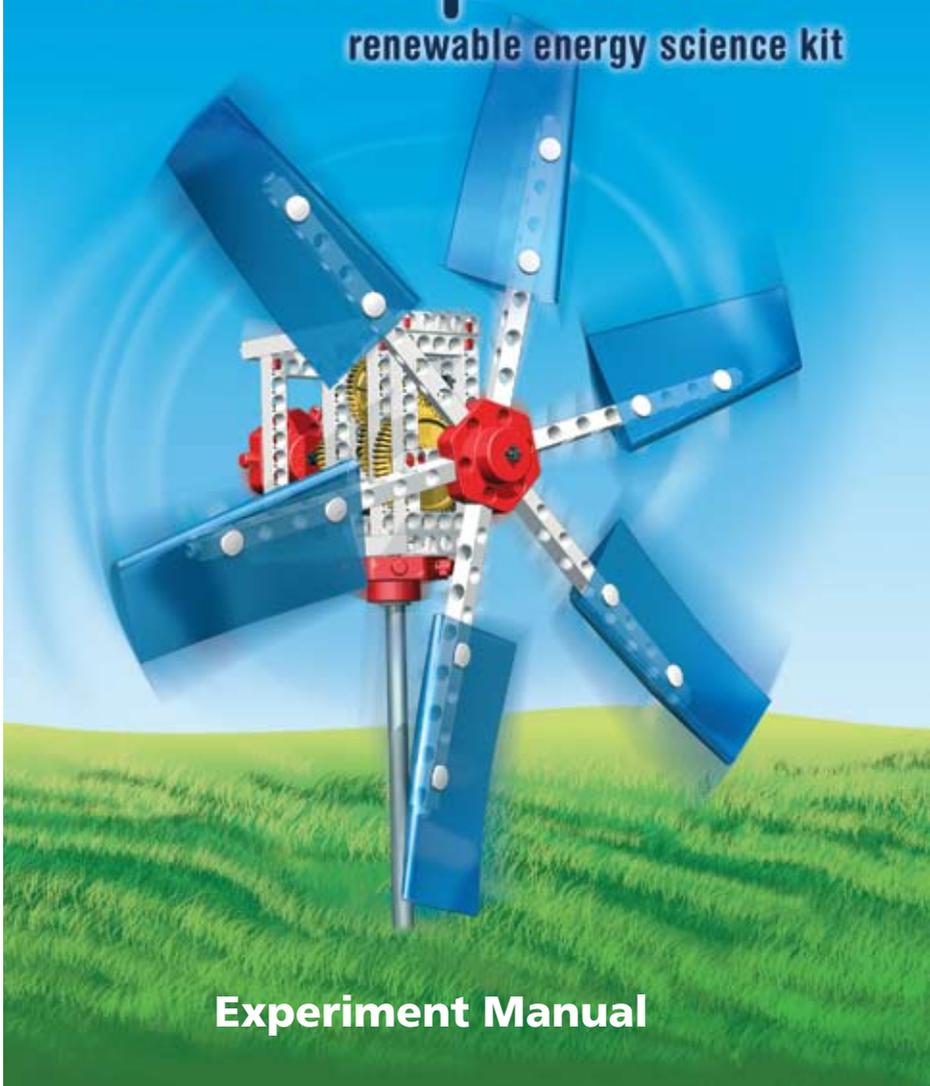


wind power

renewable energy science kit

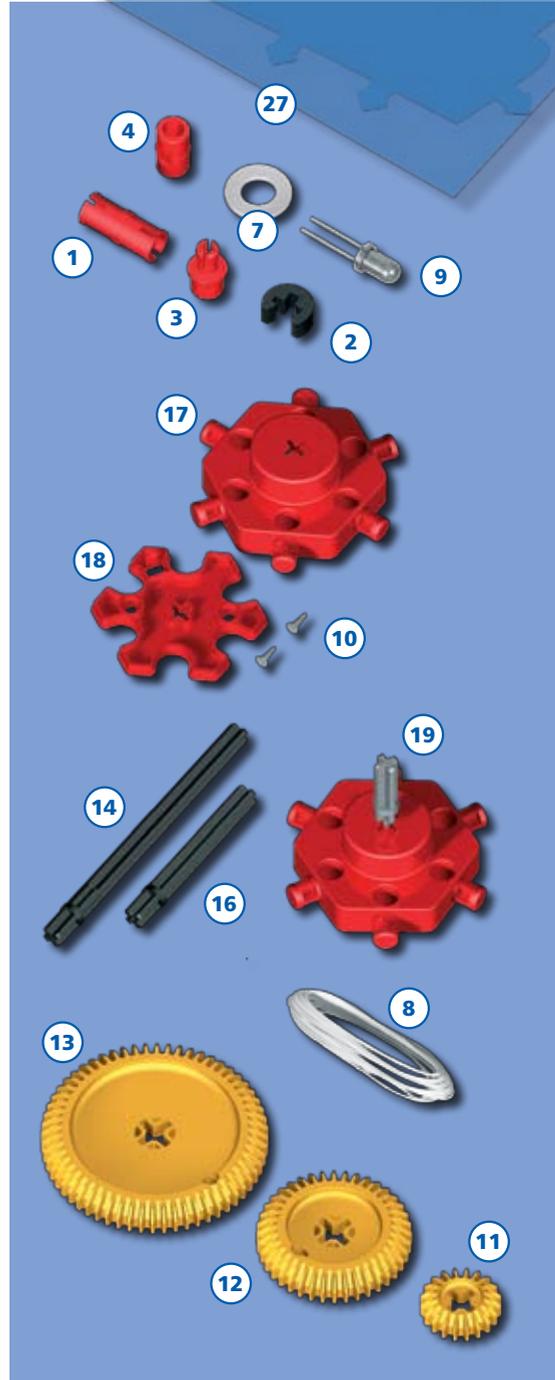


Experiment Manual

Kit Components

| No. | Description | Quantity | Part No. |
|-----|----------------------------|----------|----------|
| 1 | Joint pin | 1 | 702524 |
| 2 | Axle lock | 4 | 702813 |
| 3 | Shaft plug | 4 | 702525 |
| 4 | Anchor pin | 20 | 702527 |
| 5 | Button pin | 24 | 704062 |
| 6 | Perpendicular connector | 6 | 704064 |
| 7 | Washer | 6 | 702816 |
| 8 | Cotton string | 1 | 702812 |
| 9 | Light-emitting diode (LED) | 1 | 704072 |
| 10 | Screw | 4 | 704084 |
| 11 | Small gear wheel | 5 | 702504 |
| 12 | Medium gear wheel | 3 | 702505 |
| 13 | Large gear wheel | 1 | 702506 |
| 14 | Long axle | 3 | 703518 |
| 15 | Part separator tool | 1 | 702590 |
| 16 | Medium axle | 2 | 703518 |
| 17 | Universal adapter housing | 2 | 704066 |
| 18 | Universal adapter lid | 2 | 704071 |
| 19 | Pre-assembled generator | 1 | 704068 |
| 20 | Battery mount | 1 | 704073 |
| 21 | Small frame | 4 | 703232 |
| 22 | Short eleven-hole rod | 2 | 703233 |
| 23 | Long seven-hole rod | 6 | 703235 |
| 24 | Extra short five-hole rod | 3 | 704163 |
| 25 | Large frame | 2 | 703239 |
| 26 | Cable tie | 3 | 704081 |
| 27 | Wind turbine blade set | 1 | 704065 |
| 28 | Aluminum tube | 1 | 704080 |
| 29 | Connector cable | 1 | 704103 |
| 30 | Experiment manual | 1 | 704083E |

We reserve the right to make technical changes.



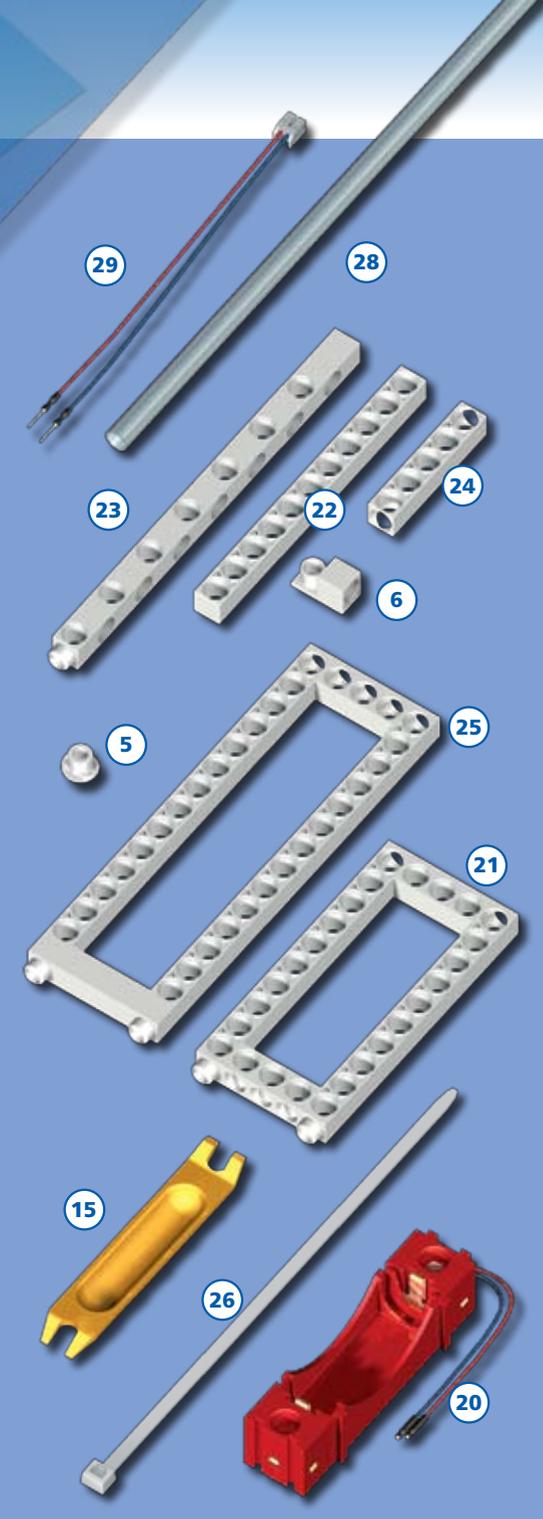
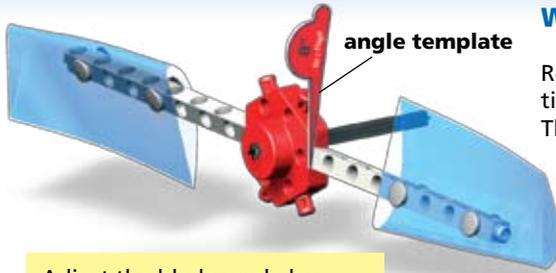


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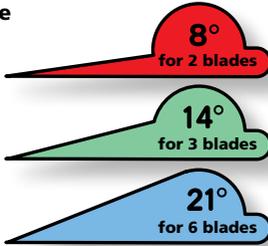
Adjust the blade angle by twisting the rod mount on the hub. The angle template cutouts will help.

What determines rotation speed?

Rotation speed indicates the number of rotations or revolutions per second or minute. The following facts determine the rotation speed:

- The wind speed
- The size of the windmill
- The number of blades
- The shape of the blades
- The required power

The three angle templates



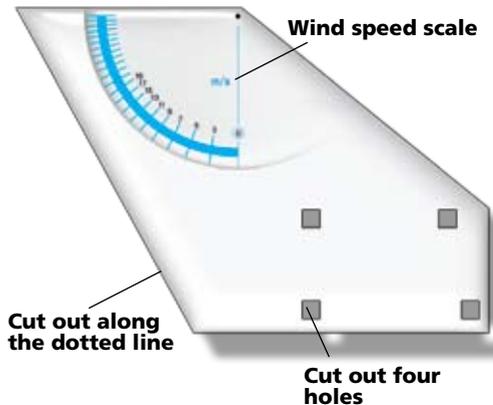
Each wing or propeller shape is determined by a specific lift ratio, or the so-called **coefficient of lift** (C_L). It has a **drag coefficient** (C_D) as well. The coefficients of different wing shapes have been determined in special wind tunnels. So have the drag coefficients of various automobile bodies and other vehicles.

For our experiments, we will have to be able to determine the wind speed. To do that, we will assemble a wind gauge.

11 Experiment

Materials: wind speed scale (cutout), 40 cm of string (8), joint pin (1)

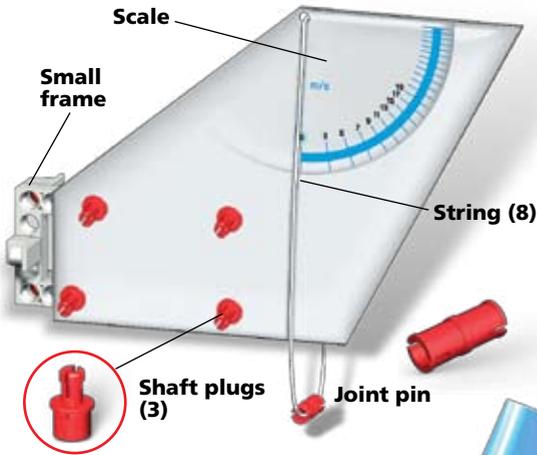
Cut the wind vane with the wind speed scale out of the cut-out sheet at the end of this experiment manual. Guide the string through the hole, and pull it through the joint pin as well. Tie its ends together so that the joint



Airplane model in wind tunnel

Your rotor blades are fairly arched and intended for a low-speed model. But what's slow and what's fast?

Windy Measurements



pin hangs 3 cm below the bottom edge of the vane. Hide the knot inside the pin and center it.

The string is the pointer. When there is no wind, it is on zero. It travels up the scale depending on the strength of the wind. It indicates speed in meters/second. (A bicycle goes about 4 m/s on average.) The wind gauge isn't one hundred percent accurate, but you can use it to compare measurement results under the same wind conditions.

We cannot change the diameter of our rotor, nor can we change the shape of its blades.

But we can adjust the number of blades and the power we want to get from it.

First, we'll measure the rotation speed with different numbers of blades and under the same wind conditions.

