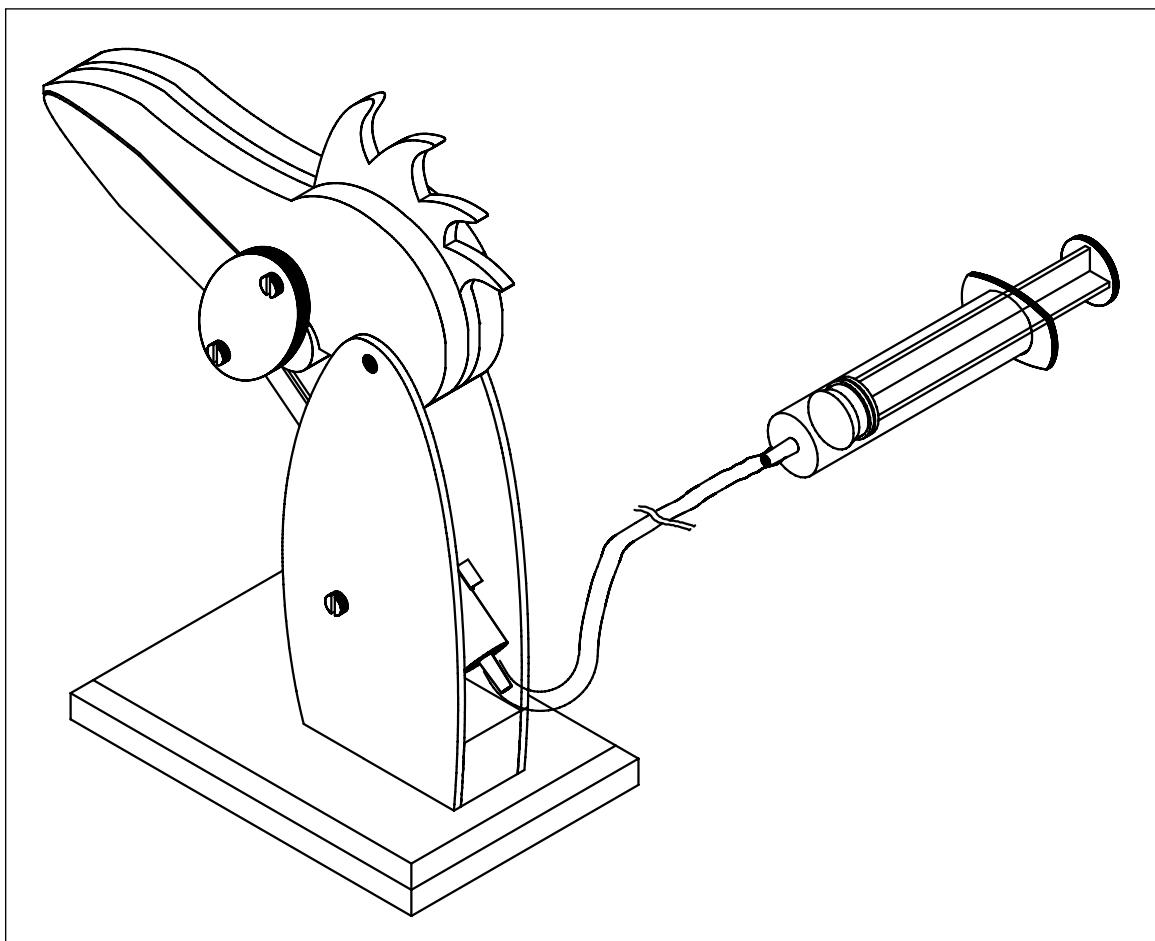




1 0 6 . 1 7 5  
*B i r d   o f   P a r a d i s e*



*Please Note*

The OPITEC range of projects is not primarily intended as toys for young children. It is for teaching, designing and making to ensure that pupils experience a range of tools and processes.

## 1. Product information:

**Article:** Pneumatic model in project pack format

**Use:** In Design Technology, Key Stage 3 /4

## 2. Material information:

**2.1 Material:** Pine wood (coniferous ), softwood.  
Wood must be relatively dry before working  
Plywood, has different layers  
Each layer is glued in a different direction!

**Working:** Wood can be sawn, planed, drilled, sanded and shaped.  
Mark out according to the plans, or use paper patterns.

**Joining:** Screws or PVA white wood glue

**Finish:** Wax ( liquid or solid)  
Wood varnish ( Undercoat & top coat )  
Stain ( coloured – water soluable, finish with varnish)  
Linseed oil.

**2.2 Material:** PVC-tube ( Polyvinyl chloride = Thermoplastic)  
Transparent, elastic.

**Joining:** Insertion;

**Finish:** No special finish necessary

**2.3 Material:** Syringe (PP = Polypropylene = Thermoplastic);  
unbreakable - odour tast free;

**Joining:** Insertion;

**Finish:** No special finish necessary;

## 3. Tools:

**Sawing:** Use a **Fret saw** for all curves and circles that cannot be sawn with a straight backed saw.

**Note!** Fret saw blades should be inserted in the bow with their teeth facing forward!

Use a Fret saw board, work with slow constant strokes turning the work as you go.

Use a **fine toothed Dovetail saw** for all cutting pine strip;

**Note!** Note hold the work on a bench hook when sawing!

**Puk-saws** are suitable for cutting dowel and small strips

**Filing/ Shaping:** Use the correct grade of wood file /rasp for the work in hand

**Note!** Files and rasps only cut on the forward stoke!

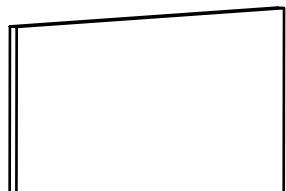
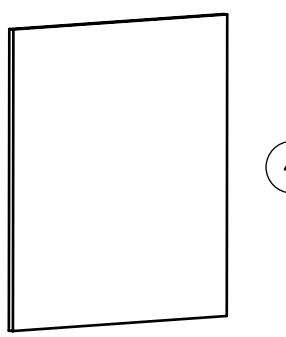
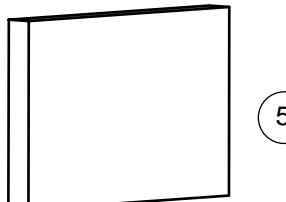
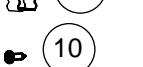
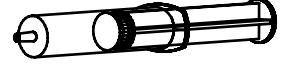
**Sanding:** Use a block and glasspaper for all flat surfaces and loose sheet for curves and individual shapes.

**Drilling:** Use a hand drill or pillar drill

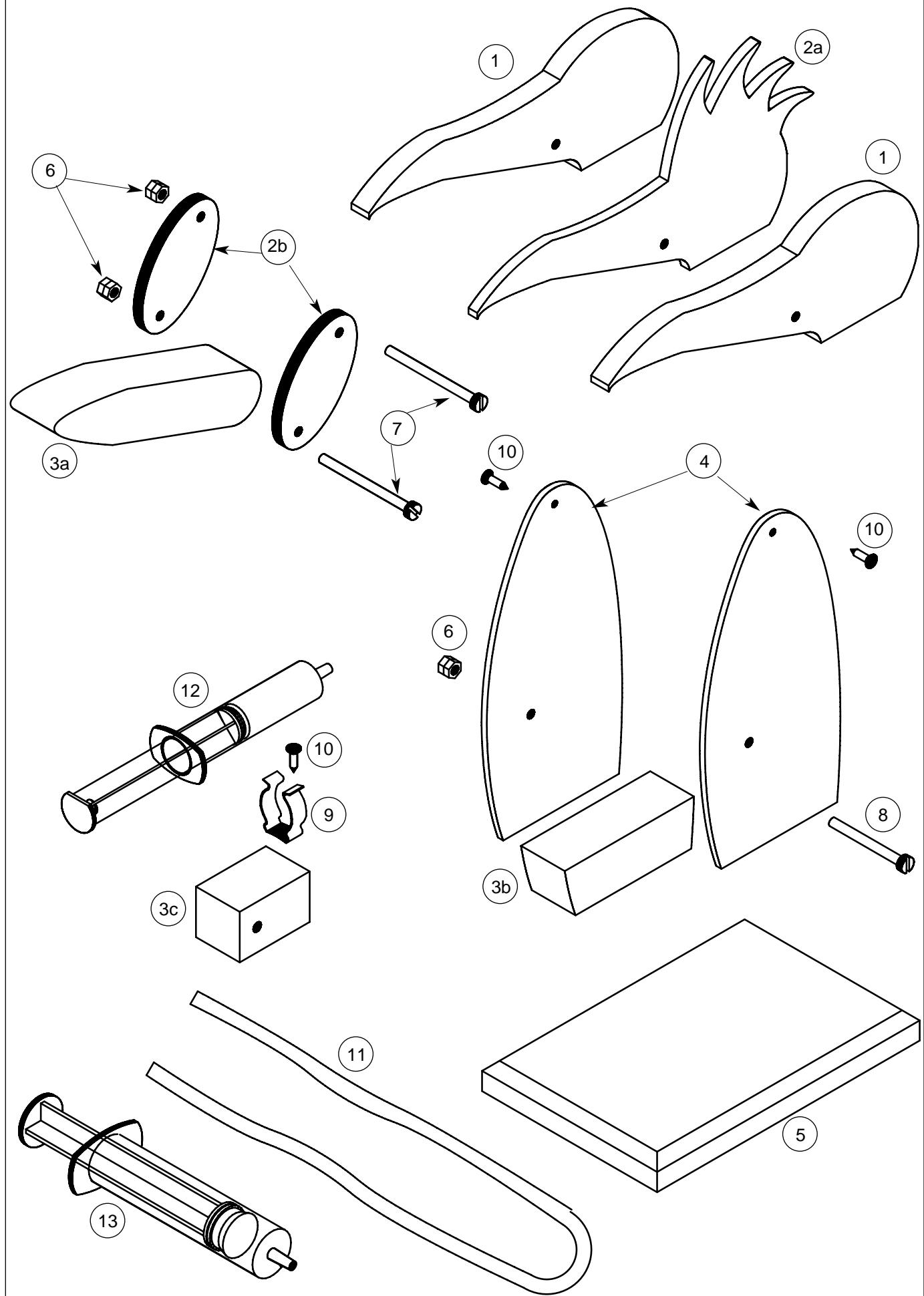
**Note!** Adhere to the safety rules when drilling; tie long hair back, wear safety glasses, remove rings and jewellery, wear an apron. Hold the work to be drilled in a machine vice.

**Clamping:** Use good quality clamps (do not over tighten them or they will leave marks)

**4. Parts list:**

Part	Material	Quantity	Size	Diagram
<b>Head/beak</b>	Pine	2	10 x 60 x 200 mm	 1
	Plywood	1	5 x 100 x 200 mm	 2
	Pine	1	25 x 25 x 250 mm	 3
<b>Body</b>	Plywood	1	3 x 160 x 160 mm	 4
<b>Base</b>	Pine	1	15 x 100 x 150 mm	 5
<b>Mechanical Parts</b>	Nuts	6	M4	 6
	Cheese head set screw	2	M4 x 50 mm	 7
	Cheese head set screw	1	M4 x 40 mm	 8
	Spring clip	1		 9
	Chipboard screw	3	3 x 10 mm	 10
	PVC tube	1	Ø 6/400mm	 11
	Syringe	1	10 ml	 12
	Syringe	1	20 ml	 13

## 5. Exploded diagram



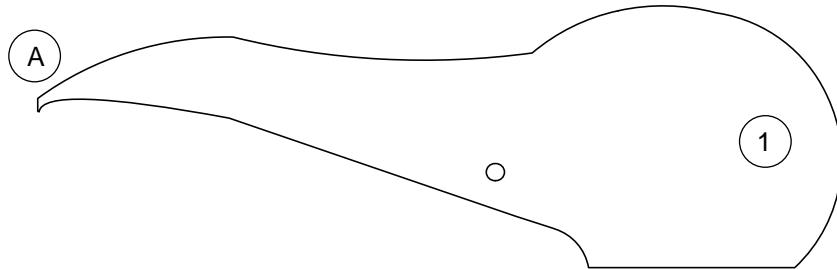
## 6. Planning overview

- 6.1 Planning and making the head and beak
- 6.2 Planning and making the body
- 6.3 Making the base
- 6.3 Final assembly and testing

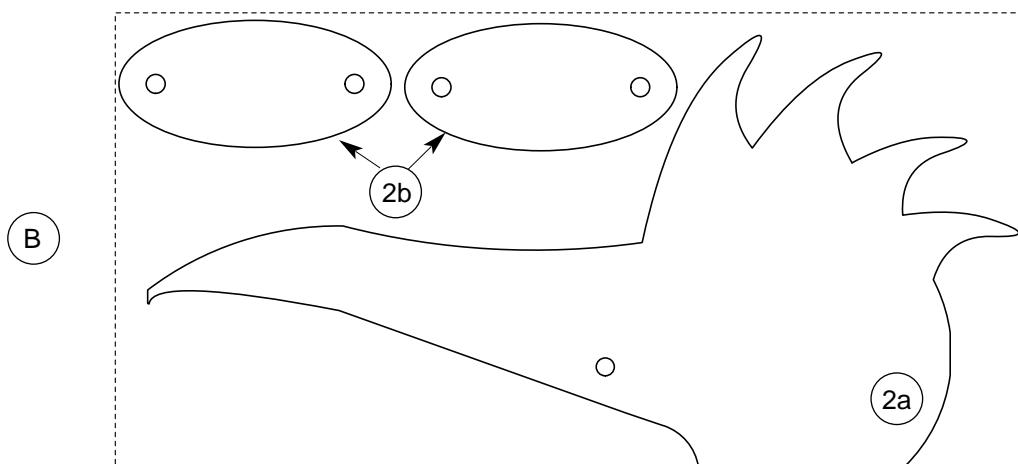
### 6.1 Planning and making the head and beak

6.1.1 Trace the pattern A ( Page 11) on the pine strips (1) and saw out the shape ( or design your own shape)

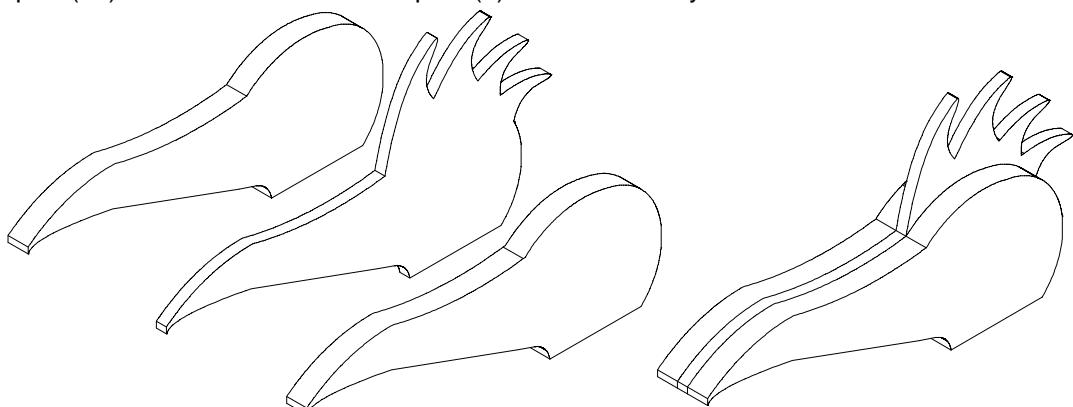
**Note:** Parts (1) can be taped together with double sided tape and both head shapes cut out in one go!



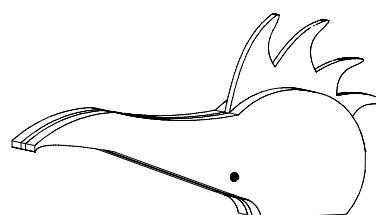
6.1.2 Trace pattern B ( Page 11) on to the plywood sheet (2) and saw out the parts. The two oval shapes are need to hold the beak.



6.1.3 Glue part (2a) in between the head shapes (1) and leave to dry



6.1.4 Using the pattern A mark out the holes and drill the 4mm diameter hole!

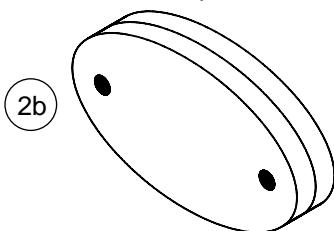


6.1.5 The lower part of the beak is made from pine (3). Saw off a 120mm length and fashion it as shown in the diagram.

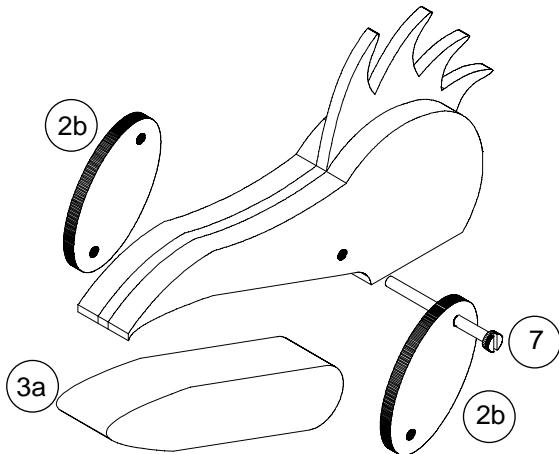
**Note:** Mark out the shape and the file it with a rasp. Check the finished work as you go!



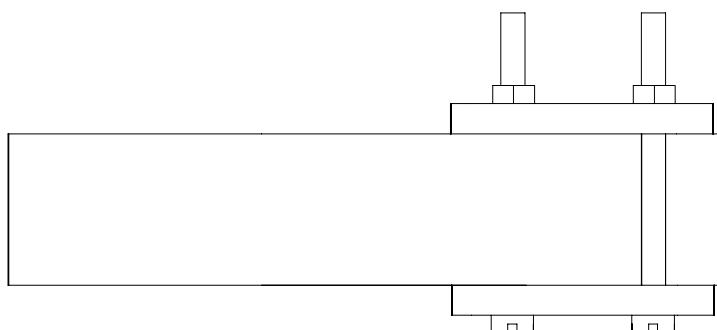
6.1.6 Join the oval parts (2b) together with double -sided tape. Using pattern B mark out the position of the 4mm holes and drill them in one go. Sand them to shape and then take them apart..



6.1.7 Lay out the lower beak (3a) screw (7) and the holder (2b) as shown in the diagram. Insert the set screw and arrange the lower beak and oval joiner as shown. Mark out the position of the joiners on the lower jaw and glue them in place. Clamp them in position until they are dry.

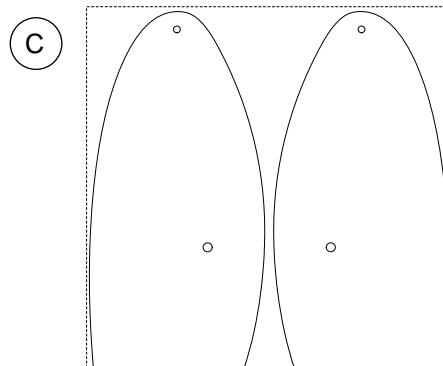


**Note:** To fit the joiner ( oval) you can insert both set screws (7) through the holes, fixing them with the nuts.(6) This will have the effect of trapping the lower jaw in position.

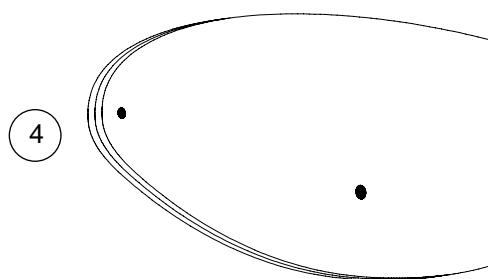


## 6.2 Designing and making the body

6.2.1 Using the pattern C (see page 13) or use your own design mark out the body on the plywood sheet (4) and saw out the shapes.

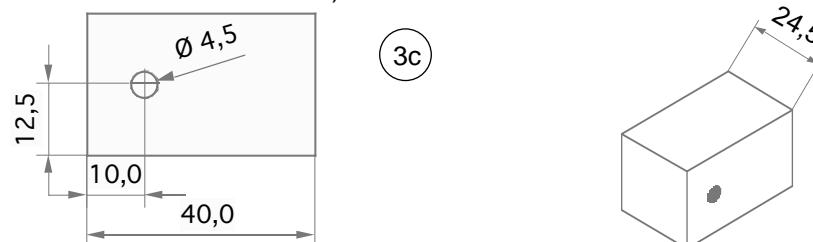


6.2.2 Join the two shapes together with strips of double sided tape. Use the pattern C to mark out the 4mm dia holes and drill them out. Sand the finished shape whilst the parts are still taped together.

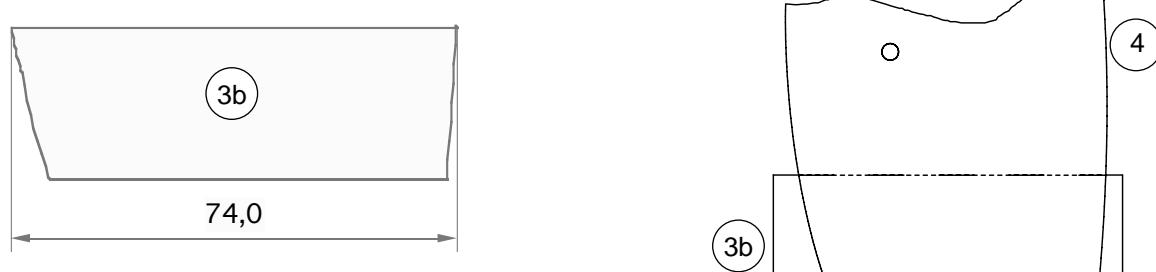


6.2.3 To make the bearing block, saw a piece 40mm long from the remainder of the pine strip (3) Mark out and drill the 4.5 mm hole and sand the block.

**Note:** So that bearing block can swing easily between the sides (4) make sure the thickness (sides with holes) are sanded down to 24.5mm

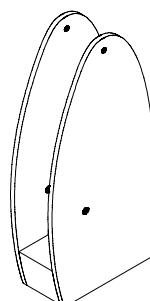


6.2.4 Make the body spacer (3b) from the remaining pine (3b) mark out to the correct shape (see diagram) and saw/sand..



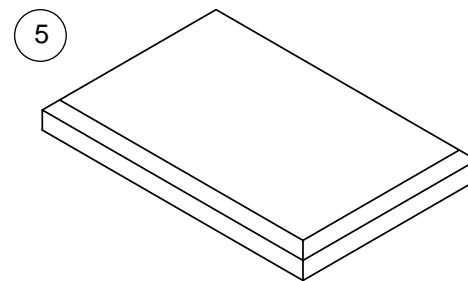
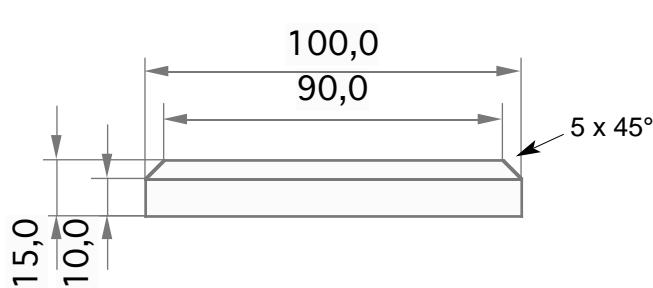
6.2.5 Glue the finished spacer (3b) between the sides (4)

**Note:** Make sure the holes in the sides line up!

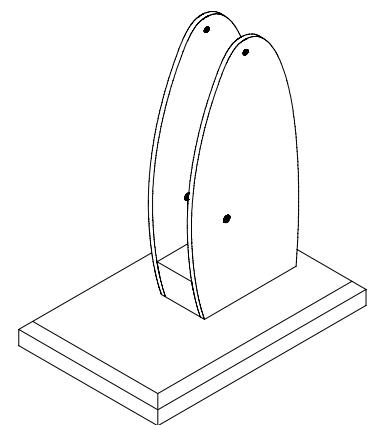
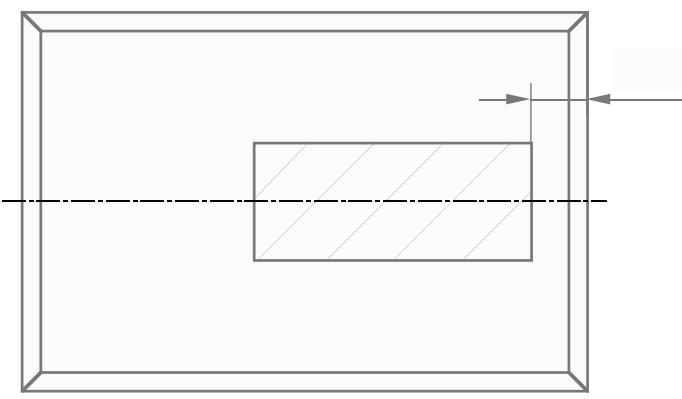


## 6.3 Making the base

6.3.1 Chamfer the edges the base (5) at 45 degrees.



6.3.2 Glue the sides of the bird centrally on the base, 15mm from one end as shown in the diagram .

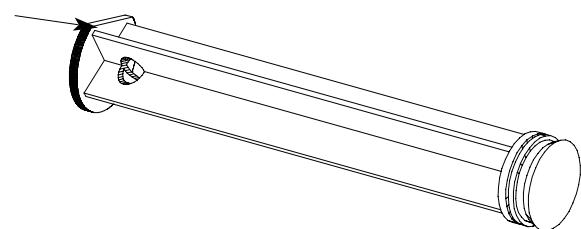


6.3.3 Once the glue has dried these parts are ready for painting and decorating, or at least have a coat of varnish.

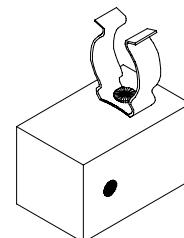
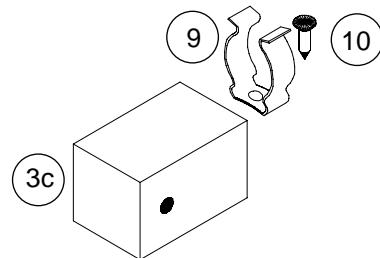
## 6.4 Final assembly

6.4.1 Drill a 4.5 mm hole in one end of the piston from the syringe (12/10ml) .Then snip off a part from the head of the piston as shown.

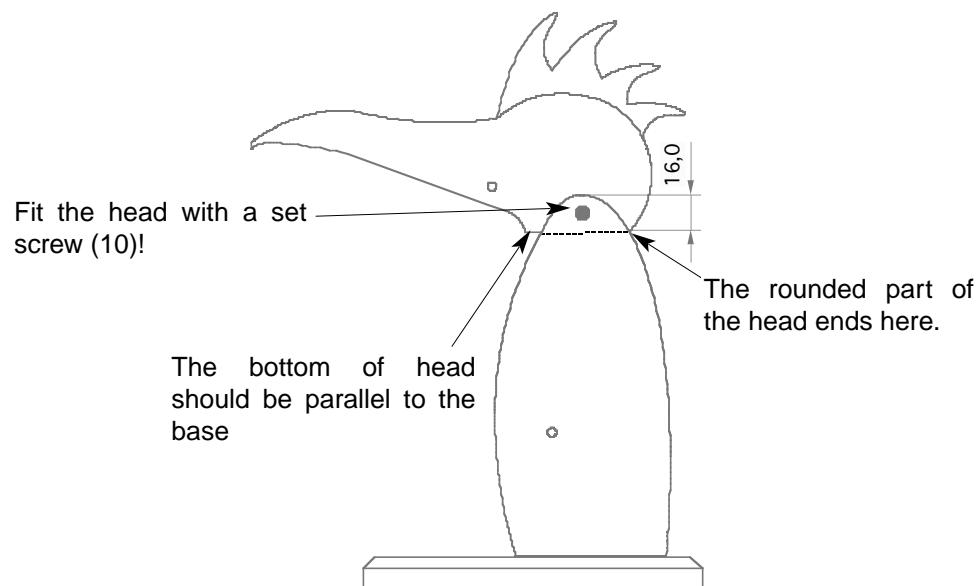
Flatten the end of the  
syringe piston



6.4.2 Screw (10) the spring clip (10) on the bearing block (3c) about 15mm from the end (see diagram)

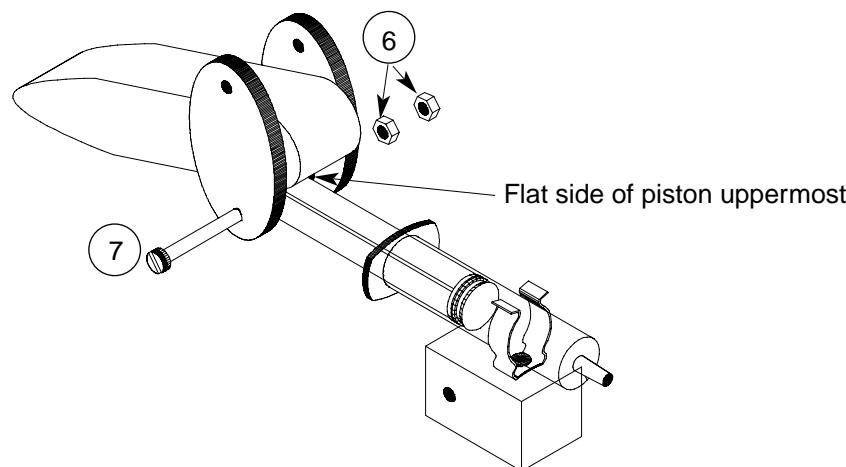


## 6.4.3 Fit the head into the body as shown using the set screw (10)



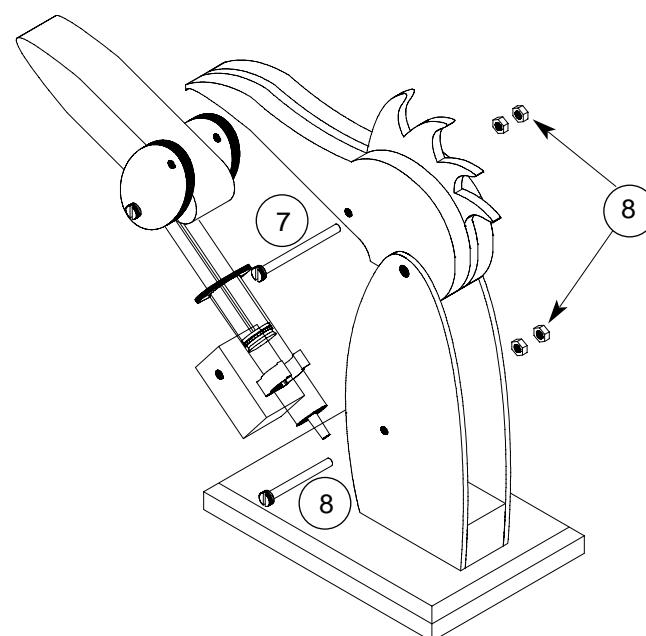
## 6.4.4 Replace the piston in the syringe (12) and clip the unit into the spring clip as shown. Attach the lower beak to the end of the piston as shown. Use a set screw (7) and nut (6) fix the beak

**Note:** Clipped off end of the piston points uppermost



## 6.4.5 Assemble the bottom of the beak and bearing block into the head with a set screw (7) and two nuts (6) and the bearing block in position with a set screw (8) so that it can swing freely

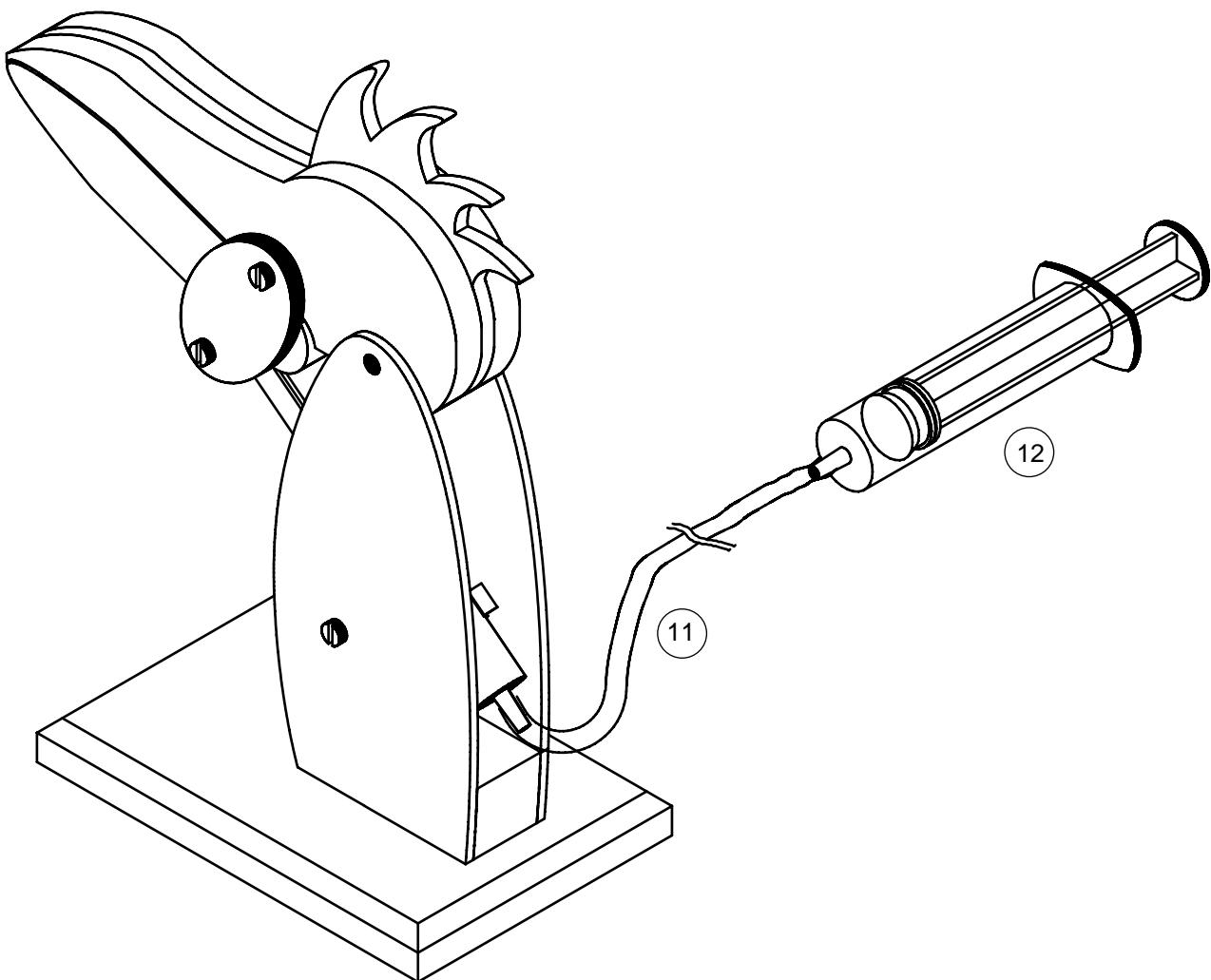
**Note:** The lower beak mechanism should move easily, when you are happy with the fit, contra tighten the lock nuts!



6.4.6 Adjust the lower beak and syringe so that when the beak is open, the piston is about halfway down the syringe.

**Note:** To adjust the position of the syringe slide it back and forth in the spring clip!

6.4.7 Take the other syringe (13/20ml) and adjust this as well, so the piston is halfway down the cylinder.



**Testing and evaluating:**

Pull the piston in the larger syringe (13) towards you and the beak should open

Push the piston in the larger syringe (13) and the beak should shut.

If the travel of the piston in the large syringe is not fully used a fine adjustment can be made and the volume altered. Simply remove the tubing and then adjust the syringes as you wish, replace the tubing then re-test.

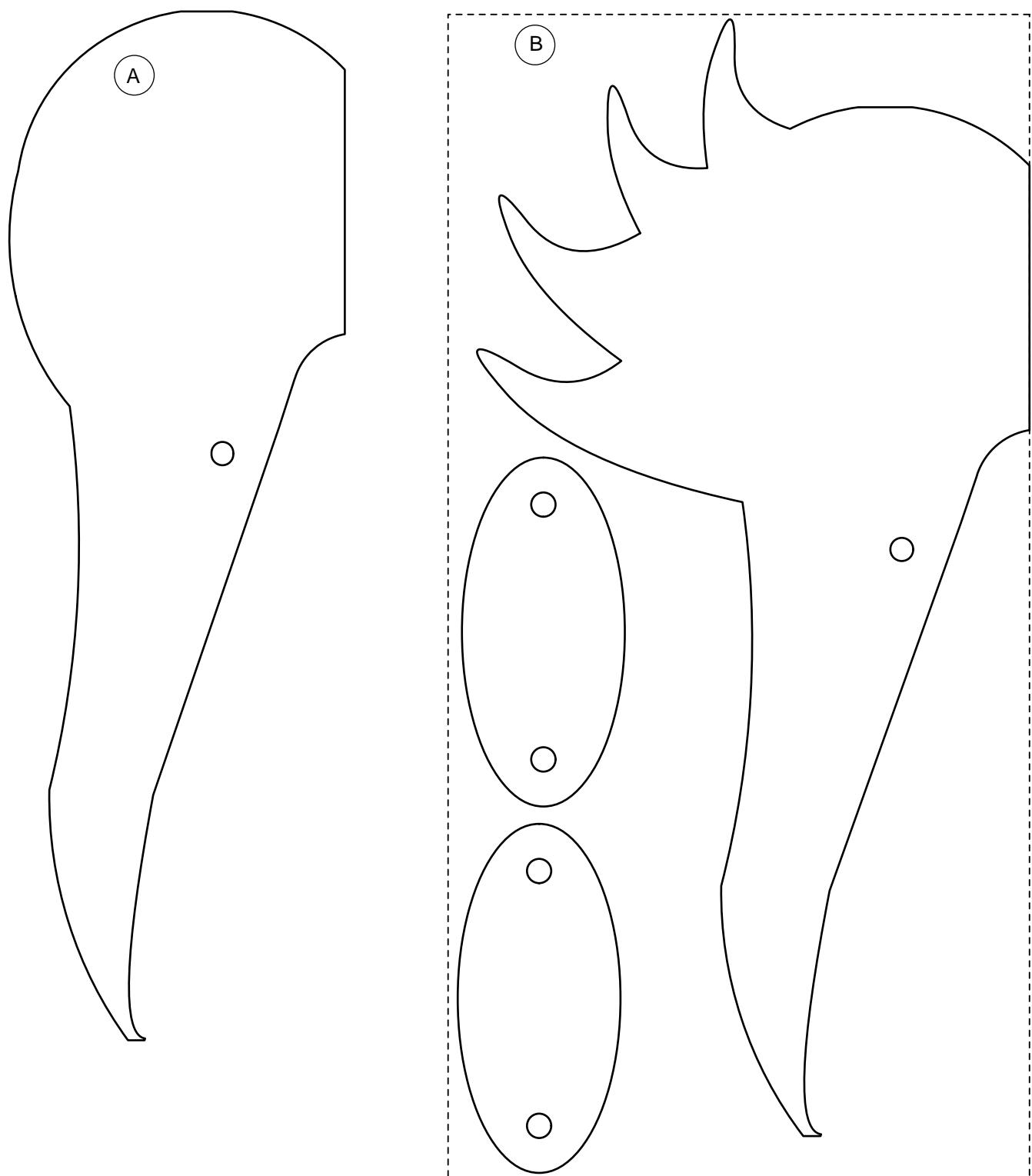
**Possible faults::**

If the movement is jerky check that all parts are working smoothly, sand if necessary.

Sometimes the movement can be simply adjusted by moving the syringe back & forth in the clip.

## 7. Patterns A and B

Scale 1 : 1





## 7. Pattern C

Scale 1 : 1

