

Microgravity

fact file

- > BY REMOVING THE EFFECTS OF THE GRAVITATIONAL PULL FELT ON EARTH, MANY PROCESSES IN THE LIFE AND PHYSICAL SCIENCES CAN BE STUDIED MORE EASILY
- > MICROGRAVITY IS THE TERM GIVEN TO THE MINUTE AND VARYING GRAVITATIONAL FORCE THAT OCCURS IN SPACECRAFT, AS THEY ADJUST THEIR POSITION
- > THE UK IS TAKING PART IN THE EUROPEAN SPACE AGENCY'S MICROGRAVITY PROGRAMME, ALTHOUGH IT DOES NOT CURRENTLY TAKE PART IN EXPERIMENTS ON THE INTERNATIONAL SPACE STATION

What is Microgravity?

On Earth we are continually subject to the force of gravity. For objects in orbit around the earth, the gravitational force is counterbalanced by other forces and these objects appear weightless. This environment is known as 'zero gravity'. 'Microgravity' is the name given to the tiny accelerations caused when spacecraft adjust their positions, which have the same effect as a minute and varying gravitational force.



Why is Microgravity Important?

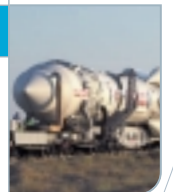
Many physical processes here on Earth are strongly affected by the pull of gravity. In most cases, it makes the process more complex and therefore harder to understand. Microgravity conditions can be used to conduct experiments without these complications.



Examples of Microgravity Experiments

UK researchers are involved in a number of experiments using microgravity. Here are some examples:

- > In normal conditions on Earth, it is extremely difficult to measure the properties of molten steel. In microgravity it is possible to 'levitate' a ball of molten metal (like suspending it in mid-air), allowing scientists to measure





its properties extremely accurately. Results of such experiments will help to improve industrial processes such as the manufacture of high-grade steels and alloys based on nickel and titanium.

- > It has been known for many years that astronauts can suffer serious muscle and bone wasting after just a few months in space. Studying this effect may provide insights into the normal ageing process. As well as having obvious attractions to society at large, slowing down ageing processes in space could help enable astronauts to travel greater distances.
- > Scientists are conducting experiments to find out how gravity affects plant genes and hence plant growth. An improved understanding of growth mechanisms is important to the science of agriculture.



Ways of Producing Microgravity

The International Space Station is the only facility to allow microgravity experiments over a period of months. Equipment is ferried up to the astronauts on the station, and they return the resulting samples or data to Earth. However, many shorter experiments can be conducted much more cheaply using other facilities. For example, microgravity can be created using drop towers, which give a few seconds of free-fall. Equally, parabolic flights, in which an aeroplane flies in a trajectory resembling that of a roller-coaster, produce periods of up to 20 seconds of microgravity.

Sub-orbital and orbital flights over a longer duration (as much as a week on the Shuttle for example) offer a better opportunity for experimentation, but at a correspondingly higher cost.



What is the UK Doing in Microgravity?

The UK is participating in the European Space Agency's (ESA) microgravity programme, which aims to enhance our scientific knowledge through experimentation, with the ultimate goal of offering regular, affordable and tailored experiment opportunities to researchers from academia and industry.





The UK is participating in this programme in order to make an informed judgement on the value of taking a fuller role in ESA activities which make use of the International Space Station. The UK has not invested in the development and construction of the ISS and its scientists do not currently have access to its facilities.

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Some microgravity experiments are carried out in specially adapted aeroplanes (NASA)



Mir Space Station (ESA)