DLR as an albatross - Biologist Dr Ulrike Friedrich manages parabolic flights on behalf of DLR

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By Andreas Söntgerath

"When the aircraft enters weightless conditions and you are lifted up from the floor and start to float, huge amounts of excitement hormones are released in your body", enthuses Dr Ulrike Friedrich. In her capacity as manager for parabolic flights at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR), she is in a position to award this feeling of exhilaration to scientists, by selecting their research proposal for inclusion in a parabolic flight campaign. This is the third in a series of portraits on the DLR Web Portal.

Even though preparing for a parabolic flight campaign involves coordinating a large number of different activities, Ulrike Friedrich has always managed to keep a cool head. With confidence and experience, the 55-year old DLR scientist has already organised parabolic flights for 227 experiments involving hundreds of scientists, engineers, students and school pupils. In early February, an Airbus A-300 ZERO-G will take off from its home airport in Bordeaux (France) for the 13th DLR flight campaign. The Airbus will fly a total of 31 parabolas on each of the three flight days. During each parabola, the Airbus's flight path follows a parabolic curve. As the Airbus moves through the upper part of this curve, weightlessness occurs for a short period - up to 22 seconds. Parabolic flights provide scientists with a unique opportunity to conduct their experiments in weightless conditions without actually having to fly into space.

A good opportunity: quick research in weightlessness

Since DLR's research aircraft fleet does not include a parabolic flight aircraft, Ulrike Friedrich works with a commercial provider. DLR buys parabolic flight campaigns from French company Novespace, which in practice means that it buys flight time on the Airbus A-300 ZERO-G. Novespace provides the aircraft and its crew, and it assists the scientists in setting up their biological, medical or physics experiments inside the Airbus and in carrying them out safely.

Ulrike Friedrich organises one or two of these parabolic flight campaigns every year. Scientists working on basic and applied research topics who need to conduct their investigations in weightless conditions are offered the chance to participate. A large number of institutes associated with universities, with DLR itself and with other research institutions are potential users of the campaigns. This means that Ulrike Friedrich has to match the limited number of available places with the high demand for them. "On each campaign, we are able to fly 15 to 23 experiments. Alternatively, scientists can also use ESA parabolic flights", explains Ulrike Friedrich to give an idea of what the situation is like for applicants.

The decision to select a particular experiment for inclusion in a flight campaign is made by DLR scientists based on the recommendations of external specialists. Important criteria are the scientific quality of the research proposal and the technical feasibility of conducting the experiment on board the Airbus. If the proposed experiment meets the requirements, Ulrike Friedrich has some good news for the researchers: they will indeed be able to conduct their research in weightless conditions.

An appealing combination of biology and management

In 1985, Ulrike Friedrich gave up her teaching and research position in Biology at the University of Bonn to work for the DLR Space Agency (DLR Raumfahrt-Agentur). She already knew DLR from the time she completed part of the research for her doctoral thesis at the DLR Institute of Aerospace Medicine (DLR-Institut für Luft- und Raumfahrtmedizin). From then on, the PhD

graduate in Biology would no longer be a full-time lecturer and researcher, but rather more of a manager, assessing scientific proposals and arranging content-related and financial support for research projects.

At first, her transition from the university to space administration was accompanied by a sense of loss. "I have always thoroughly enjoyed working with young people and finding myself challenged and stimulated by their questions. In the beginning I really missed that", Ulrike Friedrich admits. "But I gained a lot in return: I found it incredibly exciting to have contact with so many researchers, to see what kind of research is being done in Germany and how DLR can support such interesting research projects", says the biologist, looking back on her career change. In 1999, Ulrike Friedrich organised the first parabolic flight campaign.

The albatross as a symbol for DLR's research

The frequency of the campaigns has increased and by now there are often two such series of parabolic flights per year, all organised by Ulrike Friedrich - a considerable workload that does not leave her much time to devote to hobbies. In what little spare time she has, she loves to venture out into nature in order to enjoy the tranquillity and to watch birds.

Those are the moments she can give her imagination free rein, and on one such occasion it occurred to her that DLR could be compared to an albatross: "The albatross is one of the largest flying vertebrates, and practically no other bird species has perfected the art of flying to quite the same extent. It has great stamina and it can stay in the air for many days at a time", explains Ulrike Friedrich. The same can be said of the German Aerospace Center, according to her. Just like the albatross is perfectly adapted to its habitat, the major research facility DLR has adapted to the demands of aeronautics, and it conducts its research in a very efficient way. Also, for Ulrike Friedrich, the albatross also symbolises most of DLR's focus areas: Energy is symbolised by the energy-saving flight of the albatross, and aeronautics is represented by the act of flying itself.

Through this comparison, Ulrike Friedrich closes the circle of connections between her academic studies in biology and her work at DLR. As a biological scientist, she started her career in the space programme in 1985. Her focus gradually shifted to management tasks, and in her capacity as manager for parabolic flights she has been organising these important flight opportunities for other researchers since 1999, enabling them to gain new scientific insights and at the same time also to experience unforgettable moments in weightless conditions.

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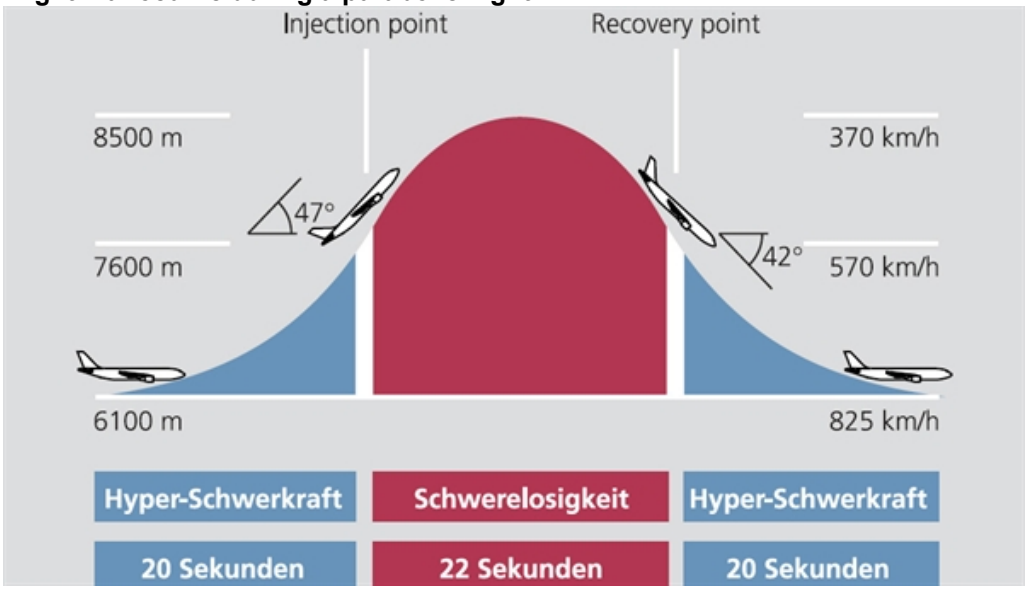
Ulrike Friedrich

Every parabolic flight campaign is thoroughly prepared. When the scientists have submitted their applications for inclusion in the campaign, DLR experts and external reviewers assess the proposed experiments. The most suitable ones are then selected. A large number of details need to be worked out before the experiments can actually be carried out. The parabolic flight campaign is thoroughly reviewed afterwards. The whole process, from the first preparations to the end of the campaign, therefore lasts several months.

Credit: DLR (CC-BY 3.0).

Flight manoeuvre during a parabolic flight



During a parabolic aircraft flight, test pilots fly the aircraft along a flight path that resembles an ideal ballistic curve. From horizontal flight, the aircraft first gains momentum at full thrust and then pulls up steeply. At this point, the people and devices on board the aircraft experience a force of 1.8 times the Earth's standard gravitational acceleration, pulling them towards the floor of the aircraft. The pilot then throttles the engines back, and weightlessness ensues for a period of 20 to 22 seconds, during which there is only a residual acceleration of about one percent of the Earth's gravitational pull. As the pilot pulls the aircraft out of its steep descent, hypergravity occurs for another 20 seconds. The aircraft then returns to horizontal flight for a period of one minute, during which the Earth's normal gravitational pull returns.

Credit: Gilles Le Barzic.

Ulrike Friedrich - floating freely

Ulrike Friedrich participated in the eighth flight campaign in March 2006 herself, which was a fascinating new experience for her. She cannot imagine having missed out on this weightless experience.

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