

6. Duck (Push or Pull)

As the duck moves its wings flap, making this a very entertaining toy for a toddler. It can be made to push along the floor (see Figure 6-1) or as a pull toy.

This chapter describes making the duck as a push toy. Eliminating the push stick and screwing a screw eye in the duck's nose with a pull string attached easily turns it into a pull toy (see Chapter 2, p. 21).



Figure 6-1. Push Duck

Materials and Tools

The wood cut list, other parts, tools needed for this toy and a drawing showing the parts explosion (Figure 6-2) follow.

Wood Cut List

Part	Material	Size (thickness, width, length)	Qty
Duck body	Any wood	3/4" to 1 1/2" x 6 1/4" x 9"	1
Wings	Any wood	1/2" x 2 3/4" x 4 1/2"	2
Handle grip	Any wood	3/4" x 3/4" x 2"	1
Axles	Dowel	3/8" diameter x 4"	2
Wing lifts	Dowel	1/4" diameter x 7/8"	4
Push stick	Dowel	1/2" diameter x 18"	1

Other Parts

Part	Material	Size	Qty
Wheels	Any wood	5/8" x 2" with 3/8" center holes	4
Wing pivots	Axle peg	7/32"	2
Decoration	Craft paint	Yellow and color for eyes	
Washers	Metal or plastic	1/4"	2
Washers	Metal or plastic	3/8"	4
Eyes	Axle peg	7/32"	2

Tools Required

- Woodworking tools and supplies (see Chapter 2, pp. 14-15)
- Special tools for this toy:
 - 13/32", 15/64", 1/2", and 1/4" twist drill bits

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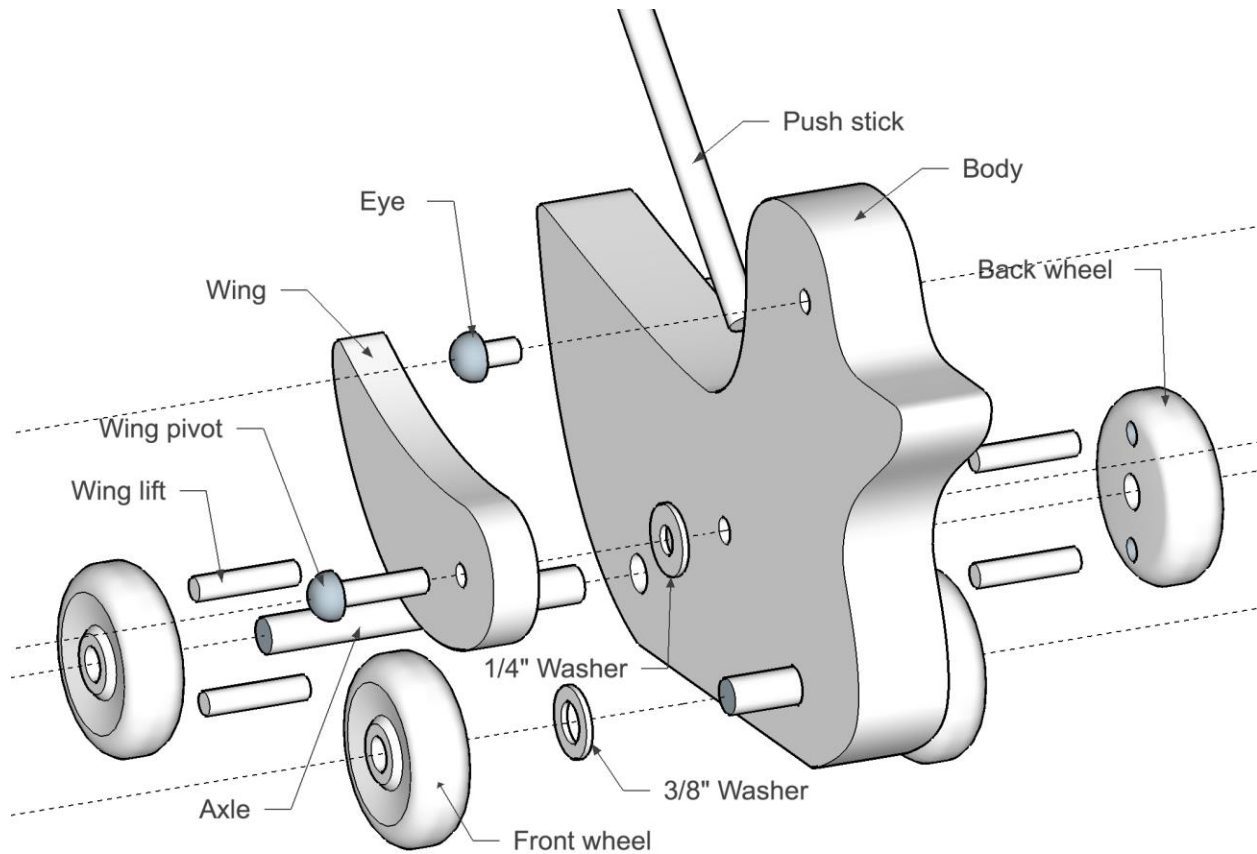


Figure 6-2. Parts Explosion

Plans and Steps

Body

1 – Transfer outline. Start with a rectangular block of wood at least 6 1/4" by 9". Adjacent sides should be square (at right angles to each other) to facilitate lining up the holes to be drilled in the body. The thickness of the body can vary to suit the material available.

Using tracing paper or a photo copy of the template (Figure 6-6), draw the outline of the duck's body onto the block. Mark the locations of the two #1 holes and the holes #2 and #3, as shown on Figure 6-3.

2 – Drilling holes. Holes #1, #2, and #3 are drilled through the body. (Hole #3 is not drilled if the eye is to be painted.) The hole for the push stick (#4) will be drilled on top of the body below the head, after the body is cut out of the block.

With a center punch or a nail, mark the holes to be drilled on the face of the block. The two holes marked #1 are made by using a 13/32" size drill bit. Hole #2 requires a 15/64" size drill bit, as does #3 if using an axle peg for the eye.

3 – Cut out and round over edges. Cut out the body to within $\frac{1}{32}$ " - $\frac{1}{16}$ " of the outline. Sand to the outline, removing any uneven bumps or hollows. If rounding over edges by hand, start with 80 grit sandpaper and approximately sand to a $\frac{3}{16}$ " radius, or use a router with a $\frac{3}{16}$ " or $\frac{1}{4}$ " round over bit.

Router Safety

DO NOT USE a router to round over edges of toy parts **UNLESS** the router is stationary, that is, attached to a router table. See Ch. 18, p. 158.

4 – Sand. Completely sand all surfaces using 120 – 150 grit sandpaper.

5 – Drill hole for push stick. Hole #4 is drilled at a 45-degree angle on the back of the duck below the head. Use a $\frac{1}{2}$ " drill bit and make the hole 1" deep. The $\frac{1}{2}$ " dowel might need to be sanded to fit properly. Use a jig or clamp to hold the body to drill the 45-degree angle.

Jig for Drilling Hole for Push Stick

See Chapter 19, p. 172.

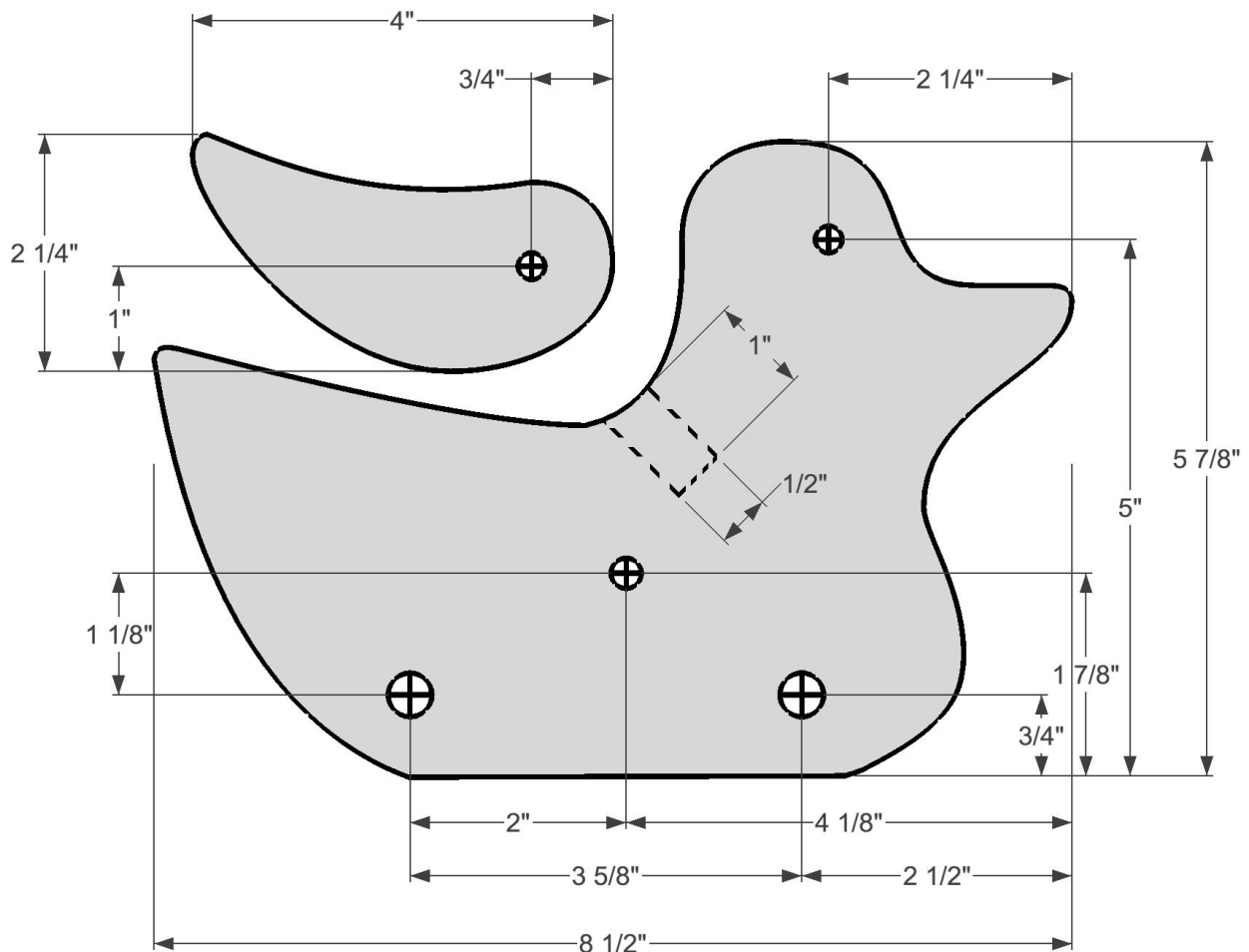


Figure 6-3. Body of Push Duck Dimensions (not actual size)

Wings and Wheels

1 – Shape wings. Start with two blocks of wood, at least 2 1/2" by 4 1/4". The sides should be square to one another to facilitate drilling the hole in the wing. The thickness of the blocks is not critical. Wood that is 3/8" or 1/2" thick will work.

Copy the pattern of the wing (Figure 6-6) onto each block and mark the hole location. The wing outline and hole location are critical in order for the wings to flap properly.

Drill the 1/4" hole in each wing at the location shown. Next cut out the two wings. Sand the edges to the outline, making sure in particular that the bottom edge of the wing (the part that will rub against the wing lift) is smooth. Round over the edges by hand or with a 1/8" round over bit using a router attached to a table.

Sand all surfaces using 120 – 150 grit sandpaper.

2 – Wheels and drive pegs. Review the suggestions in Chapter 2, p. 19 for obtaining a proper fit for dowels glued into holes. Check whether the 3/8" dowels (axles) fit into the 3/8" hole in the 2" wheels. These dowels will need to be glued into the wheels, so the fit should not be too loose or too tight.

Once a proper fit is achieved, the 3/8" dowels should **not** be glued or cut to length until the duck parts are assembled.

3 – Wing lifts. Drill the two rear wheels to accommodate the wing lift dowels. This can be a difficult operation. These wheels need to be secured firmly before drilling.

Jig to Hold Wheels for Drilling

See Chapter 13, pp. 106-7.

On the back of the wheels drill the two 1/4" holes for the wing lifts at the locations shown in Figure 6-4. Make these holes about 1/2" deep, but do not drill through the wheel.

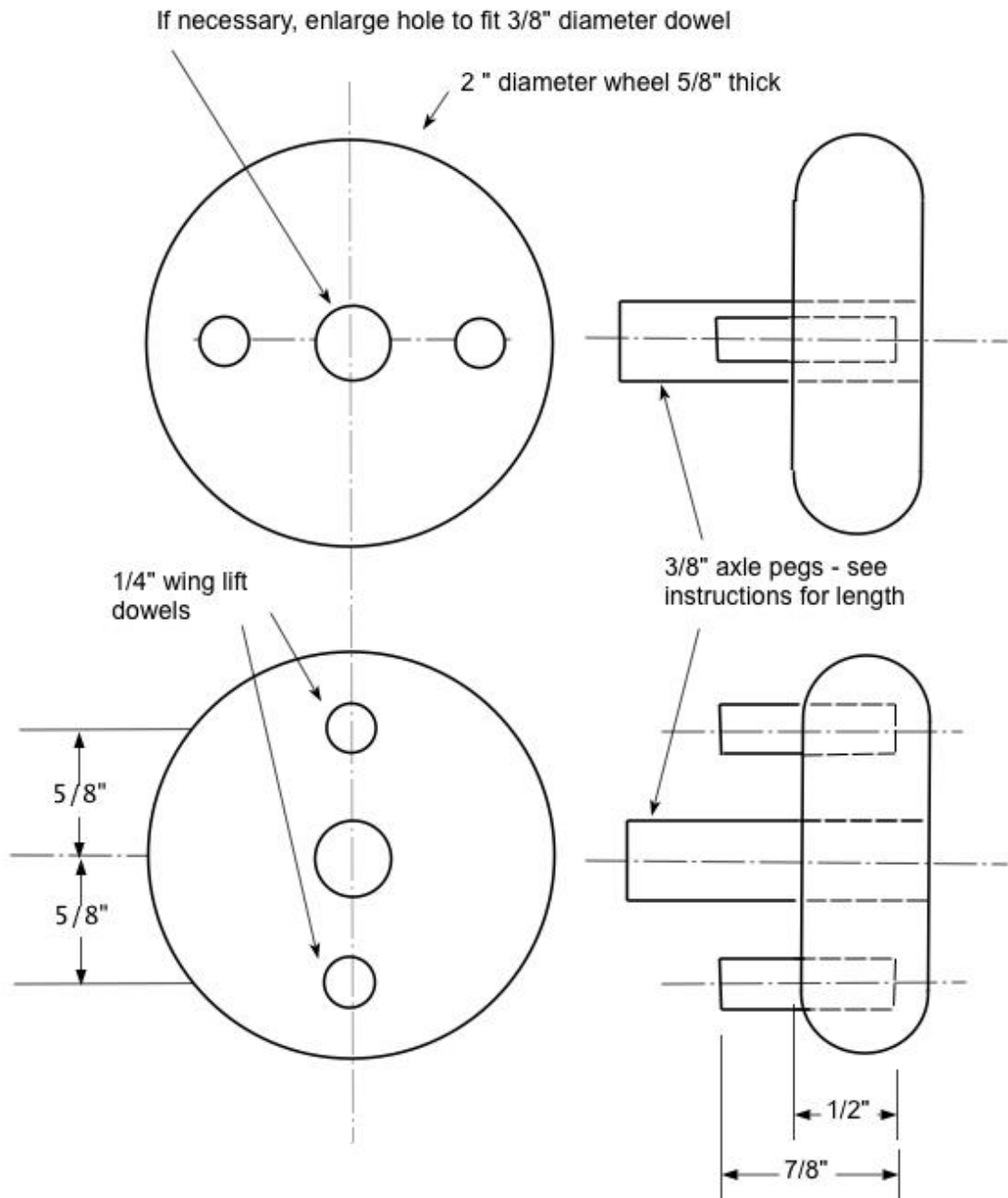
The 1/4" wing lift dowels should be 7/8" long and extend 3/8" from the surface of the wheel. Test the drill size and depth on a piece of scrap wood and be certain to obtain a good fit for gluing. If sanding the dowels, do so before cutting them to length.

Push Stick and Grip (see sub-assembly instructions in Chapter 2, p. 20)

1 – Make Push Stick and Grip. Follow the sub-assembly instruction given in Chapter 2.

2 – Glue. Glue the grip to the push stick.

3 – Prepare for Finishing. Apply masking tape to 1" of the end of the push stick that will be glued into the body of the duck to avoid getting finish where glue is to be applied.



Install wheels with wing lift dowels 90 degrees apart as shown.

Figure 6-4. Push Duck Back Wheel Assembly
(not actual size)

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Paint and Clear Finish

1 – Paint. Prime all parts to be painted. Paint the body and wings yellow, using craft paint or spray paint.

Seal all other parts, including the push stick and grip, with shellac.

If 1/4" axle pegs are used for the eyes, the heads can be painted any color other than yellow, or colored with a permanent marking pen. If using craft paint, it is best to seal the heads first, then sand lightly before painting.

Avoid getting paint into the holes that will be used for moving or glued parts, or on the tenon

of axle pegs used for the eyes.

2 – Clear finish. Put a clear finish on the push stick and grip. Also put a clear finish on the wheels and all the painted parts, but keep finish out of the holes. For a clear finish, satin or semi-gloss water-based polyurethane is recommended. If using a second coat of polyurethane, sand lightly with a fine sanding pad between coats.

Finishing Tips

See Chapter 21, p. 183.

Assemble

1 – Front axle. The length of the 3/8" dowel for this axle should be at least the sum of the thickness of the body plus the thickness of the two front wheels plus 1/4" to allow for the washers and spacers.

Dry assemble this 3/8" dowel in hole #1 in the front of the duck. On each side of the body place a washer, then a wheel. Insert a spacer (0.02 to 0.04 inches thick)¹⁶ between each of the washers and the body of the duck. Check that the axle rotates freely. Align the end of the dowel to the outside edge of one wheel and place a mark where the dowel protrudes from the outside face of the other wheel.

Then take apart what has been assembled, cut the dowel at the mark and sand the ends. Next glue the front wheels onto the axle (with washers and spacers) in place. Put glue in the holes of the wheels, wiping off any glue from the inside of

the wheels. Push the wheels onto the axles, lining up the end of the axle to the outside edge of the wheels. Finally, wipe off any excess glue that has been pushed to the outside of the wheels.

Tips for Assembling Wheels

See Chapter 22, p. 189-91.

2 – Rear axle and wing lift dowels. First glue the 7/8" x 1/4" wing lift dowels into the inner surfaces of the rear wheels (see Figure 6-4). The dowels must protrude 3/8" from the wheels.

Next size the 3/8" rear axle. The length of this axle will be the sum of the thickness of the two wheels, the thickness of the duck body, plus 1 1/8" (the thickness of two 1/2" thick wings plus 1/8" clearance).¹⁷

¹⁶ The plastic clip used to seal the bag of a loaf of bread or a piece of cardboard from a cereal box make ideal spacers.

¹⁷ If the wings are thicker than 1/2", adjust the length of the rear axle accordingly.

3 – Glue rear axle. The gluing procedure is similar to the front axle assembly except the wheels pegged with the wing lift dowels are offset 90 degrees to each other and no washers are used. The offset causes the wings to alternately lift and fall. Now glue the rear axle and wheels into rear hole #1 in the duck body as was done for the front wheels and axle. Be certain to allow for an $\frac{1}{8}$ " clearance between the lift dowels and the body of the duck.

4 – Wing assembly. Axle pegs and washers are used to glue the wings into hole #2 of the body of the duck. It might be necessary to shorten the length of the axle peg tenons. They should be no longer than the thickness of the wing plus half the thickness of the duck's body. Be certain to use a spacer between the washers and the body to allow a clearance gap of approximately $\frac{1}{32}$ " for the wings to move freely. Figure 6-5 is a rear view of the duck that shows the operation of the wing lifts.

5 – Eyes. If using axle pegs for the eyes, cut the tenons of the two axle pegs to a length of $\frac{1}{4}$ ". Apply a small amount of glue in hole #3 (on each side of duck) and glue the shortened axle pegs into each side.

There are alternatives to using axle pegs for the eyes. One is to paint the eyes directly on the body, in which case there is no need for hole #3. Another alternative is to purchase plastic eyes. A third is to use painted wooden buttons for eyes.

Creating Eyes

Chapter 21 (pp. 184-5) describes various approaches for creating eyes.

6 – Push stick. Put glue into hole #4 in the body of the duck with a toothpick or nail. Wipe off glue from the flat surface around hole, then insert the push stick sub-assembly into hole #4.

Figure 6-5. Wing Lifts



Figure 6-6. Duck and Wing Templates (next page)

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