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**News Archive Space 2010**

**Motion sickness during parabolic flights**

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First-time flyers during a parabolic flight

The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) connects every first-time flyer to measuring equipment on each parabolic flight. During the flight programme that concluded in March 2010, the equipment recorded how motion sickness indicators manifested themselves on first-time flyers experiencing weightlessness during the 22 seconds of each of the 31 parabolic flights on the Airbus A300. In this interview, Dr Bernd Johannes from the DLR Institute of Aerospace Medicine (Institut für Luft- und Raumfahrtmedizin) explains why these data are important for astronauts on the International Space Station (ISS).

**Question:** Would it be fair to say that you have reason to be pleased whenever a first-time flyer starts feeling unwell on a parabolic flight, beads of sweat breaking out on their brow?

**Johannes:** No, I wouldn't say that – just that it is a frequent occurrence. Half of test candidates are initially unable to cope with the change from steep climbing flight to parabolic flight, and these problems tend to occur begin about half way through the flight. What we want to do is to investigate motion sickness, which is something that arises when our sense organs receive apparently contradictory indications, for example when the organ governing our balance is effectively rendered inoperative. The test subjects have no prior experience to go on, nor do they receive any medication prior to the flight. Every one of them deals with this stress situation in their own personal way. For us the data get interesting when something happens to one of our test subjects.



Wired up for measurements

**Question:** What are you investigating with your first-time flyers?

**Johannes:** We have a waistcoat in which the HealthLab measuring system is integrated. This system was funded and developed by DLR. It measures all the relevant parameters essential to a complete appraisal of cardio-vascular physiology. Blood pressure, pulse, the volume of blood that the heart pumps each minute, respiration and the voice are some of the parameters we analyse. There are different ways for stress reactions to come about. The heart may beat more often, more blood may get pumped with each beat, or its contractions may be more pronounced. These indicators vary from one person to another.

**Question:** What is the sequence of events for test candidates on a parabolic flight?



Preparations for parabolic flight

**Johannes:** There are three 'working blocks'. Firstly, there is a phase when people are only sitting. Then there is a section during which they are required to concentrate fairly hard on mental / problem-solving tasks using a computer. During this time, the test subjects wear special spectacles to block any events that may be occurring around them from their peripheral vision. The third task faced by the test subjects is to ride a bicycle during the weightlessness phases. First-time flyers feel least well when they are simply sitting around doing nothing. While they are solving tasks, mental concentration prevents or at least mitigates the onset of nausea. The physical strain of riding a bicycle also constitutes a requirement that 'structures' the body – and this also frequently helps to alleviate the response to the stressful situation of parabolic flight.

**Question:** Can individuals personally influence how they react to stress?

**Johannes:** No. One week before the flight, we record data from the test candidates when not exposed to weightlessness. However, this does not lead to any firm conclusions about how any individual is going to respond to the conditions experienced during parabolic flight. Sometimes, the person who responds most acutely is the one you would least expect – 'laboratory tigers' are still a long way from becoming 'space tigers'. A parabolic flight is a fairly robust stimulus. Participants suffering from symptoms of nausea are likely to find their reactions far from mitigated after 15 parabolic flights,

instead the symptoms remain at the same level of severity. The hardest thing would be the transition back from weightlessness to normal gravity.



A female test candidate before the flight

**Question:** Does that mean that astronauts may also exhibit reactions of this kind when they return from the Space Station?

**Johannes:** Even fully-trained astronauts react to this change. What interests us is to find out exactly what is taking place inside the body. This could, for example, prove to be important if we were ever required to bring back a sick person to Earth. To date, we have recorded data from 30 test candidates on parabolic flights. Our aim is to learn more about the different regulatory mechanisms that give rise to motion sickness.

**Question:** Is your HealthLab measuring device also in service on the ISS?

**Johannes:** During this German-Russian collaborative programme, the astronauts wear our measuring system during their training sessions for the manually-controlled docking procedure. Once a month, they train on the manual docking sequence for a Soyuz spacecraft – and we record data during this stressful situation. This investigation started back in 1996 on the Russian Mir space station. The long-term aim is to devise a diagnostic procedure that can be used to forecast the ability to act reliably in stressful situations.

*This interview was conducted by Manuela Braun.*

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