News Archive Space 2009

Tenth anniversary for DLR's parabolic flights

2 February 2009

Medical research in weightless conditions

Thirteenth flight campaign launched in Bordeaux

From 2-14 February 2009, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is carrying out its thirteenth parabolic flight campaign using the Airbus A300 ZERO-G. The world's largest flying laboratory takes off from Bordeaux Airport for a total of four flights that enable research in weightless conditions. Scientists use these flights to conduct 16 experiments in Biology, Human Physiology, Physics, Materials Research and Technology.

Weightless for 40 minutes

During each of the three- to four-hour flights, the Airbus A300 ZERO-G, owned and operated by French company Novespace, flies 31 parabolas. During a parabolic manoeuvre, the aircraft first climbs steeply from horizontal flight at an angle of 52 degrees. The pilot then cuts the thrust of the turbines, causing the aircraft to follow a path that resembles an ideal ballistic curve. The aircraft, as well as its passengers and on-board experiments, will then be in free fall, creating conditions close to total weightlessness for approximately 22 seconds. During the thirteenth parabolic flight campaign, the researchers will have more than 40 minutes of weightlessness in total, divided over the four flight days. Some of the experiments on board the Airbus concern independent research projects, but others are meant to prepare experiments for the International Space Station ISS. In addition to this, medical research is carried out that aims to pave the way for human space travel, for instance to Mars.

The experiments of Professor Oliver Ullrich of the University of Magdeburg, for instance, are the first that have been designed to investigate the immune system of the brain in weightless conditions. During a longer stay in space, astronauts often experience problems with their immune system. An extremely finely regulated and controlled immunosurveillance, especially in the brain, is essential for survival, however. Until the ‘immune problem’ in space is resolved or can be treated with medication, long-haul space flights on missions far from Earth can hardly be justified, as the effects they have on the astronauts' brains and bodies are not yet known.

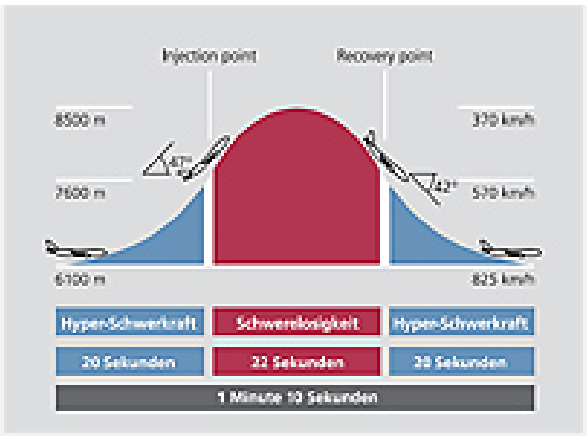
The Airbus A300 ZERO-G climbing steeply

Another experiment investigates new technologies for future spaceflight missions. Marco Straubel and his research team from the Institute of Composite Structures and Adaptive Systems (Institut für Faserverbundleichtbau und Adaptronik) at DLR Braunschweig are working on rollable, ultra-lightweight carbon-fibre booms. These components are, for instance, used for deployable solar collectors, and the aim is to bring them into space using as little storage space as possible. In addition to this, they are just as stable as metal booms while weighing much less, making their transportation more efficient.

1425 parabolas in ten years

The DLR Space Agency (DLR Raumfahrt-Agentur) has been conducting its parabolic flights for ten years. This thirteenth flight campaign will bring the total number of experiments that have been sent into free fall by the Airbus A300 ZERO-G to 227, with a combined weight of almost 33 tonnes. High-school students have participated in biological and medical experiments as well. The flight campaigns have even included two artistic experiments. In total, eight hours and 20 minutes of weightless conditions have been created in 1425 parabolas.

Everything started in 1999 with one campaign per year and each campaign consisting of three to four flight days. As scientists have become increasingly interested in research environments characterised by weightless conditions and by the transition between weightless conditions, normal gravity and double gravity, DLR now carries out two of these campaigns in most years. Weightless conditions only obtain for a short period during each parabola, but innovative measurement technology has made it possible to conduct a wider range of experiments on board parabolic flights than ten years ago. The next DLR parabolic flight campaign, the fourth one to use Cologne-Bonn Airport as its base, is scheduled to take place in September 2009.



Flight manoeuvre during a parabolic flight

Research in weightless conditions

The evolution of life and all biological, physical and chemical processes on Earth are always influenced by the Earth's gravitational pull. This raises many questions, such as: To what extent and in what way does gravity influence physical and biological processes? Could an adequate understanding of this influence enable us to improve technological processes or products? To what extent can basic research conducted on healthy human beings in weightless conditions contribute to improved medical treatment of patients on Earth? Research in weightlessness provides researchers with a unique opportunity to

investigate processes and reactions without the distorting influence of gravity, which in turn could help them to observe fundamental phenomena. Parabolic flights thus provide a gateway to space for science and technology.

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