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Pioneering science and the D1 Spacelab mission

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Interview with Peter R. Sahm, scientific manager of the mission

The scientific manager of the D1 Spacelab mission, Peter R. Sahm

When the German D1 Spacelab mission was launched on 30 October 1985 with Ernst Messerschmid, Reinhard Furrer and Wubbo Ockels on board, there was one man on the ground who had his fingers crossed for the astronauts and their mission to complete almost 80 experiments under weightlessness. Peter R. Sahm was the scientific manager of the D1 mission. He went on to lead the German D2 mission in 1993 and the Russian/German MIR97 mission in 1997. From 1979 onwards he worked as a professor of engineering at RWTH Aachen University (Rheinisch-Westfälische Technische Hochschule Aachen). In 1986 he founded the Aachen Centre for Solidification in Microgravity (Aachener Centrum für Erstarrung unter Schwerelosigkeit; ACCESS). That same year he was awarded the Gottfried Wilhelm Leibniz prize. The D1 mission lasted 7 days, the preparation time was somewhat longer. Peter R. Sahm tells us about the "fascinating time", in this interview.

Interview by Manuela Braun.

The team carried out almost 80 experiments during their time on board Spacelab. Looking back, 25 years on, which experiments are we still benefiting from today?

Some of the medical experiments made such an impact that the results are used today in medical practices; probably without the doctor even knowing where they came from. One example is issues related to the vestibular system, the balance organ in the inner ear. During the D1 mission this was tested with the ‘sled’ that the astronauts would use to move back and forth on a rail in weightlessness. Most people have no idea about the effects the vestibular system has on us. Have you ever heard of

'caloric nystagmus'? When you blow warm air into one ear and cold air into the other, there is a difference in temperature. This makes many people ill; they become unsteady on their feet or feel seasick. You can start to draw indirect conclusions from these reactions and say: "The patient has a problem with their vestibular system or with the connection between it and the cerebellum."

How long did the preparation work take for the various experiments?

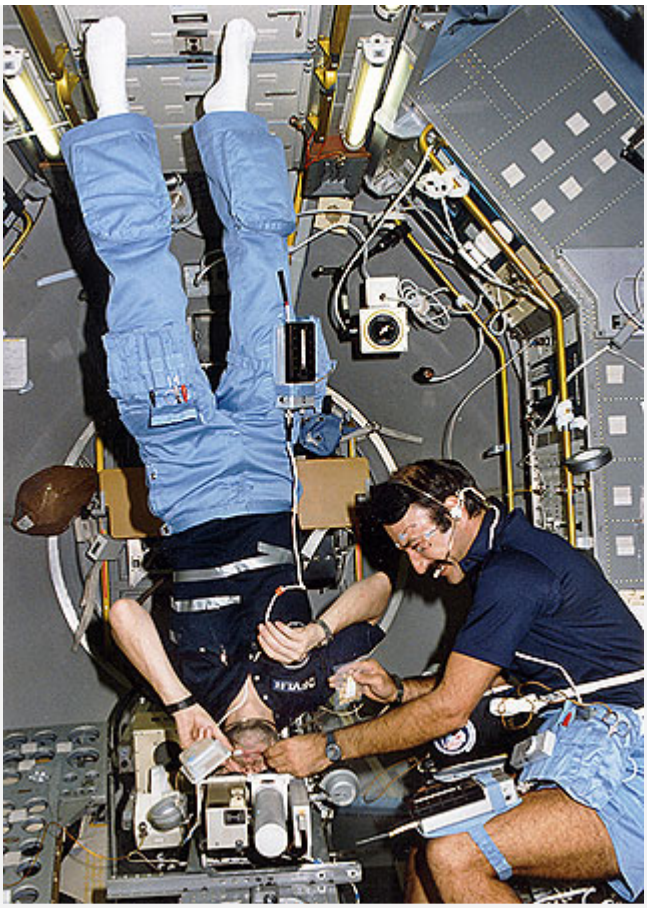
Demonstration of weightlessness

A long time! A whole year wasn't enough to learn about the experiments. Each astronaut, including the standby team, had to understand the experiments, rehearse them, and know their background. This meant we were somewhere new pretty much every day. Every university in Germany tried to contribute to at least one experiment. My colleagues – experts in their various fields – instructed the astronauts on how to carry out the experiments. When do I switch what on or off? What happens if I press the wrong button? We had to cover everything.

What was your job as scientific manager of the mission?

I was personally responsible for checking that the experiments represented first-rate scientific work. Experiments in weightlessness were relatively new and were met with some criticism. If a colleague said: "That is not good science!" I could either run away from it or stand my ground and defend it. I chose the latter – and it usually worked.

What defines a good scientific experiment? What criteria would an experiment have to meet to make it on board Spacelab?



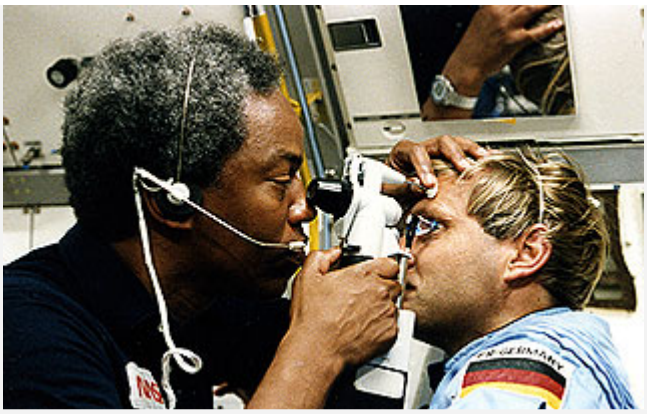
Reinhard Furrer and Wubbo Ockels

There was absolutely no possibility of the repetition of a known result or of something already well understood finding its way onto Spacelab. Sound scientific questions had to be posed and answered. I think that worked well for every D1 mission experiment. There had been only one comparable large mission; the first Spacelab mission in November 1983. That mission also represented a whole host of scientific disciplines, but the preparation wasn't as intense as had been for the D1 mission. Our mission attracted a lot of attention – especially in the US.

The astronauts kept showing experiments in front of a camera that transmitted images back to Earth. What was the atmosphere like there in the Oberpfaffenhofen control centre?

A huge team of people closely followed the seven-day mission on the ground in Oberpfaffenhofen. Up to 250 people – physicists, chemists, project managers – sat there and checked that the schedule for each experiment was being kept. The schedule had been rehearsed beforehand in simulation sessions, with every experiment allocated a timeframe to the exact second. If one needed more time, it was my job to make last-minute corrections. After each 12-hour shift I would then write a science report so the scientists would know to what extent their experiments had succeeded. Those shifts were quite a stressful.

In many of the experiments, the astronauts themselves were the research subjects…



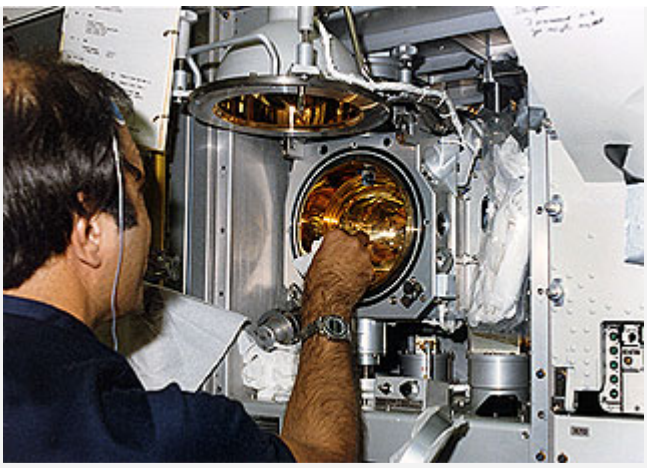
Tests on Ernst Messerschmid

Exactly – in the case of the life science experiments. For example, blood tests were carried out during the D1 mission. During weightlessness, blood flows into the upper half of the body, which is why astronauts in space have bloated faces. It puts a lot of stress on the body. There were also many physiological effects that we studied. Can you control blood pressure with high- or low-salt fluid intake? Does the intraocular pressure change during weightlessness? Biology and medicine were without doubt the most popular fields for the experiments, simply because they were the most relevant.

There were almost 80 experiments – did everything always go to plan?

Yes, for the most part. Although there was one plant experiment, where the growth direction was examined as a function of the gravity field, which worked the other way round because an astronaut forgot to pull the right lever at the right time. But it wasn’t too bad because one was still able to draw some conclusions.

When were the first results available?



Wubbo Ockels at a mirror furnace

In many cases the results were transmitted instantly. The astronauts would then notify the scientists on the ground: "The experiment went well," or "We've still got time to test another substance."

What was the most exciting experiment for you?

I naturally followed the experiments in material sciences with great interest – for example, during the mission the astronauts were able to produce materials that just cannot be made here on Earth. We were able to apply these findings for new technologies at our institute in RWTH.

You followed all the experiments from the ground. As a scientist would you have liked to venture into space?

I know that I would have failed immediately – as soon as you have to endure the triple gravitational force during the flight. It wasn't for me. But I found it fascinating – and still do today. It was a wonderful time – a pioneering time.

Related Contacts

Manuela Braun
Deutsches Zentrum für Luft- und Raumfahrt (DLR) - German Aerospace Center
Corporate Communications
Tel: +49 2203 601-3882
Fax: +49 2203 601-3249
E-Mail: manuela.braun@dlr.de
