

Zero-G aeroplane helps scientists to experiment with gravity!



The Zero-G aircraft was used to give the effect of partial gravity to the people and experiments onboard

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The International Space Station is a fantastic laboratory in space. Scientists conduct experiments in weightless conditions, leading to all kinds of new breakthroughs! But what if your experiment needs to be partly, but not totally, weightlessness? ESA, the German Aerospace Center (called DLR), and the French space agency (called CNES) teamed up to make this happen!

Instead of going into space, they used a very special aeroplane called the A310 Zero-G aircraft. When in the air, the Zero-G pilot performs a challenging manoeuvre. They pull up sharply, and then reduce thrust. This makes the Zero-G follow a large arc in the air, as if it had been fired by a catapult! As the aircraft goes over the top of its arc, all the people and equipment onboard are in free-fall, which is the same as being weightless, for around 20 seconds. The plane is then falling downwards, and the effect of gravity returns. Before long the pilot has to pull up to keep the plane in the air, and the process can begin again!

To achieve the effect of a quarter, half, and three-quarters gravity, the pilot changed the angle of the Zero-G flying upwards, leading to the plane following a different arc in the air. This technique had not been tried before, but it worked really well!



Representatives from the three space agencies onboard the Zero-G aircraft!

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The three space agencies worked together on different experiments during this special flight. One experiment investigated the effects of partial gravity on how our brains work. Earlier experiments have shown that short bursts of weightlessness increase blood flow to the brain, which helps our brains to work better. Being weightless for a long time has negative side-effects on our brains though. Could there be a good middle-ground with reduced gravity? This is what some of the scientists on-board were investigating.

Another experiment was about plant roots, and how they react to being in partial gravity. We know from experiments onboard the International Space Station that plants can adapt surprisingly quickly, but we need more information to fully understand how the plants change.



ESA astronaut Alexander Gerst has rehearsed being weightless during one of these special flights

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Experiments like these are very important for planning to send human astronauts to the Moon, and even to Mars. Can humans live and work in fully-weightless conditions for a long time, or is some gravity needed to keep us healthy? Farming plants in space and on other planets will be essential to our survival, so we need to know about how they react to different amounts of gravity too!

Imagine you are a scientist flying on the Zero-G plane. Can you think of an experiment you would like to run? Would it help astronauts to explore new worlds in the future?

Cool fact: The Zero-G aircraft can dive for reduced gravity every three minutes, a total of 31 times per flight. It is like an extreme roller coaster in the sky, but used for science!