a smooth finish) Lay the wing back in the wing seats or on a flat surface, ensuring it's nice and level, then leave over night while the glue sets.

## 6. Select one of the balsa elevons and position it next to the trailing edge of one half of the wing.

- Mark and cut the inner end of the elevon about 25mm (enough to clear the fuselage by at least a couple of mm) from the wing centre line.

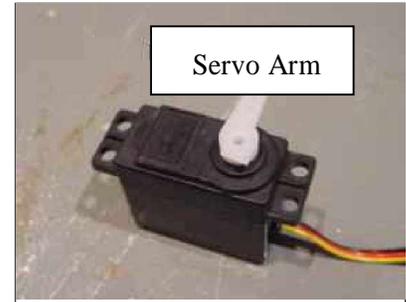


- Lay a ruler along the tip; draw a line on the Elevon in line with the tip. Cut the balsa at this line.

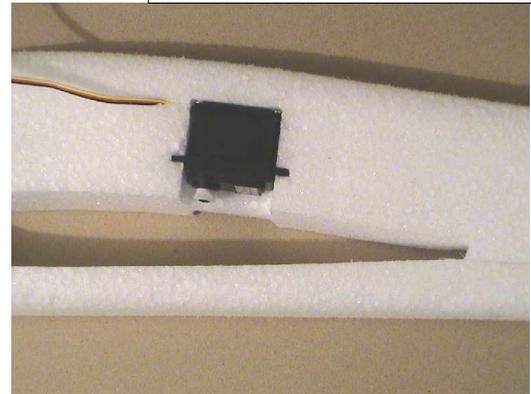
7. Cover both elevons with coloured tape or coloured material of your choice.

Plug in your Servos, Elevon mixer (if required), battery, receiver and turn on.

8. Select one servo arm for each servo. You need a straight arm about 15mm long for each servo. It'll be necessary to cut any unused arms off if there's more than one.
9. Use a 2.5mm diameter drill to enlarge the outer most hole in the servo arm.



10. Position the 2 servos in the fuselage cut-outs above the wing. Note: You can install servos without the mounting lugs. Cut the lugs off with side cutters or a very fine saw, DON'T CUT THE LEADS!! If you don't wish to cut the lugs off, you don't have to, just cut out spaces for them in the fuselage to suit.



A good tip here is to make a small hole through the fuselage in the servo cut-outs to get the left servo lead across to the receiver.

11. Ensure the servos have their arms at the bottom of the servo, pointing toward the wing tips and the servo leads towards the front. Check that the trims are in the central position on your transmitter and the servo arms are pointing out at right angles to the fuselage - adjust the position of the arms on the servo so both point out equally.

Note: Make sure the servo (arm) is 2-3mm above the wing slot so it clears the wing with a clevis attached, when fully assembled.

- Check that the directions of travel are correct. When you pull the elevator stick back (or towards the bottom of transmitter case) both servo arms should move toward the nose of the fuselage. Moving the stick towards the top of the transmitter should produce the opposite reaction. Moving the aileron stick left, should move the left servo arm towards the leading edge, the right servo arm towards the trailing edge. Moving the aileron stick to the right should cause the opposite reaction. Refer to your Transmitter or mixer documentation for instructions on programming. When satisfied the servos are correctly set up, re-install the screw to keep the servo arm on.
- It's very important that the servo arms are both the same length, both are set at the same angle, and both move the same amount when you move the elevator stick on the transmitter. If you don't get this right the model could be difficult to trim and won't loop or roll straight.

## Refer to the plan on the back page for the next steps.

### Fuselage shaping:

Now is the best time to shape the fuselage, use a sharp knife to remove the corners initially, then a sanding block with 40 to 80 grit sandpaper. Take your time, the end result should be a 25mm radius around the top and a smaller radius 5mm, around the bottom corners. Refer to the plan for the ideal shape.

12. The servos should be a neat fit in the fuselage & the cut-outs are sized for standard servos, but you may need to relieve or fill the cut-out with some EPP off-cuts to achieve a good fit around your servos. When you're satisfied with the fit, Gorilla glue the (EPP offcuts and) servos in place & alternatively, use double sided tape to hold them in. (Spray contact adhesive on the back of the cut out in the fuselage, before sticking the servo in place with tape).
13. Now install the receiver and battery in the slots provided, depending on the size of the receiver used, the cut-out may also require relieving or off-cuts of EPP to wedge the receiver in neatly. Don't glue the receiver or battery in & but do try for a nice push fit.
14. If you're using an electronic mixer, cut a hole for it just behind the receiver if necessary.
15. Make a shallow knife cut from the battery and servos to the mixer and receiver and push the wires into it.
16. Curl the aerial up on top of the receiver for now to keep it out of the way.

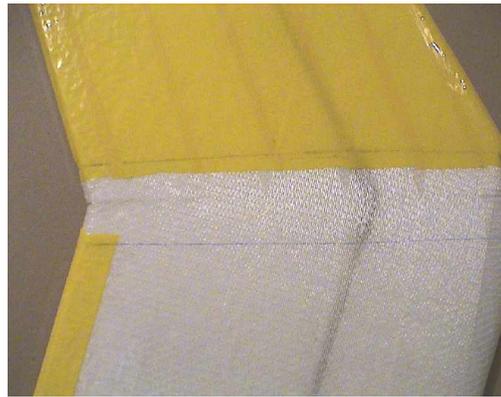
## Taping

### Wing.

Before taping the wing, you have to remove a small section from the leading edge at the wing centre & refer to the plan at the back of these instructions.

17. Spray the top of the wings with a light mist of Spray adhesive; this is best done outside or with newspaper on the floor to catch any over spray.
18. Refer to the taping plan. Using the strapping tape, first apply pieces 1A & 1B on the top of the wing, take care not to stretch the tape as it goes on! Then apply 2A. 2B is not shown but it's just forward of 1B and so on. When complete, turn the wing over and repeat on the bottom side.
19. Dry fit the fuselage to the wing at this stage, align it so that it's central to the fuselage and the distance from the nose to each wing tip (trailing edge) is equal on both sides. Draw a line down either side of the fuselage onto the wing, top and bottom.
20. Cover the wings with coloured tape & but stop the tape just 5mm over the lines you've just drawn, as shown in the photo on the next page. Apply the tape without stretching, in much the same manner as shown on the taping plan. If you like the translucent effect of the coloured tape, use one layer. If you want a more solid colour, use a second layer.

Wing centre section showing the fuselage outline drawn on the wing and the typical amount of coloured tape over the line.



21. Hinge the Elevons to the trailing edge of the wing.

- Temporarily attach the elevons with 2 small pieces of tape on the underside of the wing and elevon.
- Apply coloured tape along the top of the hinge line.
- Remove the 2 temporary pieces of tape.
- Fold the elevons onto the top of the wing and apply a layer of tape along inside of the hinge line. Check that the elevons travel freely up and down.

Fuselage.

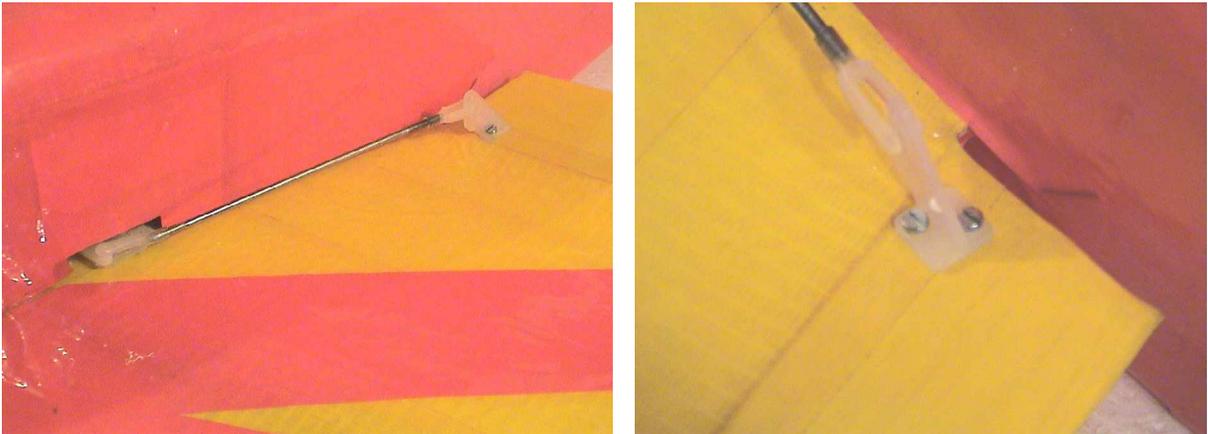
22. Put white paper over the servos to prevent the tape from sticking to them and to keep the colour even. Spray contact adhesive on the fuselage then apply strips of the strapping tape along the sides of the fuselage from the nose back to the fin & covering the wing and fin slot as well.
23. Tape from nose to tail along the top and bottom of the fuselage, segment the edges of the tape where it goes around complex curves. Stick the segments down, from the tail end first, working towards the nose.
24. Cover the fuselage with coloured tape & start at the bottom and work up towards the top of the fuselage, cover the wing and fin slot as well. Take your time, segmenting the edges to go around complex curves, avoid wrinkles as much as possible. (Small wrinkles can be 'ironed' out later on with an iron or covering iron).
25. This will have covered the servos, battery and receiver. Cut minimal holes for the servo arms to exit and for the battery lead to plug into the receiver. Most fliers choose not to use a switch, preferring to plug the battery lead into a servo extension lead outside the covering, the other end of which is plugged into the receiver. This makes it easy to charge the battery pack.
26. Cut the covering away from the wing slot and carefully slice the tape along the joining line at the rear of the fuselage.
27. Now Gorilla glue the fin in place. Cut away the tape covering the fin groove along the top of the fuselage, then glue the fin in with Gorilla glue. Make sure you keep it vertical and at 90 degrees to the wing slot and remember to wipe off any excess glue before it sets.

## Joining the wing to the fuselage.

- Apply Gorilla glue to the wing around the centre section.
- Spread the rear of the fuselage apart carefully and apply Gorilla glue sparingly to the bottom rear section of the fuselage where it will join.
- Install the wing into the wing slot from the rear of the fuselage, taking care to keep the wing central. Align the wing to the fuselage as you did in step 19. Put coloured tape around the rear of the fuselage, to hold it together while the glue dries. A bit of weight on top of the fuselage will also help.

### 28. Make and fit the Elevon Pushrods and Control Horns.

- Thread a clevis onto each end of the wire pushrods



- Attach the clevises to the servo arms.
- Ensure the pushrod wires are as near as parallel with the fuselage, mark the location on the Elevon for the white plastic Control Horn.
- Place a control horn over this mark, with the vertical section of the horn parallel to the fuselage. Mark and drill 2mm holes for the screws. Install the control horn with the screws and backing plate provided. Repeat for the other Elevon. Cut the excess length of screw off after you've tighten them.
- Clip the clevises into the Control Horns 4 holes down from the top of the horn.
- Adjust the pushrod length by threading the clevises on or off the wire to set the correct angle. Place a ruler under the wing and elevon; set the Elevons up so there's a 5mm gap between the elevon and the ruler at the trailing edge, for your first flights. Ensure both elevons are set at the same angle.
- For more control movement move the clevis hole closer to the Elevon, for less movement move it to a hole further out.

## Final balancing and control set up.

29. First balance the model laterally. Suspend the model between your fingertips placed at the nose and tail of the fuselage. If one wing is heavier than the other, add a small amount of weight to the lighter wing tip until it balances.

30. Mark the Centre of gravity 180mm back from the leading edge at the centre of the wing, next to the fuselage. Now balance the model on your fingertips placed at this point. It may be necessary to add weight (lead is best) to the nose or tail to balance, fit this into a small hole in the underside of the fuselage and tape over.



31. Set up the elevons so that when you move the aileron stick on the transmitter to the left (applying roll control) the left elevon moves 10mm up and the right elevon moves 10mm down. Move the aileron stick to the right for the opposite effect. When you move the elevator stick on the transmitter up and down (Pitch control) both elevons move 10mm up and down. (Measured at the trailing edge).  
Note for beginners, go for 6mm up/down movement on both controls instead of 10mm.

32. Lay the receiver aerial along the side of the fuselage and attach it to the top of the fin with a small piece of tape, let the excess length trail off. Don't double the aerial up as it can affect the range of your radio.



This is a photo of the original prototype for the Arrow, which flew right off the building board! Well almost, it certainly flew well on its test flight in over 20 knots of wind – it impressed me straight away with its responsiveness and ability to move around the sky in strong winds without any ballast. This model is still flying just as well, six months after it was built – it's become a firm favourite. I've flown it in winds over 20 knots and in as little as 10 knots, it thermals pretty good and its fun to fly! I hope you enjoy the Arrow as much as I do.

Cheers,  
Carey Burr.

## CONGRATULATIONS – Your model is now assembled – LET’S GO FLYING!!!

### First a quick note on safety:

- Model Aircraft, even those made from EPP foam like the Arrow, can be dangerous if you hit someone, be careful, think about where you fly and the safety of yourself and those around you.
- Avoid flying sites close to full size airfields, roads, houses and power lines.
- Don’t fly near Para-gliders, you can injure these people or worse, if you collide with them in flight. Wait until they land or fly somewhere else.

### A few notes on flying for beginners

**If you haven’t flown before it is well worth getting some help.** Ask at the local model shop or go to a local flying slope, most fliers will be very happy to help.

If you are a first time flier, before going to a slope, go to the local park and practice throwing and gliding the plane flat and level into the wind. This will get you used to the controls so that corrections become quick and automatic because on the slope you don't get time to think about which stick to push in which direction. Before flying, check the basic functions, i.e. up is up, down is down (stick forward), right is right and left is left. Check the radio range by following your radio manufacturers’ instructions.

These initial flights will also be a good opportunity to trim your model for straight and level flight.

Once on the slope and you have mastered level flight try some turns. As you turn you will need to add a small amount of up elevator to keep the model level. Be very gentle on the controls, the model will not fly well if you use lots of Jab type control movements on the sticks. It's best to **always turn into the wind** as down wind turns can take up a lot of airspace; it can also be tricky to judge the correct airspeed.

Good soaring slopes are a little hard to find, however this makes an interesting challenge for this captivating sport. A good slope is characterised by the wind blowing straight up a slope that is steeper than 45 degrees. Tall sand dunes over about 6 Meters and hills higher than about 30 Meters should provide sufficient lift. You will often see birds soaring in these areas. **It's best to talk with local flyers** or see where others are flying to find the best sites for each wind direction and strength. You can also get first-hand tips on flying and trimming. Most foam planes will fly well in winds from 10 knots to 20 knots. Experts can fly outside this window.

Choose a place to fly that offers a landing site. With EPP models this is less important - just dodge rocks if you can. Long grass, tussock or bushes are fine. **Watch out for spectators!**

Thermals will also assist flying. Thermals are generated by sun the sun heating the land, warming air which then rises as it is lighter than surrounding air. This makes a sunny slope work better than a sheltered one. Before flying, ensure that your transmitter batteries are charged. Follow your radio manufacturer's instructions for proper safe radio operation.

**Always make sure that no one is on your frequency before turning your radio transmitter on.** Do this by asking any other flyers if they are on your particular radio channel (refer radio manufacturer instructions to determine the channel you are on).

When you choose a slope, have a good look around and imagine where you will fly, pinpoint areas such as trees and cliffs where you don't want to fly and decide where you will land and perform a final range check (refer radio manufacturer instructions).

Always launch your model straight into the wind, with the wings level and a firm push out. Be ready to stop a steep initial climb by pushing the stick forward. Also be ready for a sudden turn to one side. Concentrate on keeping the model in front of you and heading away from the slope. If the model heads down and out from the slope, try pulling up a little. *If the model continues to sink, land it before you loose it!*

If the model climbs nicely but starts to go back over your head, push the elevator stick forward slightly (down elevator) to get speed up and hold it until you can fly it some metres in front of you. Once you are comfortable, try some zigzag turns, always turning into the wind. Remember to add up elevator when turning. Don't try fancy moves yet, just concentrating on getting your hours up. Practice, practice, practice.

Note the bad areas are below the horizon and down wind of you. This will put you out of the lift and into turbulence.

It can be quite cold on the slope so be prepared to dress warmly so you can enjoy the day.

## **SUMMARY OF SLOPE ETIQUETTE**

You will always be welcomed at an established slope flying location by experienced flyers. The majority of flyers will almost always be prepared to stop what they are doing to help out and offer advice if you ask for it, so don't be shy.

Some informal rules have developed over time, which allows everyone to enjoy the slope. Some of these are listed below:-

Always check there are no other flyers are on the same frequency as you before turning anything on. *You can only establish this by asking around.*

Avoid flying or landing where other flyers are standing. Pay particular attention if there are any spectators nearby, remember, foam models can hurt if they hit people.

Do not engage in combat with a composite or balsa model at any time. These are very expensive models and do not bounce like your new EPP model!

Challenge other EPP flyers before beginning combat so they know what's going on and can decline if they wish.

Avoid at all times any hang gliders or Para gliders. If you intend to share the same slope make sure you talk to these people before launching. You must give way at all times. *A foam model has the potential to damage parts of a hang glider or para glider resulting in serious injury or death.*

## **Parts list**

Fuselage	1	
Wings	1 Set	
Balsa Elevons	2	
Fin	1	
Spars	4	
Elevon Horns	2	
Screws	4	
Backing plates	2	
Clevises	4	
Alloy wing joiners	2	
Strapping tape	1	
Coloured Tape	1	
Gorilla glue Adhesive	1	
Instructions	1	

**Canterbury Sailplanes**  
www.canterburysailplanes.co.nz