Helicopter - How does a helicopter fly?

Fact

- A helicopter uses an engine (which is in the tail) to turn the rotor (which is on top of the helicopter)
- The rotor turns the rotor blades – slowly at first and then faster and faster.
- The rotor blades are designed like the airfoil section of a plane's wings. This helps to create lower air pressure above the rotor blades than below the blades.
- When the rotor blades are spinning fast enough the pushing up or lifting force is stronger under the blades than above the blades so that the helicopter rises up into the air.
- The pilot uses a joystick called the cyclic control to tilt the blades so the helicopter will turn.

Do you know

- A flying thing stays up in the air because it produces a force called lift that is stronger than its own weight.
- Airfoils help birds fly too. The upper part of the wing is curved and the underside is flat which works to make the air pressure above the wing less than the air pressure below the wing.
- When a flying thing is heavy it needs to use ground speed to help it change the air pressure above the wing so that it has enough force to lift off the ground. Some ducks have to run across the water to get their speed up.

Experiments you can do

Make an airfoil flyer.

What you need

Two thick pieces of paper about 8cms by 5 cm
Two straws
Sellotape.

Tape the straws together to make a 'T' shape. Make airfoil wings by folding the pieces of paper over so the top side doesn't quite meet the bottom side and press a crease into the paper. Tape the two long sides together and you'll see that one side of the wing is curved and the other flat.
Tape the wings onto the top straw so the curved side of the paper is facing upwards. Hold the bottom straw between both hands and twirl it. Give it a good twirl as you let it go. Watch what happens. The airfoil flyer should gently float to the ground.

Other Investigations

Try it again replacing the airfoil wings with two flat pieces of paper. How does it fly this time? Because there's no airfoil to reduce the air pressure above the wings the lift force is not very strong. The weight of the flyer is much heavier than the lift force so it drops more quickly.

To feel what the helicopter pilot feels when they're tilting their rotors to turn the helicopter try being a tightrope walker holding onto a long balancing stick as you walk (a broom handle makes a great balancing stick).