

Parachutes

Educational support materials for groups participating in this activity

This pack contains information designed to support teachers whose classes are visiting the RAF Museum and participating in the Parachutes Activity. It is intended to provide information and suggestions for class lessons before and after the activity. All the photos and diagrams are available for reasonable reproduction to help with teaching.

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Additional images from the RAF Museum's collections can be found online at <http://navigator.rafmuseum.org/>

Parachutes

Educational Background to the Parachutes Activity

Links to the Curriculum

Parachutes relates to a number of key areas of the National Curriculum. This section of the teacher resource pack discusses the scientific, historical and social factors which provide a background to the activity.

Forces of Flight

There are a number of forces which must be considered when designing a parachute.

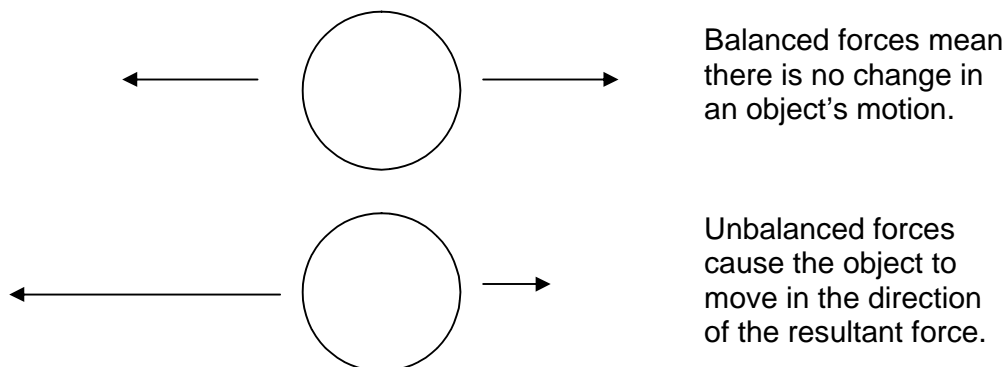
Gravity – This is a force which attracts different masses together. The strength of gravity is determined by the mass of the objects. The greater the mass of an object the greater the gravitational attraction of the object. The strength of the Earth's gravitational field (when measured at its surface) is 9.81m/s^2 .

Air Resistance – This force is also referred to as drag. It is a frictional force which opposes the movement of an object through air. Air Resistance is proportional to surface area so if surface area is increased so is air resistance.

Weight – This force is caused by gravity. It is the gravitational force between an object and the Earth. Weight, like gravity is also directly proportional to mass, it is measured in Newtons.

Balancing Forces

When forces are balanced there is no overall resultant force so an object will remain stationary or travelling at a constant speed because the forces acting on it cancel each other out. When one of these forces is made stronger than the others the object will move in the direction that this force is pushing it. Making one force weaker than the others means that the object will move in the direction that the other forces are pushing.



Parachute Materials

The material used to construct a parachute canopy has a number of effects on how the parachute works.

The material needs to be strong and wind resistant as during a parachute's descent it will be subject to a number of airborne currents which if the material is weak could lead to the parachute tearing and being less effective as it would have lower air resistance. When a parachute is badly damaged by wind it is possible that it could fail completely. This is why parachutists also have a reserve chute in case the first one fails.

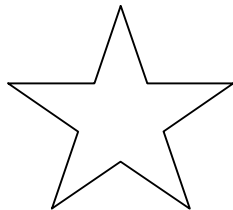
It is also important to consider the rigidity of a material as this has an effect on the shape of the parachute. Rigid materials hold their shape better than flexible materials, which is important in parachute design because the shape of a parachute affects its stability. Stable parachutes descend more slowly as they are less prone to spinning or swinging which reduces air resistance. You may notice during your activity that some of the parachutes constructed by the class do this. Stable parachutes are also much more pleasant for parachutists to use as there is less risk of motion sickness.

Parachutes were originally made of canvas, because of its strength but was eventually replaced by silk which is lighter, stronger, thinner and more easily foldable. During the Second World War as it became difficult to import silk to make parachutes, experiments were made with nylon parachutes. These parachutes proved to be very successful as nylon was cheaper than silk and was less likely to go mouldy. Nylon parachutes are still commonly used today, although experiments have been conducted using other materials.

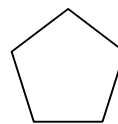
Parachute Shapes

The shape of a parachute canopy also affects how the parachute works.

Different shapes even when they have the same surface area are distorted differently by air flowing around and under them. This distortion changes the surface area of the shape as some of the surface area is lost when it is pulled perpendicular to the airflow.



Undistorted canopy
viewed from above



Distorted canopy viewed
from above

The length of the 'strings' which connect the canopy to the harness also affect how the parachute works. The shorter the strings the less air can get underneath the canopy so the lower the parachute's air resistance.

The History of Parachutes

Most people agree that parachutes first appeared in the notebooks of Leonardo da Vinci in the 15th Century; however, it was not until May 1914 that the first parachute jump from an aircraft took place. This occurred at Hendon Aerodrome, now the site of the RAF Museum.

Experiments with parachutes had been conducted before 1914, for example in 1785 Blanchard dropped a dog from a basket. The dog was wearing a parachute with a rigid frame, not at all like a modern parachute. 1797 saw the first human parachute jump, although this was not from an aeroplane (as they had yet to be invented). Andrew Garnerin jumped using a parachute without a rigid frame from a hot air balloon. This jump was also the first parachute jump to use a parachute without a rigid frame. Garnerin was also the first person to try to increase parachute stability by reducing oscillations, through creating an air vent in the parachute canopy.

Parachutes were commonly seen, tested and displayed during Edwardian times but when the First World War started parachutes were not used by pilots. Parachutes at this time were large and bulky and would not fit inside the cockpits of any First World War aircraft. While visiting the museum, have a look at our First World War aircraft and compare the cockpit size to that in later aircraft.

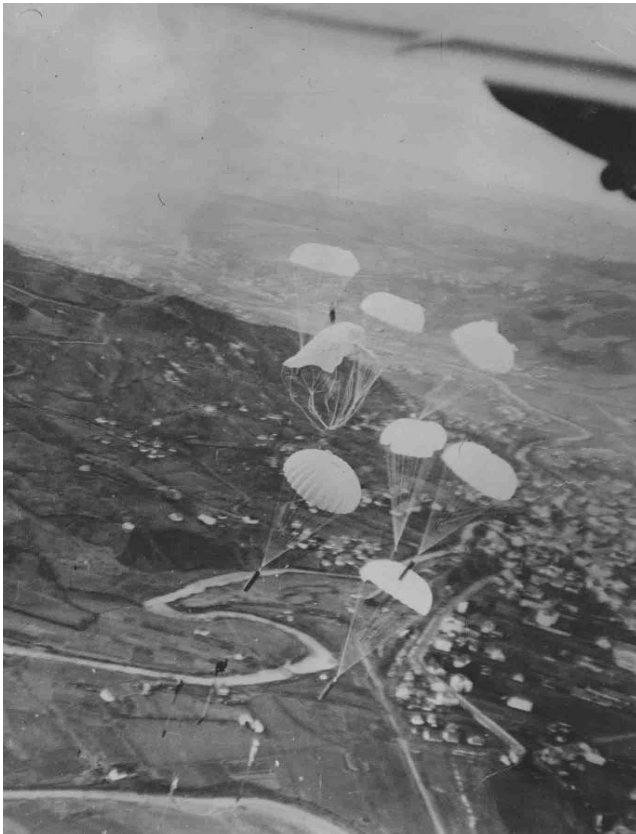
Parachutes were, however used during the First World War by the crews of Observation Balloons. The parachutes were fixed on to the sides of the baskets of every Observation Balloon. Parachutes were the only means of escaping from a balloon. Observers wore a parachute harness over their flying overalls to which a line could be hooked. When the balloon was seriously threatened, the crew would hook up the line to the parachute hanging from the side of the basket in a large conical-shaped valise or 'acorn'. As they launched themselves over the side of the basket the line would tug the 'acorn' lid open and cords would haul the carefully folded silk parachute open, so that the observers could float away to safety (a drop of up to 5000 ft). A quick escape route was vitally important for these observers as the balloons they were in were filled with Hydrogen, which is highly explosive. See image of First World War observation balloon.

Parachutes were not fully introduced into the RAF until the mid 1930's when pilots began to be given parachutes and people saw more uses for them.

Teacher Resource Pack: Parachutes
Key Stage 2



RAF Parachute Display Team.
These parachutes have been
designed to be very manoeuvrable
during their descent.



Parachutes being used to drop
cargo packets.

Teacher Resource Pack: Parachutes
Key Stage 2



Parachute being used to slow down an English Electric Lightning aircraft upon landing.



Diagram showing the deployment of an airborne lifeboat. These were used by Coastal Command during the Second World War to rescue downed aircrew.

Teacher Resource Pack: Parachutes
Key Stage 2



First World War Observation Balloon basket with escape parachute attached to the side.



Parachute jump from a biplane. Notice that the parachute is strapped to the parachutists bottom rather than worn as a rucksack as today.

Parachutes

Activities for the classroom

Links to the Curriculum

Parachutes relates to a number of key areas of the National Curriculum. This teacher resource pack is intended to provide some suggestions for classroom activities for a variety of subjects.

Science Activities

Activity: Which of the parachutes made by your class fell the slowest? Discuss why you think this happened. Look at how you could improve your parachute, what would you change and why?

Activity: Experiment with different lengths of string to attach the canopy to the load. Does the length of string have an effect on how well the parachute works? Write up your results in the form of an experiment.

Research: Your parachutes were made out of tissue paper and cotton. Find out what materials real parachutes are made of. Why do you think these materials are used? Work out what properties these materials have that makes them suitable for parachute design.

Activity: The different shaped parachute canopies used caused the parachutes to fall differently. Investigate which shapes are most stable, oscillate less, drop straightest and travel the furthest. Write up your results in the form of an experiment.

Maths Activities

Activity: What different types of shapes have been used for the parachutes made by your class? Measure the perimeter of these shapes and calculate the area.

Activity: Work out what shape is the most common in the parachutes designed by your class? Use a variety of methods to display your data, in your opinion which shows your results most clearly?

English Activities

Letter Writing: Write a letter to the person who led your activity or to the Education Team at the RAF Museum, to tell them how you felt about your trip and what you learnt.

Instruction Writing: Write a set of instructions on how to make a successful parachute using the materials provided in the activity. Make sure that the instructions are clear and easy to follow.

Creative Writing: Write a story about a parachute jump. It can be about someone's first jump, a parachute display, even using a parachute in an emergency situation like an aircraft crash.

Debate: Imagine you are important Government officials during the First World War. Some of you are arguing for parachutes to be issued to pilots others are arguing against. Try to persuade the rest of your class that your point of view is best.

Art Activities

Activity: Design your own parachute canopy. Look at the designs which are used today. How will you make your parachute distinctive?

History Activities

Research: Look at the history of your local area. Does it have any link to parachutes? Perhaps someone who lives in the area has experienced a parachute jump, or maybe you are near to somewhere where parachutes were made. If your school is from Colindale, it is likely to be close to a Second World War parachute packing facility.

Research: Find out about a famous parachute jump using secondary sources. Why is this jump important in the history of parachutes?