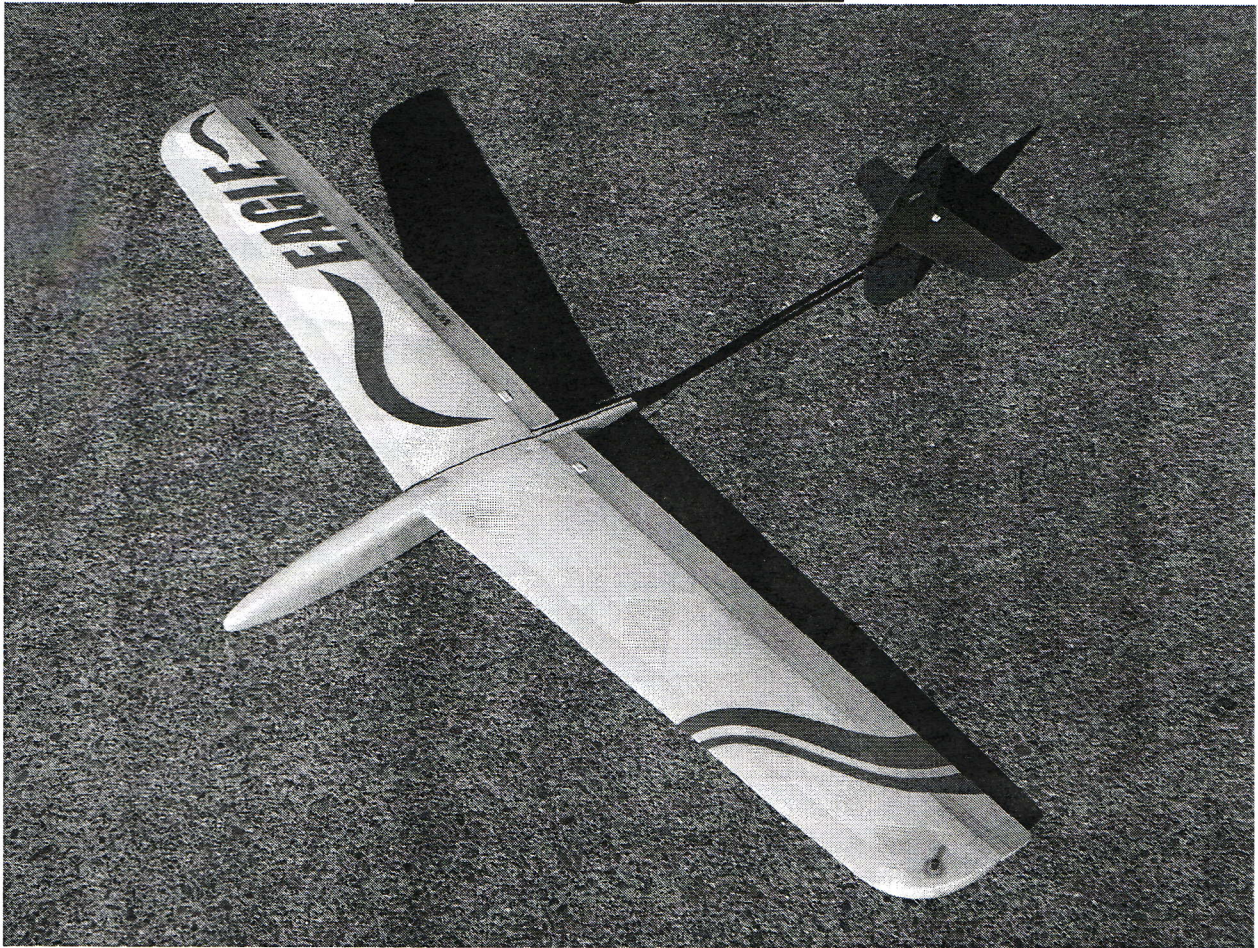


EAGLE

Building Guide



Discus launch glider

By Canterbury Sailplanes

Congratulations on your purchase.

The Eagle is designed specifically for discus launching, capable of high performance off the flat, it's also suitable for launching with a mini bungee or off the slope in light wind conditions (when most other models are grounded!).

EPP is a fantastic material for Model Aircraft; it's incredibly resilient and will take almost all the punishment you can give it – which makes it perfect for a first (DLG) model.

Assembly of the Eagle is straightforward and shouldn't be too difficult for anyone that's built an EPP glider before. If you have any problems please contact Canterbury Sailplanes or the shop you bought the kit from.

Special thanks to **Alex Hewson** for assisting with the design and development of the Eagle and **Shane Williams** for a lot of useful input into these instructions.

Canterbury Sailplanes

www.flycs.com

GENERAL NOTES – Read these before you get started!

- At the back of these instructions there are plans of the Eagle (3 sheets), study these before you start building as they show where the radio gear is located, the wing taping plan and the general layout of the Eagle.
- A computer radio is required to get the best out of your Eagle; it requires 3 mini or micro servos, a light weight receiver and a 4.8v 270mah battery pack (the Hitec 270mha pack uses 4 x AA half sized cells) or similar small sized battery, plus a short aileron extension lead for a battery connection - optional.
- The kit contains nearly everything you need to build your model. To complete the Eagle you'll need a 210ml can of spray adhesive (Ados F2 or 3M Spray 77), some Epoxy glue and some basic tools to get your Eagle ready to fly (See the list on page three). One optional item is balsa sanding sealer for the ailerons.
- Shipping regulations prohibit sending 3M Spray 77 or Ados F2 contact adhesive. These are great glues for adhering the tape to EPP and we strongly recommend using it. Adhesive spray should be available from your local hobby or hardware shop. A 210ml sized can, should be adequate.
- As you build the Eagle, avoid using excessive amounts of glue and tape as they can add weight quickly. The Eagle will fly best at its lightest weight, so try to avoid adding unnecessary weight during construction – in particular on the tail section!
- The kit includes Coloured Polypropylene tape and Strapping tape (fiberglass reinforced) make sure you use the correct tape as specified in the instructions. There are 50 meters of Coloured tape and 24 meters of Strapping tape.
- To decorate your model use different coloured tape, iron on covering film (available from a model shop) or self-adhesive vinyl (available from your local sign writer). Don't over-do it though, as this will increase the weight of the finished model. Where the Assembly instructions specify coloured tape these other products can be used instead. If you use other coloured tape products, they must be of similar spec, i.e. polypropylene or vinyl, but not PVC. Iron on film also looks great; apply using a low heat, onto the strapping tape, (use contact adhesive with iron on films as this also helps the bond). Test a small piece of covering film and heat settings on a scrap piece of EPP, before applying it to your model.
- When applying the contact adhesive to the model; lightly spray it onto the model from about 200 – 250mm away and leave for a minute or two, until the glue is quite tacky, before laying the tape onto the glued surface. Once it's on however, it's difficult to remove - so take care.
- Check that all the parts as per the parts list (see back page) are packed in the box. Notify Canterbury Sailplanes immediately if any parts are damaged or missing.

LMA

One addition we recommend for your Eagle is a Lost Model Alarm, this is an excellent investment if you ever land/crash in trees, or long grass, your model may be hard or even impossible to find. A lost model alarm will sound for up to 2 days. Ask your model shop or check out our website for details.

If you don't install an LMA, it's always a good idea to put your name, address and contact phone number somewhere on your model – just in case!

Glue types and where to use them:

Gorilla Glue is included in the kit, this is a great all purpose adhesive. Using it is a little different from most glues however as it foams while curing. Note the following points;

- Read the instructions on the packet.
- Use a minimal amount, as the glue foams and expands when curing; wipe off any excess with a damp cloth.
- To get a better finish, tape over the joints, this will leave a smooth finish to any exposed glue when it's cured.
- When gluing the wings together and later, onto the fuselage, the expanding glue may push the items apart – clamp or tape the parts together to prevent this from happening.
- Any excess can be sanded or cut off after the glue has cured.

Use Gorilla Glue:

- To join the wing halves together.
- In the spar joiner to hold the spars in place.
- Installing the spar into the wing.
- Installing the launching peg into the wing tip.
- Holding servo's in place.
- To join the tail boom into the fuselage.
- To join the wing to the fuselage.

Epoxy – (e.g: Araldite) 5 minute Epoxy is ok, but you'll get stronger joints with a slower curing Epoxy glue.

Use Epoxy glue for:

- Joining the tailplane onto the tail boom.
- Joining the fin and sub fin onto the tail boom.

Tools you need to complete your Eagle include:

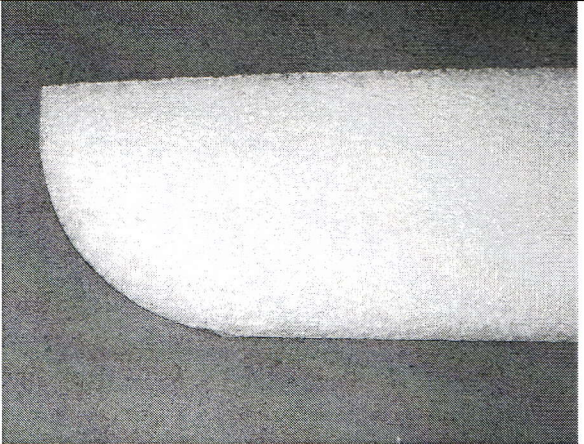
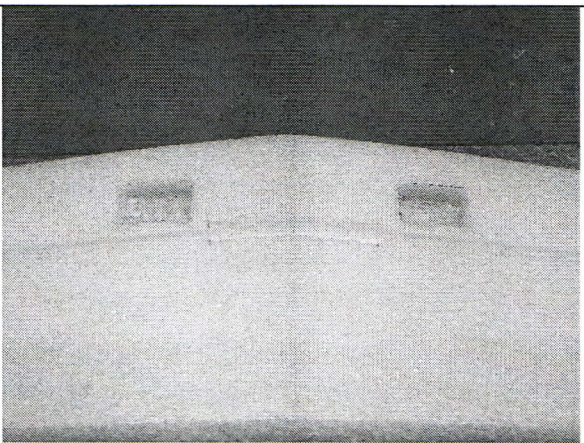

1. Small power or hand drill
2. 1.8mm drill bit (Servo arms, Control horns – to take the wire pushrods)
3. 6mm drill bit (Launching peg)
4. 2.5mm drill bit (Control horn screws)
5. Small ruler or tape measure
6. Sharp knife, scalpel or modeling knife
7. Scissors to cut tape
8. Sandpaper (40 - 240 grit is ideal)
9. Marker (a ballpoint pen will do)
10. Small phillips head screwdriver (for the servo's)
11. Small flat head screwdriver (for the control horn screws)
12. Long nose pliers
13. Soldering iron (not 'essential' but can be helpful)

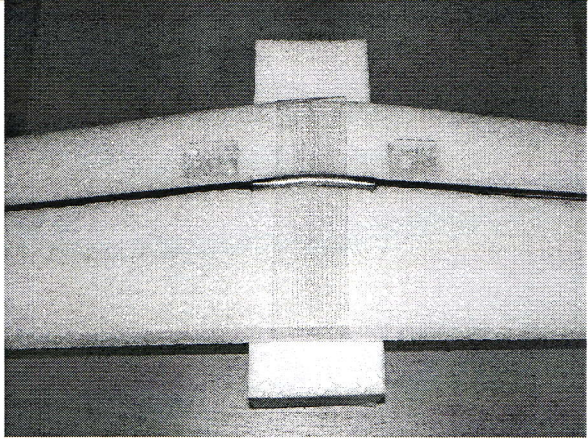
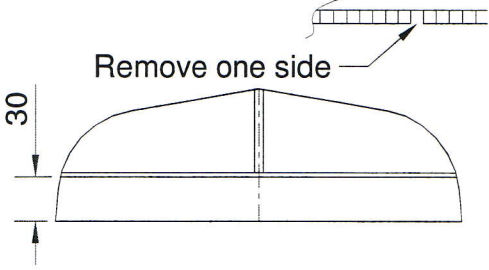
Servo installation – Retain the servos in the wing and fuselage by the following methods:

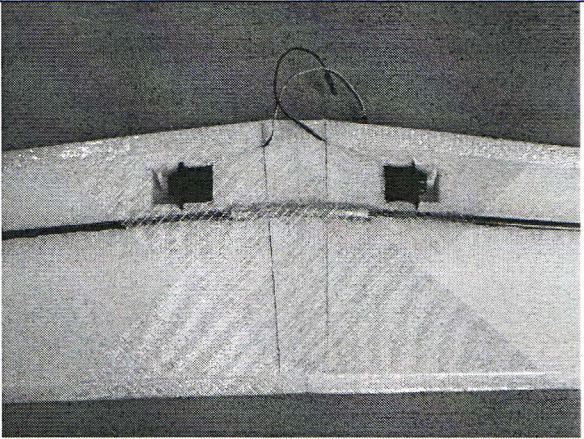

- Neat fit in the recess (no glue required),
- Gorilla glue them in, or
- Put double sided tape on the servo and spray contact adhesive into the recess before inserting the servo.

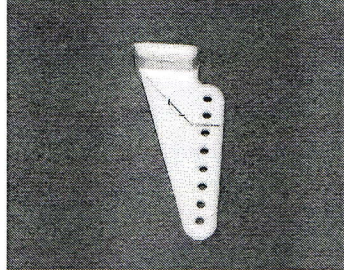
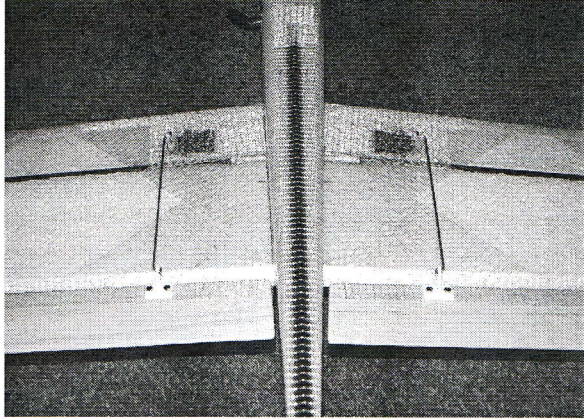
Building sequence.

The Wing:



1	<p>Form rounded wing tips.</p> <p>The one shown here on the right has been trimmed with a sharp knife to shape. This will leave just a small amount of sanding to finish off.</p> <p>(Refer to sheet 2 of the plans – Note: R95 means a radius of 95mm)</p>	 A close-up photograph of a white, rounded wing tip. The tip is smooth and has a consistent curve, demonstrating the R95 radius mentioned in the text.
2	<p>Join the two wing halves together – support one wingtip up 90mm to ensure the correct dihedral is achieved.</p> <p>(Refer to sheet 1 of the plans)</p> <p>Tip: Support the middle section of the raised wing also to prevent it from sagging and ensure a nice even joint.</p>	 A photograph showing two white wing halves joined together at their tips. The wings are held up at the tips, creating a clear dihedral angle. The joint is visible in the center.
3	<p>Assemble the spars and spar joiner.</p> <p>Apply a small amount of Gorilla glue inside the joiner either side before inserting the spars (in as far as they can go!).</p> <p>Lightly crimp the joiner tube (about 5-10mm in from each end) onto the spars with a pair of pliers.</p>	 A photograph showing a black spar and a black spar joiner. The joiner is a curved tube that fits over the spar. The assembly is shown against a dark, textured background.

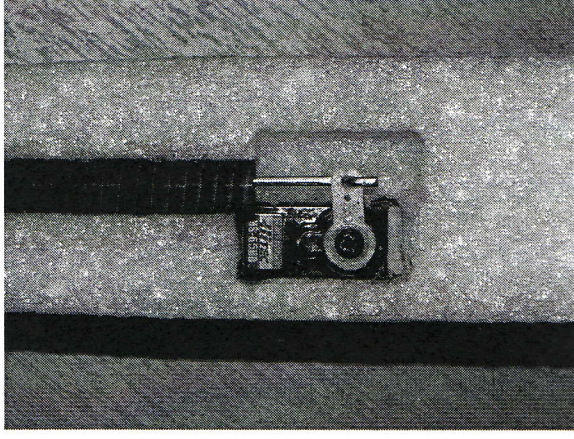
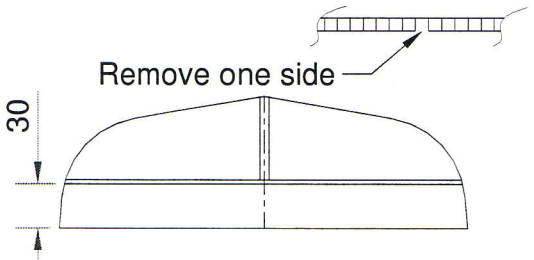
<p>4 Before installing the spar into the wing, check the spar grooves are clear of any small hard pieces of EPP.</p> <p>Lay the spar onto the upside down wing and mark out the joiner location. Carefully trim (or use a soldering iron) to relieve the spar groove sufficiently to allow the joiner to fit easily (see the photo in step 2).</p> <p>Apply Gorilla glue along the spar groove and insert the spar. Tape in position while the glue cures.</p>	
<p>5 Trim 1mm off the wing leading edge (point) at the wing centre.</p>	
<p>6 Mark the fuselage position onto the wing.</p> <p>ENSURE the wing is aligned correctly from side to side and square to the fuselage center line.</p>	<p>(Refer to photo in step 8)</p>
<p>7 Trim the ailerons to size.</p> <p>Tip: Start at the inner end first. Use a piece of cardboard to get the correct angle between the fuselage and wing trailing edge. Then mark the angle from the cardboard onto the ailerons.</p> <p>Tip: When the ailerons are to size, use one coat of balsa sanding sealer over the ailerons to provide an effective water proofing.</p>	<p>(Refer to sheet 2 of the plans)</p>

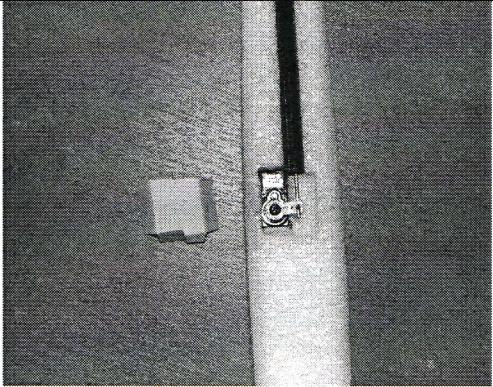

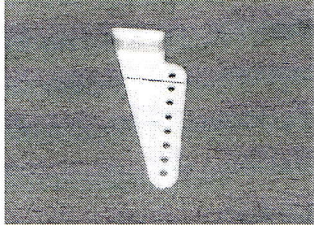
<p>8 Remove the aileron servo arms and cut off all but one of the arms. Drill the outer most hole with a 1.8mm drill bit. Set up the servos/arms to have one left hand and one right hand servo as shown here.</p> <p>Insert the aileron servos with the wires to the front and make shallow cuts for the wires to feed across to the fuselage.</p> <p>Cut away small amounts of EPP in front of the servo arms (to allow full movement) and to locate the servo mounting lugs.</p> <p>Tip: Before refitting the servo arms, ensure both servos are centered (check the trim lever on the Tx is centered as well) before finally installing the aileron servos.</p>	
<p>9 To install the launching peg, first drill a 6mm hole through the two ply reinforcing plates. Then sand the plates and the peg, to remove the square corners, as shown here.</p> <p>Drill a hole in the wingtip (refer sheet 2 of the plans for the correct position) and glue the peg and plates in place with Gorilla glue.</p>	
<p>10 Tape the wing and attach the ailerons.</p> <p>Apply the tape in the order shown in the plans.</p> <p>Note: Strips 2 and 11 go around the outer ends of the ailerons as well – but they can be fitted as four separate pieces, split at the hinge line.</p> <p>Note: Strips 16, 17, 30 and 31 are cut down to just 25mm wide.</p> <p>Tip: Rotate the servo arms down below the surface of the wing while taping, then cut a small slot in the tape for the arms to extend through.</p> <p>Tip: Put a small mark on the wing leading and trailing edges at the points indicated in the plans to help align the strips of tape correctly.</p> <p>Tip: When applying the contact adhesive spray, only spray the wing in the areas where the tape will go.</p>	<p>(Refer to sheet 3 of the plans)</p> <p>Taping Tip: Make sure your scissors or knife is really clean before starting. To prevent the gum from the tape building up on the blades while you're cutting the tape, spray a light mist of Silicone onto the blades. Wipe off the excess spray before you start cutting tape and the blades should stay clean and easy to use.</p>

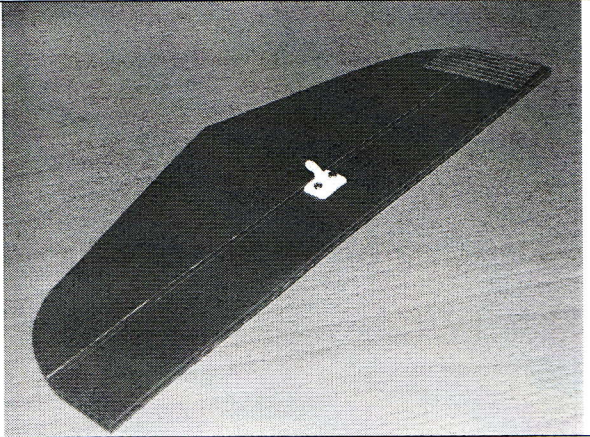
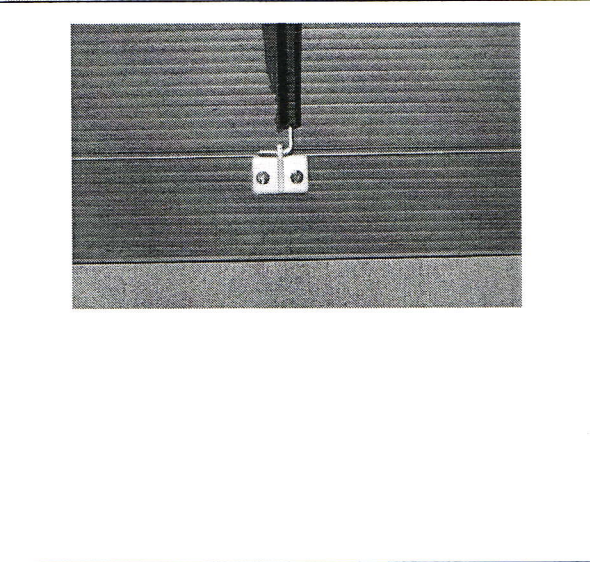
<p>11</p>	<p>Trim the aileron control horns to size.</p> <p>Cut the two aileron control horns just above the second hole – as shown by the mark on the control horn here.</p> <p>Drill the outer most hole (second hole) with a 1.8mm drill bit.</p>	
<p>12</p>	<p>Fit the aileron pushrods into the servo arms and attach a control horn to each pushrod.</p> <p>Ensure the servos are centered and the ailerons are aligned with the bottom of each wing, then temporarily tape them so they can't move.</p> <p>Position the control horns on the ailerons and mark the screw holes.</p> <p>Drill the screw holes with a 2.5mm drill bit and fit the control horns to the ailerons.</p>	


The Fuselage:

<p>13</p>	<p>Shape the fuselage around the nose.</p> <p>Note: – Do not remove any EPP from the wing seat or the rear section of the fuselage.</p>	
<p>14</p>	<p>To produce the elevator pushrod supports, first cut one of the short lengths of carbon fibre tube into two equal lengths.</p> <p>Tip: Don't clamp the tube too tightly while you cut it as it can crush easily!!!</p> <p>Insert one into the large end of the tail boom drop it down inside the boom until it's firmly lodged in place.</p> <p>Wrap <u>two</u> thicknesses of strapping tape around the second piece and insert that into the boom, push it down until firmly in place.</p> <p>Tip: Cut the strapping tape 2mm longer than the support tube – overlap the end that goes into the boom first, by 2mm, to aid getting it into the boom.</p> <p>Tip: Use a stiff wire or length of 5mm dowelling to tap the supports firmly into place.</p>	 <p>Tail end pushrod support (should be 225mm approx from the small end of the boom).</p>  <p>Servo end pushrod support (should be 150mm approx from the large end of the boom).</p>

<p>15</p>	<p>To install the elevator servo: Remove the servo arm. Trim off all but one of the servo arms. Drill the outer hole in the arm out to 1.8mm. Cut off the servo mounting lugs. Insert the servo into the fuselage with the wire towards the front – glue in place if required.</p> <p>Tip: Use small pieces of EPP from the wing skins as packing if required. (I used a small piece of balsa for this one)</p>	
<p>16</p>	<p>Connect the elevator pushrod 'z' bend to the servo arm and insert the pushrod through the tail boom.</p>	<p>(Refer to the photo in step 15)</p>
<p>17</p>	<p>Apply Gorilla glue into the tail boom slot in the fuselage – KEEP THE GLUE CLEAR of the servo end (about 10mm back). Insert the tail boom into the fuselage and connect the elevator servo arm back onto the servo. Tape the boom in position until the glue cures.</p>	<p>(Refer to the photo in step 15 and sheet 2 of the plans)</p>
<p>18</p>	<p>Cut the elevator hinge by carefully removing one side of one flute, 30mm from the tailplane trailing edge. Mark the center of the trailing edge and put a line at 90 deg up to the leading edge. Then mark a line 3mm either side of the center line – this will aid aligning the tailplane to the fuselage when attaching it.</p>	
<p>19</p>	<p>Fit the wing temporarily on the fuselage, align the marks on the wing (step 6) with the fuselage sides and mark the fuselage where the aileron servo wires (in the wing), meet the fuselage sides.</p> <p>You may also need to mark where the wing joiner touches the fuselage and relieve the wing seat slightly to allow the wing to fit neatly. Make shallow cuts in the fuselage for the aileron servo wires to go through to the receiver recess.</p>	<p>(Refer sheet 1 of the plans)</p> <p>Tip: You'll need to cut through the strapping tape on the sides later, to feed the servo wires into the cuts you've just made. To make it easier to cut the tape in the right place, mark the cuts so you'll be able to see where they are through the tape.</p>

<p>20</p>	<p>Tape the fuselage. Spray it first with contact adhesive. Start along the bottom with a full length strip, trim it to give a 5mm overlap either side. Pleat the tape edges to go around the curves.</p> <p>Tape the sides next but leave the top uncovered for now.</p> <p>Tip: Make a cardboard cover for the servo to keep the glue and tape from sticking to the servo arm and pushrod.</p>	
<p>21</p>	<p>Glue the wing into position with Gorilla glue. Line it up with the marks you made on the wing in step 6.</p>	<p>Tip: Use a piece of sandpaper (180 -240grit) to lightly roughen the surface of the strapping tape on the wing where it attaches to the fuselage, to improve the bond.</p>
<p>22</p>	<p>Lightly spray contact adhesive over the top of the fuselage and wing then apply a strip of strapping tape across the fuselage and wing. Trim the overhanging edges back to approximately 5mm and pleat the edges of the tape to go around the curves.</p>	
<p>23</p>	<p>Before gluing the fin(s) and tailplane onto the tail boom, apply a 10mm wide strip of coloured tape to the leading edges of each part.</p> <p>Refer to the fin shown here (the darker colour around the edge is actually the tape) – the coloured tape wraps around the leading edge, sealing off the coreflutes.</p> <p>You'll need to 'pleat' the tape to get it to go around the corner. Take your time and do this carefully to get the best finish.</p>	
<p>24</p>	<p>Cut the elevator control horn just above the first hole – as shown by the mark on the control horn here. Drill the (first) hole out to 1.8mm.</p> <p>Fit the elevator control horn onto the elevator, aligning the 'horn' <i>with one</i> of the outer lines you marked on the tailplane in step 18. (Refer photo in step 18)</p> <p>Tip: Drill 1.8mm holes through every <u>second</u> 'flute' along the center line starting 15mm forward of the hinge line. This will improve the joint when the tailplane is glued onto the tail boom.</p>	

	<p>Step 24 cont'd</p> <p>Note the lines through the center of the tailplane to align with the tail boom and the tape across the hinge on the far side to hold the elevator flat for step 26.</p> <p>Tip: Ensure the elevator servo is centered (check the trim lever on the Tx is centered as well) before going to the next step.</p>	
<p>25</p>	<p>With the elevator servo in it's centered position measure and mark the elevator pushrod 6mm out from the end of the tail boom.</p> <p>Grip the pushrod wire with pliers at the end of the tail boom so that the mark is <i>just covered</i> by the pliers. Now bend the pushrod extending from the pliers (opposite the tail boom), 90 deg horizontally to the side the control horn will be on. Trim the bent end of the pushrod 6-8mm long (Refer to the photo opposite).</p> <p>Now grip all of the pushrod exposed at the tail end of the boom (including the bent section) and bend it down approximately 1-2mm.</p>	
<p>26</p>	<p>Lightly sand the top and bottom faces of the tail boom.</p> <p>Connect the elevator pushrod to the control horn. Check you have approximately 6mm between the bent section of the pushrod and the end of the tail boom.</p> <p>Glue the tailplane onto the tail boom with Epoxy glue – aligning it with the wing horizontally and square to the tail boom.</p>	<p>(Refer to sheet 1 of the plans)</p>
<p>27</p>	<p>When the glue for the tailplane has cured, the upper and lower fins can be glued on with Epoxy glue.</p> <p>Ensure they're both at right angles to the tailplane and aligned with each other.</p> <p>Tip: Feed a small amount of Epoxy into the ends of the coreflute to improve the joint strength.</p>	<p>(Refer sheet 1 of the plans)</p>

28	<p>Cut the tape away from the receiver and battery recesses. Insert the battery and receiver then connect the servos to the receiver. If you're using an aileron extension lead for the battery connection, connect the lead to the receiver.</p>	(Refer to sheet 2 of the plans)
29	<p>Use small pieces of cardboard or EPP as covers for the receiver and battery.</p> <p>Wrap strips of tape around the fuselage to cover the battery and receiver recesses (barrel wrap), leaving the aerial and battery leads exposed as required.</p> <p>Tape the receiver aerial to the fuselage and across the top of the wing, leave the remaining aerial to hang free.</p>	
30	<p>Check the balance of the finished model nose to tail and from wing tip to wing tip.</p> <p>Tip: Use decorative stripes etc on the light wing to balance the model from side to side. Add weight if required to the nose in the battery compartment.</p>	(Refer to sheet 2 of the plans)

Computer radio set up ideas.

The Eagle used for putting together these instructions, was fitted with a Hitec Optic 6 radio, HFS-06MT receiver, 'Y' harness, 270mha flight battery and three HS-65HB servos.

With this set up I was able to use the ailerons as fully proportional flaps (using one of the two slide switches on the sides of the transmitter) and I mixed in rudder control at the Tx with aileron, so I could fly the model with just the left stick (Rudd/Aile and Elev) or more typically in Mode 1 form (Aileron on the right, Elevator on the left stick). The advantage of this set up was the ability to correct the climb heading immediately after launching – instead of waiting until my right thumb connected with the right stick again. I also use a small amount of right aileron mixed in with another switch on the Tx, for launching, to correct for a left swing on the climb – the need for this will differ from model to model.

Flying tips

Thermal soaring off the flat

I use a mid setting on the flap for launches and only put the flaperons down when the model is settled and lift is marginal. When lift is more readily available, I usually do a couple of launches going into wide circuits to assess where the lift is best. Then launch again and fly to where the lift seems to be generating from. If you notice the launch height is higher than normal you've possibly launched straight into a thermal – start circling immediately and watch for where the lift is best on each circuit. Adjust the circles to put the model more centrally into the lift and don't let it get too far down wind!

Slope soaring the Eagle

Although not designed specifically for slope soaring, the Eagle will slope soar in light to medium winds easily. I haven't tested it in winds above 10knots on the slope, so I can't offer a lot of advice, however the model penetrates well and with the wing stiffness it has, adding ballast shouldn't present any problems – although I suggest you do this gradually!!!

Discus launching the Eagle

Launch method

The basic discus launch isn't difficult to do, it's really just three steps, a spin and a half with a release of the model to finish... the trick is to get the movements happening automatically, because the whole launch takes just over a second to complete and to use your whole body. This is the method I use and for ease of explaining the wind is coming from the north and I'm right hand launching:

The grip. Grasp the launching peg with your index finger on top of the wing and only the first joint of your finger behind the peg. The middle finger on your launch hand goes under the wing and also only has the first joint behind the peg. Initially it feels like the model is going to fall off your finger tips (which is just about right) but by curling the two fingers in contact with the peg just a little, the model is quite secure.

Lining up. Identify which direction the wind is coming from (North) and point your launching arm and the wings of the Eagle down wind (South), or slightly off wind (South West) with the wind coming more onto your back. Start off with the outer wingtip resting on the ground. This position is almost the same one you need to be in just before step 3.

Step 1. With your weight mainly on the foot under your launching arm, start your rotation with a big step onto your other foot – into wind. At the same time start rotating your upper body into wind, leading with your shoulder (your launching arm is behind the shoulder at this stage).

Step 2. Now it's a little more tricky... when your second foot touches the ground, your launching arm is accelerating to catch up with your shoulder. This second 'step' is almost a skip; as you continue your rotation, *jump* onto your first foot – facing the opposite way (West).

Just remember you're only supposed to be winding up at this point, full speed ahead happens next...

Step 3. Ok you're on your first foot facing west, your launching arm should be pointing NE and catching up fast. The model will attempt to climb going into wind, a little bit is ok, but try to control it as best you can.

Now you're starting to rotate the model around you – heading down wind. This is the time to put the speed on, aim to get your launching arm in line with your shoulders just as you go through the down wind (South) point, ready for the final step.

I tend to let the model dive a little on the down wind section of rotation which helps get a good climb angle for release and gains a bit more speed.

As the model reaches the down wind position (South) my upper body is leaning down wind a little as well, with my left (second) foot off the ground, ready to put down. This part requires some twisting of the knee as you complete the final section of the spin so try not to load it up too much!!!

Make a fairly normal sized step onto your second foot and complete the last quarter turn of rotation with your upper body, coming to an upright position or slight lean into wind.

The release. Once you've made step 3, your feet should be roughly in line with the wind and you should be rotating your upper body into the wind (facing North). Your launching arm will be climbing up at between 45 and 60deg, and sweeping past you (to the East) at, or just above head height. At that point, relax your fingers on the launch peg and all going well your Eagle will be racing skyward.

Watch the model carefully, the climb should be quite steep (60deg or more) and possibly curling left or right. Correct the turn first, then bump in some down elevator to level off before the model stalls.

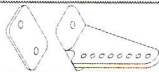

Start launching slow and at a lower climb angle until you feel confident about the movements. Adjust your launch direction relative to the wind direction to get the best launches.

Storage and care of your model.

Due to the awkward fuselage/fin arrangement, flat storage of the Eagle is difficult. The best method I've found is to hang it by the tail, vertically – preferably against a wall, alternatively stand it against the wall, with the nose and one wingtip on the floor.

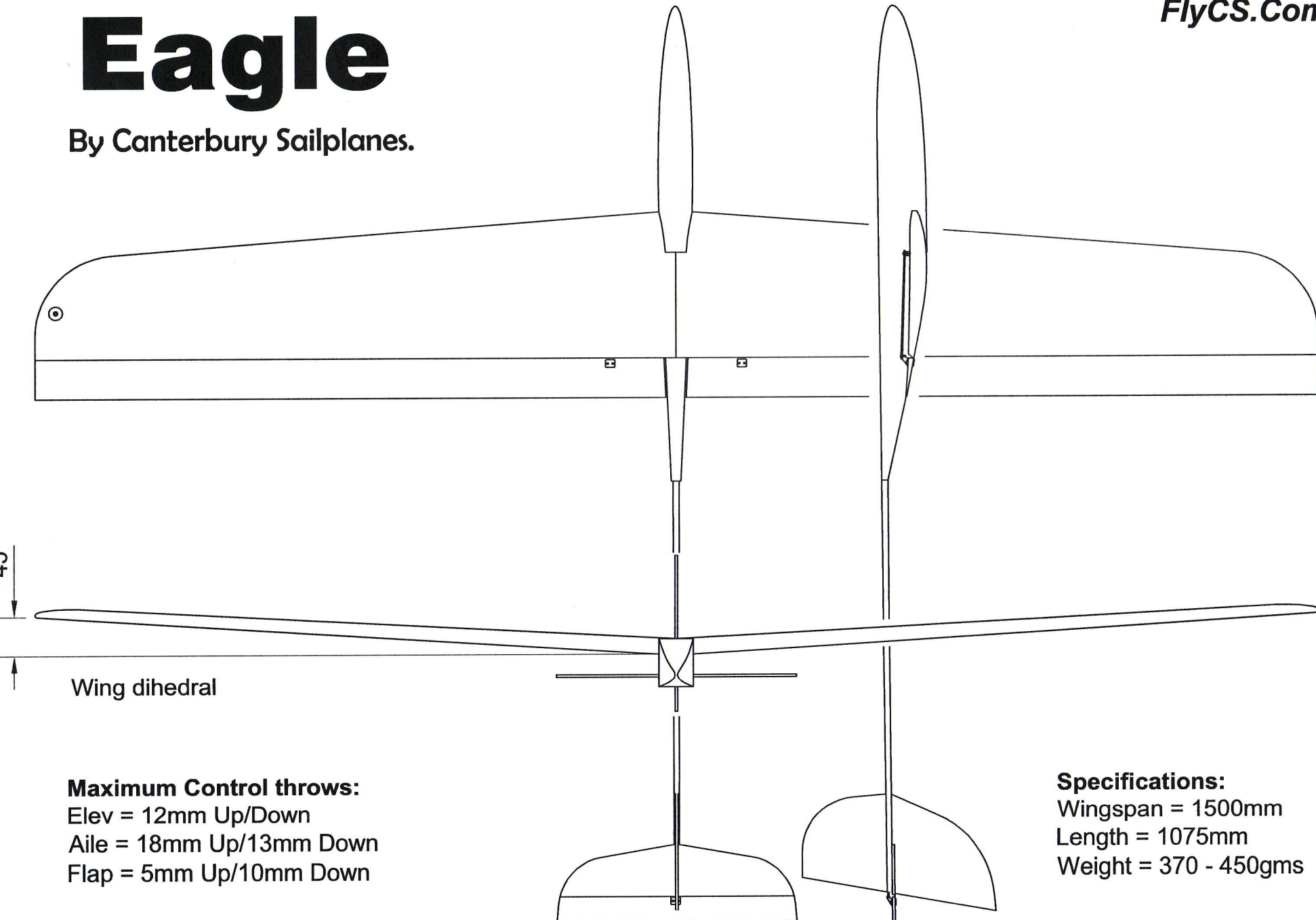
The sub fin is very vulnerable to being removed during a ground loop landing. Where possible, try to land straight and level to reduce the risk of knocking the sub fin off. In the event that this does happen, stop discus launching the model until you can re-attach the sub fin – without it the launches are uncontrollable. The Eagle will fly ok (ie: on the slope) without the sub fin – it's just not safe to discus launch it.

Parts List

EPP Wings	Left & right	
EPP Fuselage	1	
C/F Tail boom	1	
Corflute tailplane	1	
Corflute Fin	2pcs	
C/F Spars	2	
Wing Spar joiner tube	1	
Elevator pushrod wire	1	
Aileron pushrod wires	2	
Balsa Ailerons	2	
C/F Launching peg/pushrod support tubes	2	
Launching peg ply reinforcements	2	
Gorilla glue Adhesive	1	
Strapping Tape	1	
Coloured tape	1	
Control Horn & Base Plate	3 sets	
Control Horn screws	6	
Instruction Manual	1	
Plan	3 sheets	

Eagle

By Canterbury Sailplanes.



Wing dihedral

Maximum Control throws:

Elev = 12mm Up/Down
Aile = 18mm Up/13mm Down
Flap = 5mm Up/10mm Down

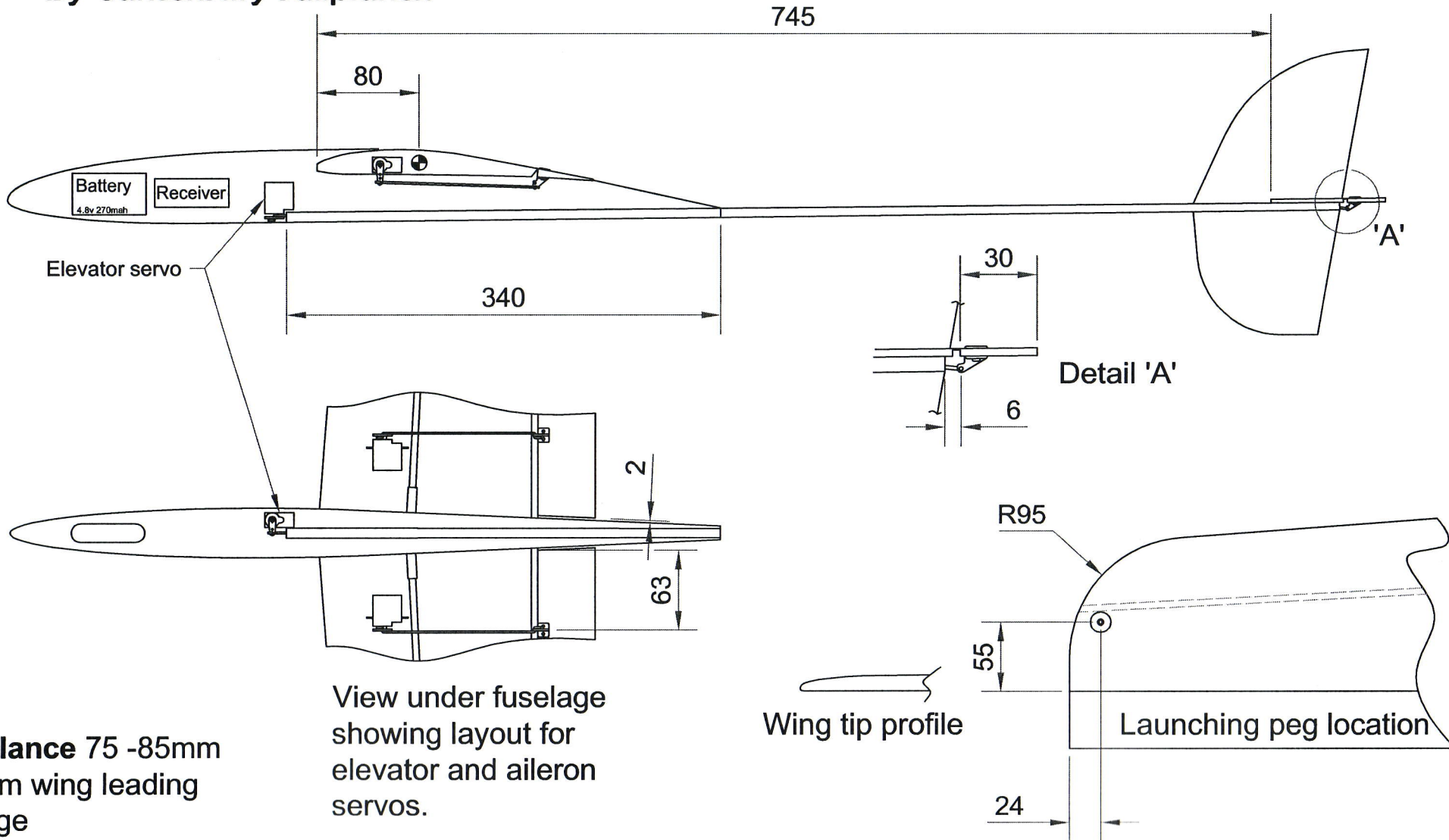
Specifications:

Wingspan = 1500mm
Length = 1075mm
Weight = 370 - 450gms

Eagle

Radio gear layout

By Canterbury Sailplanes.



Balance 75 -85mm
from wing leading
edge

Eagle

By Canterbury Sailplanes.

Wing Taping plan

