Learn about wind energy by designing your very own Wind Lift!
### Supplies

**LIFT PARTS**

These are the parts you need to build one Wind Lift.

<table>
<thead>
<tr>
<th>NAME</th>
<th>QTY</th>
<th>PICTURE</th>
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</thead>
<tbody>
<tr>
<td>Hole Plate</td>
<td>1</td>
<td><img src="image" alt="Hole Plate" /></td>
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<tr>
<td>Block</td>
<td>4</td>
<td><img src="image" alt="Block" /></td>
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<tr>
<td>Slide Stop 7 cm (3 in)</td>
<td>1</td>
<td><img src="image" alt="Slide Stop" /></td>
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<tr>
<td>Nuts # 10 Hex</td>
<td>2</td>
<td><img src="image" alt="Nuts" /></td>
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<tr>
<td>Screws 25 mm (1 in)</td>
<td>2</td>
<td><img src="image" alt="Screws" /></td>
</tr>
<tr>
<td>Mini Hub Screw</td>
<td>1</td>
<td><img src="image" alt="Mini Hub Screw" /></td>
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<tr>
<td>Mini Hub Cover</td>
<td>1</td>
<td><img src="image" alt="Mini Hub Cover" /></td>
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<tr>
<td>Mini Hub Base</td>
<td>1</td>
<td><img src="image" alt="Mini Hub Base" /></td>
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<tr>
<td>Portion Cup</td>
<td>1</td>
<td><img src="image" alt="Portion Cup" /></td>
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<tr>
<td>Wire 15 cm (6 in)</td>
<td>1</td>
<td><img src="image" alt="Wire" /></td>
</tr>
<tr>
<td>String 45 cm (18 in)</td>
<td>1</td>
<td><img src="image" alt="String" /></td>
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<tr>
<td>Chipboard 22 cm x 5 cm</td>
<td>3</td>
<td><img src="image" alt="Chipboard" /></td>
</tr>
<tr>
<td>Project Sticks 25 cm (10 in)</td>
<td>10</td>
<td><img src="image" alt="Project Sticks" /></td>
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<tr>
<td>Dowels various sizes</td>
<td>4</td>
<td><img src="image" alt="Dowels" /></td>
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</tbody>
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**INCLUDED TOOLS**

- Reamer

**MATERIALS YOU SUPPLY**

- Fan
- 100 Pennies or jellybeans, nuts, etc. to use as weights
- Tape
- Phillips Screwdriver
- Recycling Materials (to use for turbine blades)

**Optional Tools**

Modify materials to make even more creative designs with the Maker Tool Set SKU TGMTS

Have a Maker Cart? Use Multi-Cutters to cut your own dowels.
1. **Attach two blocks** to the top of the hole plate using two 25 mm (1 in) screws and two nuts.

2. **Wiggle** or tap two 30 cm (12 in) dowels into the center holes of the blocks.

3. **Push the dowels**, from Step 2, **into the blocks** on the hole plate.

4. **Push the 15 cm (6 in) dowel** into the top blocks.
5. **Ream** the two holes, as shown, to remove the splines (teeth).

6. **Cut a 1 cm (½ in) section of slide stop.**

7. **Push the slide stop** about 5 cm (2 in) onto the 25 cm (10 in) dowel.

8. **Push or tap the hub base onto** the end of the dowel from Step 7.

9. **Attach the mini hub cover with** the mini hub screw.

10. **Slide the dowel with hub** through the reamed holes.

Use more slide stop to secure the dowel.
11 **Tape** the 45 cm (18 in) **string** **onto** the **dowel** with the hub.

12 **Tape** the 15 cm (6 in) **wire** **to** the **portion cup**.

Tape the wire to the cup, leaving some extra.

Fold the extra over, then tape again.

Repeat on the other side of the cup.

13 **Tie** the **string** **to** the **cup**’s wire to finish your lift. Spin the dowel to test it out, then continue on to add blades that capture wind power!

If using this activity in a classroom, your lift mechanism can be re-used by kids year-after-year as they engineer and test different blade designs.
**Add Blades**

14. Get three 22 cm x 5 cm (8.5 in x 2 in) pieces of chipboard.

15. Tape a project stick to each edge, leaving some extra on one side.

16. Loosen the mini hub screw just enough to allow the blades to be pushed in (about 1 ½ turns).

17. Add the blades, being sure to angle them (that’s what will make them spin).

18. Tighten the hub screw and test it out!

☐ It’s time for labs or challenges!

Complete one of the optional labs below or continue on to set up for an engineering challenge!

- **Energy Lab** (Ages 9+)
- **Blade Angle Lab** (Ages 11+)
- **Blade Area Lab** (Ages 11+)

Download these labs at shop4-h.org
Heavy Lift Challenge

Engineer your Wind Lift to raise the most weight possible!

Constraints:
(rules and limits for your design)

The fan must be the only power source for your lift.

You may only alter the blade design – the lift and base must stay the same.

Your wind lift must be at least 60 cm (24 in) from the fan.

Weights must be raised at least 20 cm (8 in).

Speed Challenge

Engineer your Wind Lift to raise 10 pennies in the shortest time possible!

Use the same constraints as the Heavy Lift Challenge.
Make unique 3D shapes by cutting up plastic bottles and other recyclable materials.

Test different blade angles.

Wind up the weight and let it go to make a gravity-powered fan!

Design

Test

Design Process

Evaluate

Redesign

The design process never ends! There is no perfect design.

What will you use for blades?

Time to engineer your own blades for the wind lift! Try using cardboard, card stock, cereal boxes, plastic bottles... there are tons of ways to make turbine blades!

Change the size, shape and number of blades.