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From Cologne/Bonn to weightlessness - Ten years of scientific parabolic flights by DLR

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Experiments on board the A300 Zero-G

From 7–21 September 2009, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) will perform, for the 14th time, a series of research flights to provide weightlessness conditions, using the Airbus A300 ZERO-G. The event will also celebrate ten years of activity for DLR's parabolic flight programme for microgravity research. The largest flying laboratory in the world will take off from Cologne/Bonn airport for a total of five research flights. Scientists will use these flights for experiments in biology, medicine, physics, materials research and technology.

Weightless in the sky

The Airbus A300 ZERO-G from the French company Novespace flies up to 31 parabolas daily during its 3-4 hour flights. In the parabolic flight process, the aircraft climbs steeply upward at an angle of up to 52 degrees from its horizontal flight path. Then the pilot throttles back the propulsive force of the engines and flies on a path that follows a parabolic trajectory. In the resulting freefall, there is almost zero gravity for passengers and experiments for around 22 seconds. Scientists use these conditions for research and to prepare complex experiments for the ISS. In addition, medical studies are expected to improve the health conditions of astronauts in space and of humans on Earth.

1538 parabolas in ten years

The Airbus A300 ZERO-G climbing steeply

The DLR Space Agency has been performing parabolic flights for science for ten years. After the flying days in September 2009, researchers will have carried out a total of 241 experiments in weightlessness conditions. Industrial enterprises with research projects are also increasingly taking part. In addition, students from schools and universities are also using the opportunity provided by the parabolic flights for their biological and medical experiments. Also, two artistic experiments have also been on board to date. In the 1538 parabolas, the researchers have had a total of at least nine hours of zero gravity conditions at their disposal.

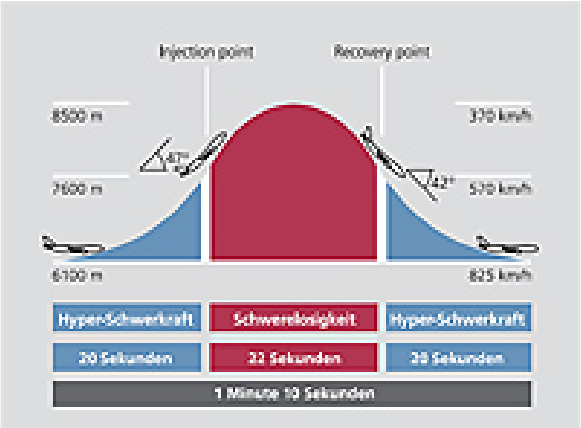
The 14 experiments of the current parabolic flight series include a trial from the University of Magdeburg to analyse cells that contribute to the formation and deterioration of bones. The results will form the foundation of the development of promising measures to prevent osteoporosis. Osteoporosis, or bone deterioration, is a big problem in the human aging process. Osteoporosis also affects young, physically healthy and very fit astronauts during the time they spend in space. It can, however, be completely reversed after they return to Earth. Flights under space conditions offer a good opportunity to examine the causes of osteoporosis in healthy people.

Logo of DLR's 14th parabolic flight campaign

Another experiment, from the Leibniz Institute for New Materials in Saarbrücken, is dedicated to the question of how we can make technical improvements to certain nanomaterials that, for example, can make surfaces scratch-proof or resistant to bacteria. Nanowires made from different alloys play an important role in this context. We already know that gravity plays a part in their manufacture. Now, the goal is to examine this process for the first time in zero gravity conditions in order to better understand it and optimise it on Earth.

Research in weightlessness conditions

The evolution of life and all biological, physical and chemical processes on Earth always take place under the influence of Earth's gravity. If this influence is removed, scientists can concentrate on observing other significant factors. The knowledge thus gained can be used to improve both the treatment of patients and the design of materials. Basic research in the physical, biological and medical fields also profits from this. As a link between the long-term research on the International Space Station (ISS) and research and development on Earth, parabolic flights represent a 'bridge into space' from both scientific and technological perspectives.



Flight manoeuvre during a parabolic flight

DLR offers parabolic flights once or twice a year. Although the 22 seconds of weightlessness per parabola is very short, innovations in the area of measuring technology allow manifold experiments on parabolic flights today than was possible during DLR's first parabolic flight in 1999. Parabolic flights are an important addition to the experimentation possibilities that the DLR Space Agency makes available to science: from the drop tower in Bremen, where zero gravity conditions can be achieved for up to nine seconds in an evacuated tube, to rockets and satellites on which automatic experiments can take place over several minutes or weeks, to the ISS. The special benefit of the parabolic flights is that scientists can work on their experiments themselves during the flight and carry out a variety of test procedures using their own laboratory devices. Flying on the aircraft is generally possible for research teams within one year of lodging their application.

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