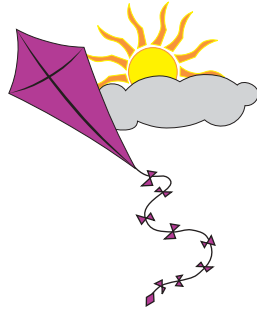


# KITES



This unit explores the variety of kite designs around the World, together with the scientific principles that keep kites aloft. It is a fun way of exploring some types of forces. There is a strong multicultural element, there are also strong links to the design and technology curriculum. The unit provides another context for the development of pupils' literacy skills.

Kites have fascinated people for centuries. It is not surprising that something so relatively simple and inexpensive to make should have been enjoyed in many countries of the World over a period of more than two thousand years. Observations and investigations with kites led eventually to the first heavier-than-air flying machines, such as Otto Lilienthal's hang glider and the Wright brothers' 'Fliers'.

This unit is in three parts:

**Part A – Kits around the World**

**Part B – How does a kite fly?**

**Part C – Making a Scott Sled kite**

By using this unit pupils will:

- learn about the wide variety of form and function in kites around the World, both in past and present times
- explore the simple forces that act on model kites
- make a simple kite and investigate how certain features affect its flight.

## Teaching focus

In working through this unit, pupils should be encouraged to develop investigative skills whilst using and developing scientific knowledge and understanding. They should be encouraged to raise and answer questions that arise out of their everyday experience and growing understanding. They should be given opportunities to explore with increasing precision, appraise their approaches to their investigations and think about how they could improve them. It gives pupils the chance to explore and experience different types of forces.

## Managing the unit

Making kites is an exciting and rewarding activity for pupils, but it often depends upon classroom space and outside weather conditions. This unit provides two kite-related activities that can be managed in the classroom while waiting for the right flying conditions outside.

The three parts could be taught in rotation with three working groups of pupils, allowing the teacher to spend more time with one of the groups.

Although kite flying is fun, it can sometimes be frustrating for very simple reasons. Impress upon the pupils that they can make the small adjustments needed, such as the length of string or the position of the tail, themselves. In this way they become fully involved in the process of scientific observation and analysis.

## Part A Kites around the World

Kites were flown more than two thousand years ago, but their exact origins are unknown. It is widely believed that kites existed in China and Korea about two and a half thousand years ago, and that their designs spread to other parts of the World along trade routes. The possibility remains, however, that kites were developed independently in a number of places at around the same time.

The simple principles that govern the flight of kites have enabled a wide variety of kite designs to develop involving different shapes, sizes and materials used. It is not surprising, then, that each country has developed its own particular set of kite designs and uses.

Today, kites are used for festivals, sporting events and leisure activities, but they were not always used in these ways. They were used in China at one time for military purposes, such as signalling, estimating distances and carrying propaganda leaflets. In other countries, kites have been used as an aid to fishing, as a way of lifting people and as a method of pulling a small boat along. Kite experience was important in the early development of flight, when pioneers such as Hargrave, Cayley and the Wright brothers used kites to make observations and test a range of aerodynamic theories. How many uses for kites can your pupils think of?

This activity will help pupils appreciate the variety of kites around the World. The following notes may add interest to the activity.

### **Giant kite – Japan**

These kites can be as large as 14 metres by 11 metres and may weight up to 800 kilograms, equal to about ten adults! As much weight again will be used to anchor the kite while it is being flown from a hillside. The kite-flying team has to be well organised in order to control the great pull on the kite 'string'. About 150 years ago a giant kite called a *wan wan* was flown regularly in the Japanese city of Naruto. It was said that this kite could lift a man, his wife and his child and required between 150 and 200 men to fly it!

### **Moon kite – Malaysia**

This is a fighting kite that can be as tall as two adults, one standing on the other's shoulders. Village teams compete and try to cut the string of their opponent's kite. People often take bets on the winning kite at these popular events.

### **Bird kite – China**

Some of the earliest kites were bird-shaped and may have been made of wood. The famous Chinese engineer, Kungshu Phan, is thought to have made a wooden 'bird' that flew for three days without coming down.

**Giant kite – Guatemala**

This kite can be up to 10 metres across, and does not fly very well. It is made to last only one day, All Saints' Day, on 1 November. The frame of the kite is bamboo and the paper skin is made of hundreds of paper clippings glued together to make beautiful patterns. At the end of the festival the kites break in the wind, or are set alight.

**Skirt or Gate kite – Korea**

This is the most popular kite design in Korea. A plain rectangle is supported on a cross of bamboo struts. The hole in the middle allows some of the air to escape to stop the kite turning over. These kites might be only 50 cm across.

**Hamatsu fighting kite – Japan**

This fighting kite can be two or three metres across and has to be controlled by a team of handlers. The kite string is covered with glue and dipped into powdered glass. During the fight one kite string rubs against another and may cut it through. The winner is the one whose kite is left flying at the end. The ideograph on this kite means 'boat'.

**Fishing kite – New Guinea**

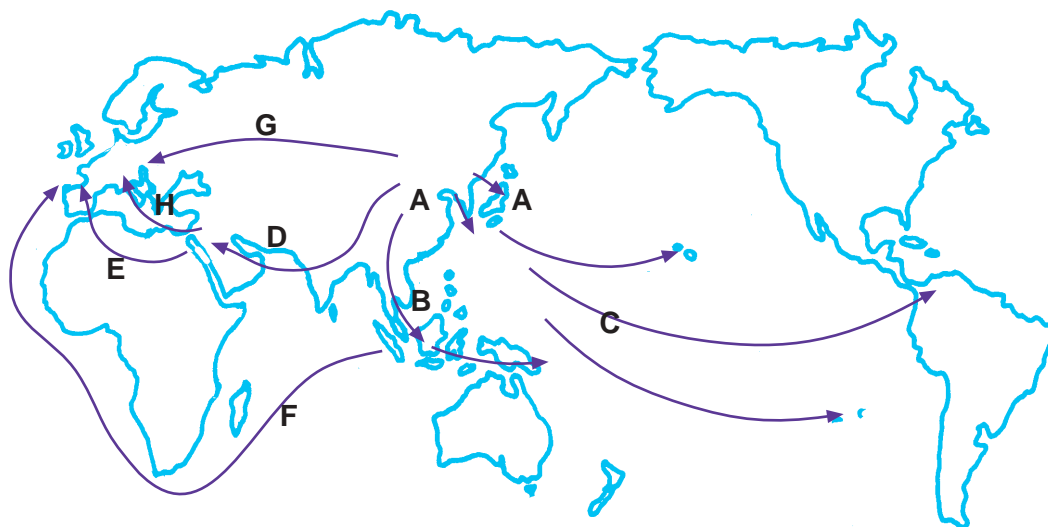
This kite is used to catch a special kind of fish called a Garfish, by getting it tangled in the line hanging from the kite. The kite is about one metre long and is made from the leaves of the sago palm or the epiphytic fern, with bamboo spars pushed through to keep it rigid.

## Activities for pupils

Materials for **Activity 1** consist of three pages to be photocopied for each pupil or group.

- **Kites around the World** – information that they have to read in order to do the activity.
- **Kites of the World** – a page of pictures of the kites described above.
- **A map of the World** – naming places mentioned in *Kites around the World*.

The pupils read *Kites around the World*, cut out the drawings of kites in *Kites of the World* and stick them in their country of origin on the map of the World. They then add arrows and letters to illustrate how kites may have spread to many countries.



## Part B How does a kite fly?

This activity enables pupils to explore some of the forces acting on a kite as it rises in the air. The activity can take place in the classroom. It introduces a design for a Chinese figure kite. Pupils might like to colour the design *before* it is made into the model.

The forces acting on a simple flat kite are shown here.

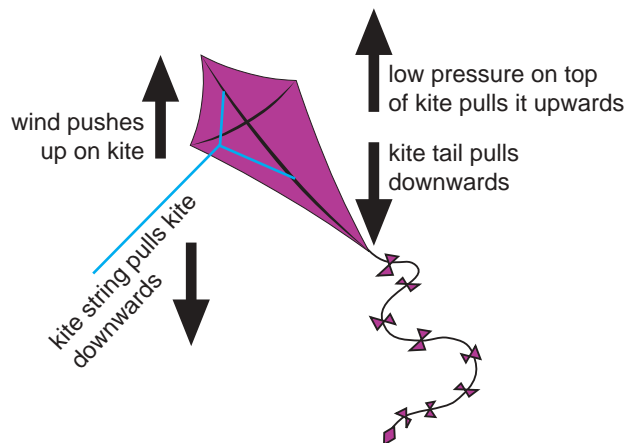
The blue bridle holds the kite at an angle of attack to the airflow, so that it can work like an aeroplane wing. The air flow over the kite also produces a low pressure on top.

The bridle holds the kite stable in the vertical plane.

The tail holds it stable laterally.

The tail pushes the nose of the kite into the wind.

Stunt-kite bridles work laterally as well as vertically – pulling the kite to one side or the other.



Some kites are designed to form a curve when they are in flight. These may gain additional lift due to the aerofoil shape which is similar to an aeroplane wing. The complications of this effect are avoided in the model made in this activity.

It is worth discussing with pupils the difference between the simplified model and a real kite. A drinking straw is used to provide stability in the model, but will give a similar pulling force to that on the kite. The bridle on a real kite is adjustable and often made of string. Here a paper triangle is used instead. A real kite would be made of fabric and made rigid with bamboo struts or spars. Its edges are swept back to spill any excess wind. The paper model is rigid enough and the limited 'wind' blown onto it is easily 'spilled'.

There are two pages for Activity 2, How does a kite fly? Possible discussion points from pupils' answers on the second page:

- The force of the wind can be simulated by using the pupil's finger which, by pushing can be seen to lift the kite when it is at an appropriate angle.
- The bridle on a real kite is often adjustable and holds the kite at the correct angle to the wind.
- The tail on some kites pulls down on the bottom of the kite thus keeping it upright in the air. This downward pull is provided more by the drag of the wind on the tail material rather than the weight of this material.

## Part C Making a Scott Sled kite

The Scott Sled kite is a simple and inexpensive one to make in the classroom. Small versions could be flown in the playground by pupils pulling them along, even on a relatively windless day. Polythene is suggested as a strong material for construction, but other materials, such as tissue paper, could be investigated. The effect of cutting different shaped vents in the bottom half of the kite, or trying different types of tail, makes an interesting science investigation that can be planned by the pupils themselves.

There is one page for this activity.