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MAXUS 8 – a leap into space

26 March 2010

MAXUS 8 launch

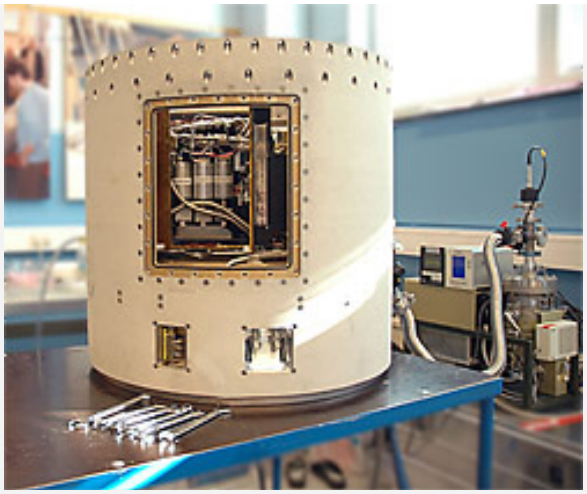
A successful flight for the European zero gravity research rocket

On Friday 26 March 2010 at 14:43 the MAXUS 8 research rocket was successfully launched from Esrange Space Center in Kiruna, northern Sweden. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is a major partner in this European Space Agency (ESA) project. During the parabolic flight, one experiment in gravitational biology and three experiments in materials science were conducted successfully.

MAXUS 8's payload contained in a six-metre long light-alloy cylinder, which landed with parachutes 25 minutes after launch according to plan and was retrieved by helicopter. On this occasion, two of the experiments were German, and German scientists played leading roles in the other two. The rocket was carrying an additional payload – an Italian experimental return capsule – that separated during the rocket's ascent phase.

Experiments examine plants and metallic materials in weightless conditions

One of the experiments, performed by scientists from the University of Bonn, investigated the cellular- and molecular-level biological mechanisms for gravity sensing in plants. They used Chara green algae for the experiment, determining the minimum forces and energy that are required for it to sense gravitational attraction at the cellular level.



Radiography module for diffusion measurement

The Fraunhofer Institute for Manufacturing and Advanced Materials (Fraunhofer-Instituts für Fertigungstechnik und Angewandte Materialforschung) in Bremen conducted an experiment to investigate the agglomerate behaviour of nickel nanoparticles in mocro gravity. The experimental data, including the size and structure of the resulting products, will be of value in improving the design and properties of industrial catalysts, nanoparticle magnets and certain sensors.

In a materials science experiment carried out by the DLR Institute of Materials Physics in Space (Institut für Materialphysik im Weltraum), Cologne, diffusion processes in melting aluminium alloys and a semiconductor alloy were investigated. For this purpose, the institute has developed a new method for the investigation of chemical diffusion in real time and tested and carried out the experiment. The trial was part of the multilateral project XRMON (X-Ray Monitoring), which is being conducted as part of the ESA's Microgravity Applications Programme, supporting the applications of microgravity research.

By using an X-ray radiography system, which was built by SSC, the chemical diffusion within the samples during the MAXUS flight in weightlessness was, for the first time, 'made visible' and analysed. The researchers tested the use of this procedure in weightlessness. The experiment provides an important reference for experiments conducted on Earth and is making a significant contribution to the understanding of solidification processes.

The fourth experiment studied the melting and solidification behaviour of alloys of titanium and aluminium. The results of this experiment, conducted by the Institut Polytechnique de Grenoble (France), will be compared with similar experiments on the ground to improve the accuracy of computer modelling of industrial casting techniques for, among other things, lighter and more energy efficient turbine blades. At Esrange, German scientists from the Access research centre at Aachen ran the experiment.

Zero gravity for 13 minutes

The Castor 4B rocket can lift payloads of up to 800 kilograms to an altitude of 750 kilometres. The experiments are installed in autonomous modules mounted in a vertical stack inside the rocket. Data is obtained either by telemetry during the flight or after recovery of the payload. The scientists can control the experiments directly as they are operated by means of telecommand and video streams. About 13 minutes of weightlessness were available during the MAXUS rocket's ballistic flight.

Transport to the launch pad

As part of the ESA's ELIPS programme (European Programme for Life and Physical Sciences) – in which Germany plays a leading role – the flights can be used by researchers nominated by the DLR Space Agency, as well as German research institutes and industrial concerns.

Since the first flight in 1991, eight such missions have been completed successfully. Industrial users of MAXUS include Astrium (Bremen, Germany), SSC and RUAG Space (Sweden), Kayser-Threde (Munich, Germany) and DLR Moraba (Oberpfaffenhofen, Germany). The Sounding Hypersonic Atmospheric Reentry Kapsule, an experimental return capsule, was built by Centro Italiano Richerche Aerospaziali (Italy).

The MAXUS programme offers scientists the possibility of conducting experiments in microgravity conditions and to prepare experiments for the International Space Station. It offers re-usability of payloads, short preparation and access times, regular access to zero gravity and lower safety requirements than manned missions.

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