

# GYROBOT



 THAMES & KOSMOS



## EXPERIMENT 1



## DID YOU KNOW?

This effect is also at play when you tilt a bicycle while entering a curve. Of course, if you were to tip the bicycle to the side when the wheels were not turning, you would simply fall over.



## What is the gyroscopic effect?

### YOU WILL NEED

- > Gyroscope
- > 3 x AAA batteries or 3 x AAA rechargeable batteries
- > Watch or clock

### HERE'S HOW

1. Open the cover on the underside of the gyroscope. That's how you get to the battery compartments.
2. Insert the batteries as indicated inside the battery compartments.
3. Replace the cover and switch on the gyroscope. With this kit, you can make five different glowing concoctions using the included materials and materials from around your house.
4. The disk inside will start to spin. Hold the gyroscope firmly in its upright position and wait for the disk to reach its maximum speed. It will take about 20 seconds.
5. Now try carefully tilting the gyroscope a little to one side — first a little to the left, then a little to the right.

### WHAT'S HAPPENING?

Do you feel the force that makes it so difficult to tip the gyroscope? What you're experiencing is something called the gyroscopic effect. It arises when an object (the disk, in this case) spins very rapidly. The force you feel when you tip the gyroscope is trying to maintain the disk's axis of rotation.

### LET'S GO

Build your own gyrobot. It will be able to keep its balance as long as the gyroscope's disk is spinning.



# Gyroscopes in airplanes

## YOU WILL NEED

- > Gyroscope
- > 3 x AAA batteries or 3 x AAA rechargeable batteries
- > Watch or clock

## HERE'S HOW

1. Open the cover on the underside of the gyroscope. That's how you get to the battery compartments.
2. Insert the batteries as indicated inside the battery compartments and replace the cover.
3. Now switch on the gyroscope, hold it tightly, and wait for the disk to reach its top speed. It will take about 20 seconds.
4. First hold the gyroscope straight, and then tilt it a little to the side as if the gyroscope were flying into a curve. What do you feel? Briefly tip the gyroscope a little more to the side.
5. Also try tipping the gyroscope forwards and backwards.



## LET'S GO

All modern airplanes have something called an altitude indicator, also known as a gyro horizon or artificial horizon.

Now you can build your own altitude indicator model! While it's true that your gyroscope is mounted vertically in your model, it will maintain its orientation even when you take the model in your hand and tip it forwards or backwards, simulating a climb or descent.

**Note:** You do not turn on the power for this display model!

## WHAT'S HAPPENING?

The more the gyroscope is tipped, the greater the tilt of the airplane you're simulating here, and the greater the corresponding force. The force counteracts the tilt, working to re-establish the original position. If the gyroscope is suspended in such a way that it can move freely, it will maintain its orientation regardless of the tilt of the airplane.



CHECK IT OUT



# Multiple talents ...

**Personal Transporters** can travel at speeds up to 20 km/h over distances of 40 km if their batteries are fully charged. They are often used by police and rescue crews in crowded locations — at airports, for example, or large exhibits. They also work off-road!

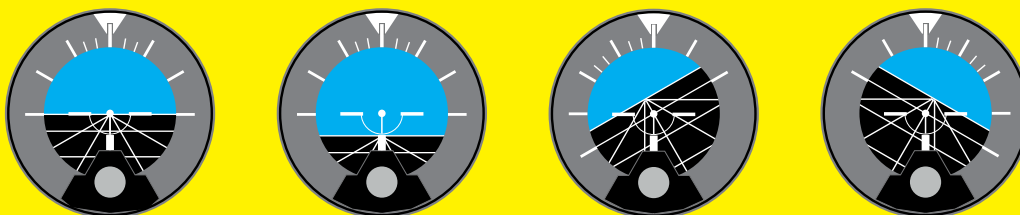
## YET MORE "GYROS" FROM EVERYDAY LIFE

You often encounter objects that maintain a stable position by turning or rotating — and not just tops or bicycles. For example, have you ever given a **diabolo** a whirl?



## AN AIRPLANE CHOCK FULL OF TECHNOLOGY

All modern airplanes have altitude indicators, also known as a gyro horizons or artificial horizons. These instruments show the pilot any deviation of the plane from its horizontal position. That is particularly important if visibility is poor or at night, when the pilot can't see the natural horizon.



From left to right: Artificial horizon in horizontal flight, when ascending, when descending and banking to the right, when descending and banking to the left.